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Moral imagination: Facilitating prosocial decision-making through scene imagery and theory of mind

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ABSTRACT

How we imagine and subjectively experience the future can inform how we make decisions in the present. Here, we examined a prosocial effect of imagining future episodes in motivating moral decisions about helping others in need, as well as the underlying cognitive mechanisms. Across three experiments we found that people are more willing to help others in specific situations after imagining helping them in those situations. Manipulating the spatial representation of imagined future episodes in particular was effective at increasing intentions to help others, suggesting that scene imagery plays an important role in the prosocial effect of episodic simulation. Path modeling analyses revealed that episodic simulation interacts with theory of mind in facilitating prosocial responses but can also operate independently. Moreover, we found that our manipulations of the imagined helping episode increased actual prosocial behavior, which also correlated with changes in reported willingness to help. Based on these findings, we propose a new model that begins to capture the multifaceted mechanisms by which episodic simulation contributes to prosocial decision-making, highlighting boundaries and promising future directions to explore. Implications for research in moral cognition, imagination, and patients with impairments in episodic simulation are discussed.

1. Introduction

Central to leading moral lives, maintaining meaningful relationships, and existing in a sophisticated large-scale society is our capacity to cooperate with and help others (Greene, 2013; Nowak & Highfield, 2011; Preston, 2013; Rand, Arbesman, & Christakis, 2013; Stavrova & Ehlebracht, 2015; Young & Durwin, 2013). Research in social psychology has focused on investigating how our perceptions of people in need, our ability and motivation to infer their mental states, and our emotional reactions to them contribute to decisions to help or not (Chakroff & Young, 2014; Lim & Desteno, 2016; Marsh, 2016; Morelli, Rameson, & Lieberman, 2014; Singer & Lamm, 2009; Warneken & Tomasello, 2009; Zaki & Ochsner, 2012). Yet helping consists of more than responding to a person in a vacuum but rather a specific event unfolding in time and place, within which the person is embedded. Does the way that we experience the surrounding environment and episodic details of a helping event also inform our willingness to engage in the helping behavior in the first place?

1.1. Episodic simulation: mechanics and relevance to morality

Understanding the mechanisms supporting episodic simulation, that is, our ability to imagine future events in specific time and place, has become a topic of growing interest in cognitive psychology and neuroscience (for reviews, see Atance & O'Neil, 2001; Buckner & Carroll, 2007; Gaesser, 2013; Schacter, Benoit, & Szpunar, 2017; Seligman, Railton, Baumeister, & Sripada, 2013; Suddendorf & Corballis, 2007; Szpunar, Spreng, & Schacter, 2014). Much progress has been made uncovering how episodic simulation draws on similar component processes as episodic memory, revealing how memory provides the source of details (e.g., places, people, and objects) that are flexibly recombined into imagined events of future social interactions (Schacter & Addis, 2007; Schacter et al., 2012; see Szpunar, 2010 and Irish & Piguet, 2013 for discussion of semantic memory).

Much less is known, however, about how episodic simulation can inform social cognition (Hassabis et al., 2013; Madore & Schacter, 2014; Rubin, Watson, Duff, & Cohen, 2014; Sheldon et al., 2011; Spreng & Mar, 2012), and, more specifically, moral decisions about whether we should help others in need. Across a series of recent studies, we have found that people make more prosocial decisions (i.e., report being

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more willing to help a person in need) after imagining helping in that situation in the future (Gaesser et al., 2017; Gaesser et al., 2017; Gaesser, Horn, & Young, 2015; Gaesser & Schacter, 2014). Specifically, we have found that the more vividly participants represent the helping scene the more subjectively plausible it becomes that they will help (Gaesser & Schacter, 2014; Gaesser et al., 2017; Gaesser et al., 2015). This finding converges with previous research on imagination inflation and related phenomena, in which vividly imagining an event also increases event likelihood (Carroll, 1978; Crisp & Turner, 2009; D'Argembeau & Van der Linden, 2012; Garry & Polaschek, 2000; Husnu & Crisp, 2010; Hyman & Pentland, 1996; Mazzoni & Memon, 2003; Szpunar & Schacter, 2013; Weiler, Suchan, & Daum, 2010). No study, however, has directly manipulated the vividness of scene imagery of the helping episode and examined a subsequent impact on a willingness to help others.

1.2. Episodic simulation: setting the scene

Beyond its basic visual features (Kosslyn, Ganis, & Thompson, 2001), a scene is a space with objects and people integrated into a coherent and vivid whole that unfolds over time as a specific event or episode (Hassabis, Kumaran, Vann, & Maguire, 2007; Maguire & Hassabis, 2011; Mullally, Intraub, & Maguire, 2012; Summerfield, Hassabis, & Maguire, 2009; Summerfield, Hassabis, & Maguire, 2010; Zeidman & Maguire, 2016). Spatial processing is broadly thought to be an important component of imagining vivid scenes (a view most prominently developed by Maguire and colleagues (see Maguire & Mullally, 2013 for review, but see also Addis & Schacter, 2012; Andrews-Hanna, Reidler, Huang, & Buckner, 2010; Rubin & Umanath, 2015; Schacter & Addis, 2007 for related ideas).

The spatial context serves as a platform upon which fragmented details can be constructed into an integrated and vivid scene (Addis & Schacter, 2012; Andrews-Hanna et al., 2010; Suddendorf & Corballis, 2007). Notably, past work has found that the more familiar the location of the imagined future episode, the more vividly the imagined future episode is experienced (Arnold, McDermott, & Szpunar, 2011; De Vito, Gamboz, & Brandimonte, 2012; Robin and Moscovitch; 2014)—a finding we leverage in the current work. Setting imagined events in familiar locations facilitates scene imagery, affording a richer spatial representation for constructing vividly imagined events.

1.3. Overview and aims of present studies

In the present studies, we tested the effect of vividness of scene imagery on willingness to help others by setting imagined future helping episodes in either familiar locations (strong spatial contexts) or unfamiliar locations (weak spatial contexts) (Experiments 1–3), controlling for individual differences in empathic and prosocial personality traits (Experiment 2), and controlling for possible effects on attributions of experience and agency to a person in need (Experiment 3). Furthermore, we explored whether an effect on willingness to help would extend to costly prosocial behavior in the form of economic donations to help people in need (Experiment 3).

We also tested whether scene imagery exerted its effect on willingness to help via theory of mind (akin to mentalizing, cognitive empathy, perspective taking). In other words, are people more likely to help after vividly imagining the helping scene because they are subsequently more likely to consider the mental states (i.e., thoughts and feelings) of the person in need? The role of theory of mind in decisions to help others has been well established within social psychology (Chakroff & Young, 2014; Coke, Batson, & McDavis, 1978; Decety, 2005; Zaki & Ochsner, 2012). Indeed, more recent work suggests that subjective experience of scene imagery and theory of mind may be dynamically correlated when imagining future helping episodes (Gaesser et al., 2017). An alternative possibility is that theory of mind does not mediate the effect of scene imagery on willingness to help but is more generally recruited when imagining a helping episode, regardless of spatial context. Thus, while the primary focus of the present studies was on manipulating scene imagery (i.e., strength of the spatial context of the helping episode) and observing subsequent effects on willingness to help, a secondary aim was to examine the role of theory of mind to gain greater insight into the cognitive mechanisms and their potential interaction underlying the relationship between episodic simulation and prosocial decision-making.

2. Experiment 1: strength of spatial context (lab-based experiment)

As an initial test of the effect of vivid scene imagery on prosocial response, we manipulated the underlying spatial representation of the imagined helping episode. We set the imagined helping events in either familiar locations (i.e., strong spatial context) or unfamiliar locations (i.e., weak spatial context). We hypothesized that imagining helping events in a strong spatial context would increase one's willingness to help, compared to imagining events in a weak spatial context, as a direct result of the increased vividness of the scene imagery of the helping episode.

2.1. Method

2.1.1. Participants

A total of 44 participants were recruited for this study. All participants were provided written informed consent in accordance with the Boston College Institutional Review Board. Participants were primarily undergraduate students from Boston College and Boston University. We also recruited participants from Craigslist; however, all six Craigslist participants failed to comply with task instructions. Participants either received course credit or were paid $15 as compensation. We ran the experiment until we had collected 30 participants (21 female, $M = 22.83$ years, $SD = 3.72$,) who provided complete data sets that were then used for analysis. A power analysis of the effect size (d = 1.32) corresponding to the central contrast of interest in relevant prior work (i.e., the difference in willingness to help for episodic vs. control conditions, n = 15) (Gaesser & Schacter, 2014), indicates that running 30 participants in the lab conservatively allows detection of behavioral differences across conditions (power > 0.80). To ensure participants paid attention and comprehended task instructions in the present study, we applied the same criteria as used in related behavioral work on episodic processes and prosocial intentions (Arnold et al., 2011; Gaesser & Schacter, 2014). Specifically, participants who provided only partial data or inappropriate responses (e.g., imagined helping on No Helping control condition trials) on more than 20% of the trials (more than 4 of the 21 trials), or who failed to provide appropriate descriptions of what they generated were not considered for data analysis. Thirty participants provided data sets used for analysis. Data sets for each study can be found on the Open Science Framework here.

2.1.2. Procedure

Participants read study instructions and completed two practice trials to familiarize them with the study design. After each practice trial, participants were given feedback on their performance by the experimenter and had the opportunity to ask questions concerning the practice trials. If necessary, practice trials continued until participants demonstrated task comprehension. Participants were asked to closely follow instructions during the experimental trials and told that they would later be asked a series of questions regarding the responses they generated. Participants were then presented with a series of 21 brief stories describing everyday events featuring a person in need of help (e.g., This person is locked out of their house, This person's dog has not returned home) using Eprime software. Scenarios were a subset of those used in previous work (Gaesser & Schacter, 2014; see Rameson, Morelli,

& Lieberman, 2012 for related materials). After reading each story, participants were prompted to imagine themselves helping the person in need in the future in a familiar location (Strong Context Helping condition) or an unfamiliar location (Weak Context Helping condition), or to consider the writing style and media source of the story of need (No Helping condition) (see Supplemental materials for task instructions).

For the Strong Context Helping condition, participants were instructed to imagine, for a full 60 s, an event specific in both time and place that involved their helping the person in the story at a specified familiar location. For example, if the specified location were a museum, participants would imagine helping the person in a room of a specific museum that they had been to and were familiar with. For the Weak Context Helping condition, participants were instructed to imagine, for a full 60 s, an event specific in both time and place that involved them helping the person in the story at a specified unfamiliar location. For example, if the given location were the Grand Canyon, participants would imagine helping the person in a part of Grand Canyon that they had not previously encountered. For both conditions involving imagining helping, participants were instructed to imagine plausible events that could occur approximately 1 year from the present to match temporal distance. Location cues were adapted from previous work that manipulated location familiarity using cues for locations participants were likely or unlikely to have visited (Arnold et al., 2011). Location cues and scenarios of need appeared in a random order across participants. The No Helping condition served as a neutral control condition in which participants were instructed to identify the media source of the story based on writing style and journalistic techniques. The No Helping condition, in which the subjects did not generate a helping episode, controlled for exposure to the story of need; no location cues were provided.

Following completion of all trials, participants were asked to complete a survey that assessed willingness to help and theory of mind for every trial, and, when imagining helping (Weak Spatial Helping and Strong Spatial Helping conditions), various aspects of the imagined events produced during the experimental trials. Stories were re-presented in the same order as before, and measures were presented in a fixed order within subjects to facilitate comprehension and completion. Participants rated their *willingness to help* (How likely would you be to help in this situation?; 1 not at all – 7 very willing) for each trial. Participants reported ratings for subjective *theory of mind* (akin to mentalizing and perspective taking) for each trial (When you identified media or imagined helping, did you consider the person's thoughts and feelings? 1 = not at all – 7 = strongly considered). To assess the vividness of scene imagery and the related sensation of mentally visiting the event as though it were currently occurring (Gaesser & Schacter, 2014), participants were asked to rate their imagined events for *scene coherence* (The imagined scene in your mind was?; 1 vague – 7 clear and coherent), *scene detail* (The imagined scene in your mind was?; 1 simple – 7 detailed), *clarity of the location* (The location where the event takes place in your mind was? 1 vague – 7 clear), and *preliving* (How strongly did you experience the imagined event in your mind? 1 = not at all – 7 = vividly, as if you were there) for each imagined helping trial.

As a manipulation check, we also asked about participants' location familiarity (How familiar are you with this location? 1 not at all familiar – 7 very familiar) and whether they had previously been to the specified location before (Have you been to this location before? 1 = yes, 2 = no) for each trial. Consistent with the logic of previous work that manipulated imagined locations (Arnold et al., 2011), any trials in the Weak Context Helping condition in which participants indicated that they had been to the location before were eliminated from analysis (average number of trials removed per participant $M = 1.23$, $SE = 0.17$). Similarly, any trials in the Strong Context Helping condition in which participants indicated that they had not been were eliminated (average number of trials removed per participant was extremely small $M = 0.14$, $SE = 0.35$). Analyses confirmed that manipulated imagined locations varied in familiarity across conditions (see Supplemental Material).

Along with these ratings, participants typed a brief description of the helping events they imagined (Strong Context Helping and Weak Context Helping conditions) or the media source and writing techniques they identified (No Helping condition). These short descriptions were used to evaluate task compliance (e.g., imagining actually helping the person as opposed to simply imagining the situation of the person in need). Previous research and pilot testing found that subjects are able to reliably reflect back on similar experiences generated during the experiment (Addis, Wong, & Schacter, 2007; Martin, Schacter, Corballis, Addis, 2011; Gaesser & Schacter, 2014; Gaesser et al., 2017). At the end of the study, participants were debriefed and thanked for their time.

2.2. Results

2.2.1. Spatial context manipulation

Reliability analyses showed that measures of scene imagery (i.e., scene coherence, scene detail, and location clarity) were all highly related to one another (Cronbach's Alpha, Strong Context Helping = 0.84; Weak Context Helping = 0.82); thus, we averaged these items to form a scene imagery index consistent with previous work (Gaesser et al., 2017; see Supplemental Material for additional analysis and discussion). Our manipulation effectively increased the vividness of scene imagery, with participants experiencing more scene imagery in the Strong Context Helping condition (M = 5.55 SE = 0.13) than in the Weak Context Helping condition (M = 3.38 SE = 0.15), $t(29) = 14.35$, $p < .001$.

2.2.2. Willingness to help by condition

To test whether the strength of the spatial context of the imagined event contributes to one's prosocial intentions, we conducted a repeated-measures ANOVA (Strong Context Helping; Weak Context Helping; No Helping) on ratings of willingness to help across conditions. The analysis revealed a significant effect of condition, $F(2, 29) = 9.93$, $p < .001$, $\eta_p^2 = 0.469$, suggesting that willingness to help varies as a result of condition. We then conducted paired-samples t-tests to examine which conditions were driving differences in willingness to help. Participants were more willing to help in the Strong Context Helping condition (M = 5.41 SE = 0.20) compared to the No Helping (M = 3.87 SE = 0.24) condition, $t(29) = 6.68$, $p < .001$. Likewise, participants were also more willing to help in the Weak Context Helping (M = 4.55 SE = 0.26) condition compared to the No Helping (M = 3.87 SE = 0.24) condition, $t(29) = 2.91$, $p = .007$. Importantly, participants were more willing to help in the Strong Context Helping condition (M = 5.41 SE = 0.20) compared to the Weak Context Helping condition (M = 4.55 SE = 0.26), $t(29) = 6.68$, $p < .001$. This pattern suggests that the spatial context may contribute to a willingness to help others in need (Fig. 1a). Correlational analysis showed that the more vividly participants imagined the helping scene the more willing they were to help (Strong Context Helping condition, $r(28) = 0.64$, $p < .001$; Weak Context Helping condition, $r(28) = 0.33$, $p = .075$).

2.2.3. Modeling the effect of spatial context on willingness to help through scene imagery

To test whether the effect of spatial context on willingness to help was mediated by scene imagery, we conducted a path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery entered as a proposed mediator (Preacher & Hayes, 2008; Sobel, 1982). This analysis revealed a significant indirect path from spatial context condition to scene imagery to willingness to help (Sobel test, $b = 1.64$, $SE = 0.45$, $Z = 3.69$, $p < .001$). The direct effect of spatial context condition on willingness to help ($b = 0.86$, $SE = 0.33$, $p = .012$) was reduced to non-significance when scene imagery was included in the model

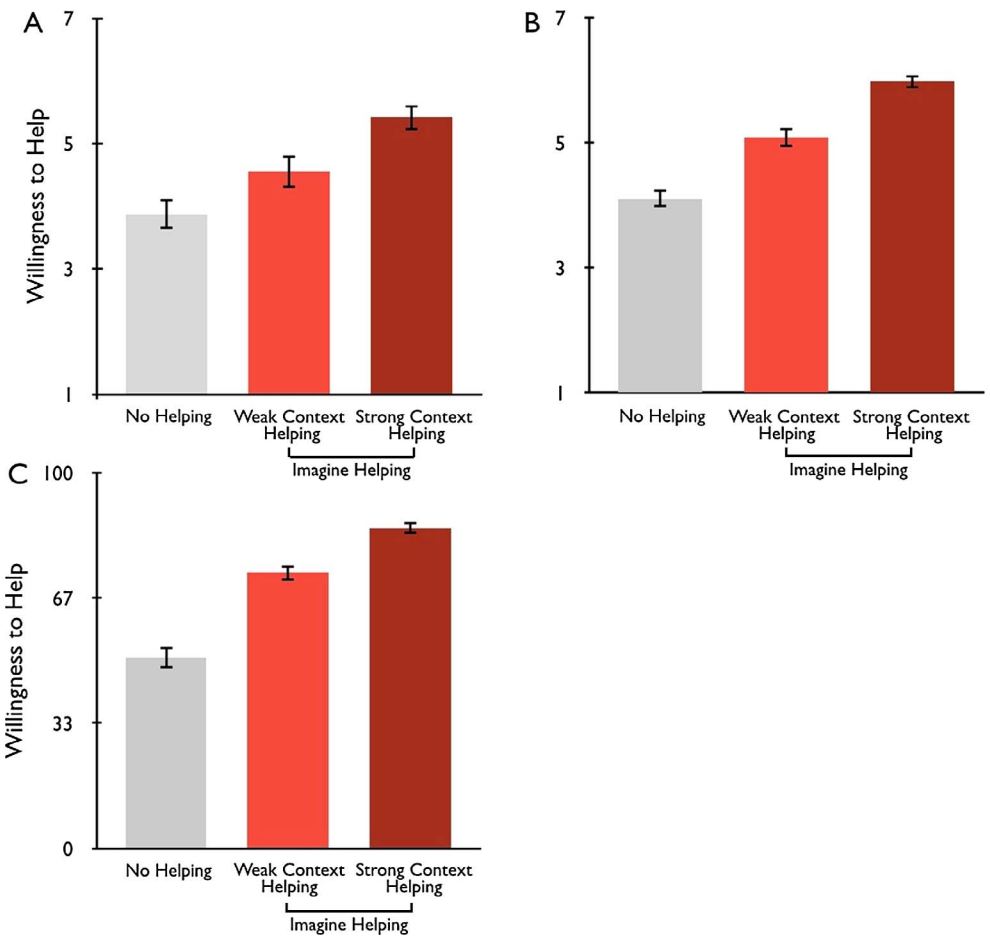

Fig. 1. (A) In Experiment 1, imagining helping episodes set in a strong spatial context (Strong Context condition) increased willingness to help compared to baseline control (No Helping condition) and imagining helping episodes set in a weak spatial context (Weak Context condition). (B) In Experiment 2, imagining helping episodes replicated and extended the pattern from Experiment 1 using a larger sample size online. (C) In Experiment 3, imagining helping episodes replicated and extended the pattern using a larger continuous scale. Across experiments this pattern suggests that people are more willing to help others after initially imagining a helping episode, and that the spatial representations of the imagined events are particularly effective at increasing willingness to help others. In Experiments 1 and 2, willingness to help was measured on a 1–7-point scale. In Experiment 3, willingness to help was measured on a 0–100-point scale. Error bars indicate standard error of the mean.

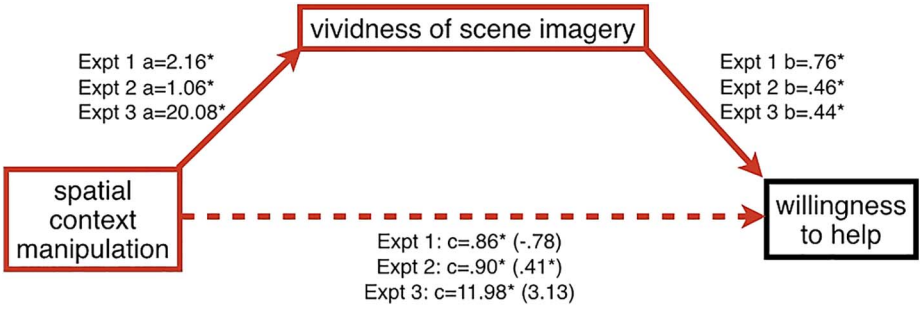

Fig. 2. In Experiments 1–3, manipulating the spatial context of an imagined helping episode heightened the vividness of scene imagery and in turn willingness to help. The indirect path from spatial context condition (Weak Context Helping vs. Strong Context Helping) to scene imagery to willingness to help was significant (Expt. 1: $b = 1.64$, $Z = 3.69$, $p < .001$, 95% CI = 0.95, 2.59; Expt. 2: $b = 0.49$, $Z = 4.44$, $p < .001$; 95% CI = 0.29, 0.72; Expt. 3: $b = 8.84$, $Z = 5.22$, $p < .001$; 95% CI = 5.60, 12.93). The direct path coefficient of spatial context condition to willingness to help significantly diminished in the model after including scene imagery as a mediator (Expt. 1: from $b = 0.86$, $SE = 0.33$, $p = .012$ to $b = -0.78$, $SE = 0.52$, $p = .139$; Expt. 2: from $b = 0.90$, $SE = 0.18$, $p < .001$ to $b = 0.41$, $SE = 0.19$, $p = .034$; Expt. 3: from $b = 11.98$, $SE = 0.2.55$, $p < .001$ to $b = 3.13$, $SE = 2.61$, $p = .232$). Numbers in parentheses represent the coefficients when indirect paths are entered into the models. Asterisks indicate significance at $p < .05$.

($b = -0.78$, $SE = 0.52$, $p = .139$). Bootstrapping results lend further support to the mediating effect of scene imagery. Bootstrapping path analysis calculated a distribution of the effect for 1000 iterations of data sampled with replacement using the product of the paths from the independent variable to the mediator and from the mediator to the dependent variable (INDIRECT macro, Preacher & Hayes, 2008). Such an approach overcomes assumptions about the shape of the sampling distribution of the indirect effect made by the Sobel mediation test (Hayes & Scharkow, 2013; Preacher & Hayes, 2008). Statistical significance with alpha at 0.05 is indicated by 95% confidence interval (CI) not crossing a null value of 0. In line with conventional mediation analysis, bootstrapping results observed a significant indirect path from spatial context condition to scene imagery to willingness to help, 95% CI = 0.95, 2.59 (Fig. 2).

2.2.4. Interaction between scene imagery and theory of mind

Previous work has demonstrated that scene imagery and theory of mind can interact when participants imagine helping episodes (Gaesser et al., 2017); thus, we examined the relationship between scene imagery and theory of mind. Scene imagery was significantly associated with theory of mind in the Strong Spatial Helping condition ($r(28) = 0.44$, $p = .016$), but not in the Weak Spatial Helping condition ($r(28) = 0.25$, $p = .19$). However, the associations between scene imagery and theory of mind for the two conditions were not significantly different (Steiger's test: $z = 1.16$, $p = .247$; Lee & Preacher, 2013). While these analyses preclude strong claims about condition differences, they do provide additional evidence that scene imagery and theory of mind can be related in some contexts.

2.2.5. Modeling the effect of spatial context on willingness to help through scene imagery and theory of mind

Given evidence that scene imagery and theory of mind can correlate together, we examined whether scene imagery would continue to mediate the effect of spatial context when theory of mind was also entered as a potential mediator. To do so, we conducted a path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery *and* theory of mind entered as proposed mediators (Preacher & Hayes, 2008; Sobel, 1982). The indirect path from spatial context condition to theory of mind to willingness to help was non-significant (Sobel test, $b = 0.26$, $SE = 0.17$, $Z = 1.55$, $p = .121$; 95% CI = −0.02, 0.69). In contrast, the indirect path from spatial context condition to scene imagery to willingness to help remained significant (Sobel test, $b = 1.06$, $SE = 0.39$, $Z = 2.68$, $p = .007$; 95% CI = 0.18, 1.79), providing evidence for an independent effect of spatial context on willingness to help through scene imagery.

2.2.6. Modeling the effect of imagining on willingness to help through theory of mind

While theory of mind did not mediate the effect of spatial context on willingness to help, theory of mind could still be recruited when imagining helping and may play a role in facilitating a willingness to help when people imagine helping more broadly (Strong Context Helping and Weak Context Helping conditions compared to No Helping condition). To test whether the effect of imagine helping condition on willingness to help was mediated by theory of mind, we conducted a path modeling analysis with willingness to help entered as the dependent variable, imagine helping condition (Strong Context Helping and Weak Context Helping vs. No Helping) entered as the independent variable, and theory of mind entered as a proposed mediator (Preacher & Hayes, 2008; Sobel, 1982). The indirect meditation path from imagine helping condition to theory of mind to willingness to help was significant (Sobel test, $b = 0.59$, $SE = 0.19$, $Z = 3.16$, $p = .002$; 95% CI = 0.27, 1.08). Thus, while theory of mind did not account for the effect of spatial context, there is some evidence that theory of mind does contribute to the effect of imagining helping condition on willingness to help, compared to the control condition.

2.3. Experiment 1 discussion

The results from Experiment 1 demonstrate that manipulating the strength of the spatial context of an imagined episode affects prosocial responses. Imagining helping episodes located in strong spatial contexts increased willingness to help, compared to imagining episodes located in weak spatial contexts. Path modeling analyses revealed that the increased vividness of scene imagery for imagined helping episodes set in strong spatial contexts facilitates this difference in prosocial responses: as the helping scene becomes more vivid, the subjective plausibility of the imagined helping event increases.

We also found that, while theory of mind did not account for the effect of spatial context, theory of mind did independently contribute to the broader effect of imagining helping on willingness to help. Overall, Experiment 1 suggests that a prosocial effect of episodic simulation may be supported by scene imagery processes and, independently, by theory of mind processes.

3. Experiment 2: strength of spatial context (online-based experiment)

In Experiment 2, we further investigated the cognitive mechanisms underlying the prosocial effect of episodic simulation. Using an adapted design and similar analytic approach from Experiment 1, we ran Experiment 2 online through Amazon Mechanical Turk (MTurk). Experiment 2 allowed us to examine whether the effects observed in Experiment 1 replicated in a larger and more diverse sample (e.g., Goodman, Cryder, & Cheema, 2013; Horton, Rand, & Zeckhauser, 2011). Moreover, a larger sample size provided the opportunity to test whether episodic simulation could be used to facilitate prosocial response while taking into account individual differences in empathic and prosocial personality traits. For example, we could explore the possibility that individuals scoring higher on prosociality and empathic concern for others generate more vivid scene imagery when imagining helping. Are associations among episodic simulation, scene imagery, and willingness to help contingent on these traits?

3.1. Method

3.1.1. Participants

The same inclusion criteria from Experiment 1 were used in Experiment 2. A total of 127 participants were recruited through MTurk. All participants provided informed consent in accordance with the Boston College Institutional Review Board. Participants were from the United States or Canada and were compensated at a rate of $5 per hour. Given the reduced number of trials per condition when running subjects on MTurk, each subject was required to provide at least one trial per condition that was used for analysis. One hundred and three participants (42 female, age $M = 34.7$, $SD = 10.2$) provided complete data sets that were utilized for analysis.

3.1.2. Procedure

Participants completed one of three randomized versions of the study in which the order of the stories and conditions varied. Participants consented and read the instructions for each task before proceeding to the experimental trials. Participants were then presented with six brief stories of everyday events involving a person in need of help (e.g., “This person is missing their keys”) using Qualtrics software. Stories were a subset of those used in Experiment 1. The short story was displayed on the screen for 10 s for participants to read. Stories were then removed, and the task instructions appeared on the screen. Participants were prompted to imagine themselves helping the person in a familiar location (Strong Context Helping condition) or an unfamiliar location (Weak Context Helping condition), or identify the media source and writing style of the story (No Helping condition). For both Helping conditions, the specified familiar or unfamiliar location was displayed below the task instructions. During the performance of each task, participants were prompted to type the events they imagined or the media source and writing style they identified in a text box displayed below the instructions. The task instructions and text box remained on the screen while participants performed the task for a full 60 s.

Participants completed ratings similar to the post-task survey used in Experiment 1, with the addition of a measure of scene imagery that used pictures for scenes ranging in transparency from 0% opaque (i.e., no picture) to a 100% opaque of the imagined helping event (*scene picture,* Did you imagine a scene of helping the person in your mind?; 1 no helping scene – 7 highly vivid scene). Ratings were collected immediately after participants imagined helping or completed the control task on a trial-by-trial basis. This design facilitated comprehension online, and had the added benefit of allowing us to observe whether the same pattern or results emerged across experimental conditions regardless of when ratings were collected relative to experimental trials.

At the end of the study, participants completed two brief questionnaires widely used to measure individual differences of empathic and prosocial traits. Participants completed the Empathic Concern component of the Interpersonal Reactivity Index (EC IRI), in which participants were presented with 7 statements and asked to rate whether the statement described them well (e.g., I often have tender, concerned feelings for people less fortunate than me; (A) Does not describe me well…(E) Describes me very well; Davis, 1983). Participants also completed the Social Value Orientation (SVO) questionnaire, a 9-item

measure in which participants chose how to distribute resources between themselves and another person. Participants were categorized as altruistic, egoistic, or competitive depending on how they distributed these resources (Van Lange, 1999).

3.2. Results

3.2.1. Spatial context manipulation

Consistent with Experiment 1 and past work, reliability analyses showed that measures of scene imagery (i.e., scene coherence, scene detail, location clarity, and scene image) were all highly related to one another (Cronbach's Alpha, Strong Context Helping = 0.82; Weak Context Helping = 0.85), and averaged to form a scene imagery index. Our manipulation of the spatial context effectively increased the vividness of scene imagery, with participants experiencing more scene imagery in the Strong Context Helping condition (M = 5.65 SE = 0.09) than in the Weak Context Helping condition (M = 4.60 SE = 0.11), t (102) = 11.91, $p < .001$).

3.2.2. Willingness to help by condition

A repeated-measures ANOVA (Strong Context Helping; Weak Context Helping; No Helping) of ratings of willingness to help across conditions revealed a significant effect of condition, F (2, 102) = 78.67, $p < .001$, $\eta_p^2 = 0.435$; Fig. 1b. Paired-samples t-tests showed participants were more willing to help in the Strong Context Helping condition (M = 5.98 SE = 0.11) compared to the No Helping (M = 4.11 SE = 0.15) condition (t (102) = 12.47, $p < .001$) and the Weak Context Helping condition (M = 5.08 SE = 0.15), t (102) = 7.31, $p < .001$. Participants were also more willing to help in the Weak Context Helping (M = 5.08 SE = 0.15) condition compared to the No Helping (M = 4.11 SE = 0.15) condition, t (102) = 5.69, $p < .001$. Correlational analysis showed that the more vividly participants imagined the helping scene the more willing they were to help (Strong Context Helping condition (r (101) = 0.31, $p = .002$; Weak Context Helping condition, r (101) = 0.39, $p < .001$).

3.2.3. Modeling the effect of spatial context on willingness to help through scene imagery

Path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery entered as a proposed mediator (Preacher & Hayes, 2008; Sobel, 1982) revealed a significant indirect path from spatial context condition to scene imagery to willingness to help (Sobel test, $b = 0.49$, $SE = 0.11$, $Z = 4.44$, $p < .001$; 95% CI = 0.29, 0.72). The direct effect of spatial context condition on willingness to help ($b = 0.90$, $SE = 0.18$, $p < .001$) significantly diminished when scene imagery was included in the model ($b = 0.41$, $SE = 0.19$, $p = .034$), indicating that the effect of spatial context on willingness to help is partially mediated by the vividness of scene imagery (Fig. 2).

3.2.4. Interaction between scene imagery and theory of mind

We next examined the relationship between scene imagery and theory of mind. Correlational analysis showed that scene imagery was associated with theory of mind (Strong Context Helping (r (101) = 0.34, p = .001); Weak Context Helping (r (101) = 0.25, p = .011), with no significant difference in the strength of the association between scene imagery and theory of mind across conditions (Steiger's test: z = 0.70, p = .485).

3.2.5. Modeling the effect of spatial context on willingness to help through scene imagery and theory of mind

A path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery *and* theory of mind entered as proposed mediators (Preacher & Hayes, 2008; Sobel, 1982) showed that the indirect path from spatial context condition to theory of mind to willingness to help was significant (Sobel test, $b = 0.20$, $SE = 0.07$, $Z = 2.77$, $p = .006$; 95% CI = 0.07, 0.37)—a result that was previously non-significant in Experiment 1 ($p = .112$), suggesting that manipulating the spatial context of the imagined helping episode may subsequently impact theory of mind for the person in need and in turn willingness to help. Importantly, the indirect path from spatial context condition to scene imagery to willingness to help remained significant with theory of mind included in the model (Sobel test, $b = 0.36$, $SE = 0.10$, $Z = 3.63$, $p < .001$; 95% CI = 0.16, 0.61), providing additional evidence for an effect of scene imagery on willingness to help, independent of theory of mind, converging with the results of Experiment 1.

3.2.6. Modeling the effect of imagining on willingness to help through theory of mind

To test whether the broader effect of the imagining helping on willingness to help was mediated by theory of mind, we conducted a path modeling analysis with willingness to help entered as the dependent variable, imagine helping condition (Strong Context Helping and Weak Context Helping vs. No Helping) entered as the independent variable, and theory of mind entered as a proposed mediator (Preacher & Hayes, 2008; Sobel, 1982). The indirect meditation path from imagine helping condition to theory of mind to willingness to help was significant (Sobel test, $b = 0.94$, $SE = 0.14$, $Z = 6.62$, $p < .001$; 95% CI = 0.63, 1.31), replicating the findings from Experiment 1.

3.2.7. Relationship between scene imagery and individual differences in empathic/prosocial personality traits

Next, we examined the relationship between the scene imagery and empathic and prosocial personality traits. Correlational analysis found that scene imagery was not associated with trait differences in social value orientation (r (101) = −0.14, $p = .148$) but was associated with empathic concern (EC IRI (r (101) = 0.22, $p = .028$), hinting at the possibility that an effect of spatial context on willingness to help through scene imagery may be related to individual differences in empathic concern for others in need. To control for differences in empathic concern we ran a path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, scene imagery entered as a proposed mediator, and empathic concern (EC IRI) as a control variable (Preacher & Hayes, 2008). The indirect path from spatial context condition to scene imagery to willingness to help remained significant ($b = 0.37$; $SE = 0.10$, 95% CI = 0.21, 0.61), with the direct effect of spatial context condition on willingness to help ($b = 0.90$, $SE = 0.16$, $p < .001$) diminished when scene imagery was included in the model ($b = 0.53$, $SE = 0.17$, $p = .002$), suggesting that even when individual differences in empathic concern are accounted for, manipulating the spatial context of a helping episode impacts a willingness to help others by heightening the vividness of scene imagery.

3.3. Experiment 2 discussion

Results from Experiment 2 support and build on the findings from Experiment 1. We replicated the finding that manipulating the strength of the spatial context of imagined events contributes to a willingness to help. Path modeling analyses revealed that the increased vividness of scene imagery for imagined helping events set in strong spatial contexts consistently facilitates a willingness to help. Moreover, this effect does not appear to be fully accounted for by individual differences in empathic and prosocial personality traits or changes in theory of mind for the person in need, further bolstering evidence for a scene-based mechanism supporting the prosocial effect of episodic simulation.

In contrast to Experiment 1, we observed a partial effect of spatial context on willingness to help through changes in theory of mind,

suggesting strong spatial context may make it easier to consider the thoughts and feelings of the person in need—though this effect was statistically weaker than the effect of scene imagery (see Supplemental Materials for additional analysis). One possibility is that the absence of a partial effect of spatial context on willingness to help through changes in theory of mind in Experiment 1 is at odds with the results in Experiment 2. Another possibility is that the increased sample size of Experiment 2 (compared to Experiment 1) afforded greater power to detect a genuine effect of theory of mind. Recruiting a similarly large sample in Experiment 3 will serve to adjudicate these interpretations.

Considered together, both experiments reveal that changes in scene imagery reliably impact prosocial decision even when accounting for changes in theory of mind and individual differences in empathic concern and prosociality. Both experiments also consistently revealed a broader effect of theory of mind on willingness to help.

4. Experiment 3: Strength of spatial context (economic behavior)

In Experiment 3, we further examined the cognitive features supporting the prosocial effect of episodic simulation and examined whether episodic simulation's effect on willingness to help observed in Experiments 1 and 2 would translate into actual prosocial behavior. Experiment 3 was run online through Amazon Mechanical Turk (MTurk) using a similar design and analytic approach to Experiments 1 and 2.

Building on the findings from Experiments 1 and 2, we set out to address four aims in Experiment 3. First, Experiment 3 allowed us to examine whether the central effects observed in Experiments 1 and 2 on willingness to help replicated. Second, by including a measure that enabled participants to make economic decisions of how much money to keep or give to people in need, we could examine whether episodic simulation could ever affect costly prosocial behavior (Peysakhovich, Nowak, & Rand, 2014). Third, we sought to gain insight into a possible relationship between episodic simulation with different components of mind perception. Experiments 1 and 2 suggest that broadly engaging in theory of mind for the person in need heightens a willingness to help. However, research has demonstrated that people often represent others minds along two dimensions: a capacity for *experience* (e.g., feeling, sensing) and a capacity for *agency* (e.g., intention, thinking, planning; Gray, Gray, & Wegner, 2007). Attributions of experience and agency have distinct consequences for moral judgments and responsibility (Gray & Wegner, 2009; Waytz & Young, 2014). For example, a person perceived as highly capable of experience is more readily considered a victim in need of aid, whereas a person perceived as highly capable of agency are considered more morally responsible for his or her own behavior (Gray & Wegner, 2009).

4.1. Method

4.1.1. Participants

The same inclusion criteria from Experiments 1 and 2 were used in Experiment 3. A total of 129 participants were recruited through MTurk. All participants provided informed consent in accordance with the Boston College Institutional Review Board. Participants were from the United States or Canada and were compensated a base rate of $1 with the possibility of receiving an additional $3 depending on their economic decisions during the study. One hundred participants (50 female, age $M = 36.41$, $SD = 12.14$) provided complete data sets that were utilized for analysis.

4.1.2. Procedure

Participants completed one of three randomized versions of the study in which the order of the stories and conditions varied on Qualtrics. Participants consented and read the instructions for each task before proceeding to the experimental trials. Participants were presented with six brief stories of everyday events involving a person in need (e.g., "This person is missing their keys") and then prompted to complete one of three tasks (Strong Context Helping, Weak Context Helping, No Helping condition). Stories and tasks were the same as those used in Experiment 2.

Participants completed ratings similar to the surveys used in Experiments 1 and 2. The following changes were made in Experiment 3. First, all ratings were converted to continuous scales from 0 to 100 and recorded using a sliding bar (e.g., for *willingness to help* (How likely would you be to help in this situation?; 0 not at all – 100 very willing)). Second, measures of the person in need's mental capacities for agency and experience were added (Gray & Wegner, 2009; Waytz & Young, 2014). To measure *Agency,* we averaged ratings for *intentionality* (To what extent is the person from the story capable of having intentions; 0 not at all – 100 very much), *planning* (To what extent is the person from the story capable of planning?; 0 not at all – 100 very much), and *purpose* (To what extent is the person from the story capable of doing things on purpose?; 0 not at all – 100 very much). To measure *Experience,* we averaged ratings for *pain/pleasure* (To what extent is the person from the story capable of experiencing pain and pleasure?; 0 not at all – 100 very much), *feeling* (To what extent is the person from the story capable of feeling?; 0 not at all – 100 very much), and *emotions* (To what extent is the person from the story capable of having emotions?; 0 not at all – 100 very much).

As a measure of costly prosocial behavior, we adapted instructions and procedures for the economic dictator game (see Supplementary Methods from Peysakhovich et al., 2014). Specifically, participants were given an economic endowment ($1.50) at the beginning of the study that they could choose to donate to a person in need. This was explained to the participants as follows: "On each trial, you will be asked if you want to make an offer to the person in the story. Each trial will involve different people. The offer will be given in points; every point will be worth 1.5 cents at the end of the study – so an offer for 100 points has $1.50 at stake. We don't want what happens in one trial to affect your decisions in another. So, at the end of the study we will randomly choose one trial and use its outcomes to determine your bonus payment. Thus, because only one trial will count, but you don't know which one it will be, it is in your best interest to treat each decision as if it is the only one that matters for your final payoffs". A question about different point transfers and payouts was included to ensure task comprehension. Consequently, participants made economic decisions about whether to keep money for themselves or to donate to a person in need: *donate* (How much would you like to offer to help the person in the story? 0 points – 100 points). After the entire study was complete, a single trial from each participant was randomly selected for the final payoff, and bonus payments were provided to participants accordingly. Although donations could not be donated to the actual people in the stories, as the stories were hypothetical and constructed by the researchers (Gaesser & Schacter, 2014; see Rameson et al., 2012 for related materials), donations were provided to charitable organizations to help actual people in need suffering plights broadly related to the situations depicted in the stories.

As in Experiment 2, ratings were collected immediately after participants imagined helping or completed the control task on a trial-by-trial basis. For the pragmatic reasons of making room for the additional time and cost of the new measures above, we did not include individual differences of empathic and prosocial traits, or the specific measure of scene imagery that used pictures. All other measures from Experiment 2 were included in Experiment 3.

4.2. Results

4.2.1. Spatial context manipulation

In line with Experiments 1 and 2, reliability analyses showed that measures of scene imagery (i.e., scene coherence, scene detail, location clarity) were all related to one another (Cronbach's Alpha, Strong Context Helping = 0.83; Weak Context Helping = 0.68), and averaged

to form a scene imagery index. As in our prior experiments, our manipulation of the spatial context increased the vividness of scene imagery. Again, participants experienced more scene imagery in the Strong Context Helping condition (M = 84.64 SE = 1.54) than in the Weak Context Helping condition (M = 64.56 SE = 2.09), t (99) = 10.32, $p < .001$).

4.2.2. Willingness to help by condition

A repeated-measures ANOVA (Strong Context Helping; Weak Context Helping; No Helping) of ratings of willingness to help across conditions revealed a significant effect of condition, F (2, 99) = 102.52, $p < .001$, $\eta_p^2 = 0.509$; (Fig. 1c). Paired-samples t-tests showed participants were more willing to help in the Strong Context Helping condition (M = 85.31 SE = 1.55) compared to the No Helping (M = 50.76 SE = 2.81) condition (t (99) = 12.24, $p < .001$) and the Weak Context Helping condition (M = 73.34 SE = 2.03), t (99) = 6.53, $p < .001$. Participants were also more willing to help in the Weak Context Helping (M = 73.34 SE = 2.03) condition compared to the No Helping (M = 50.76 SE = 2.81) condition, t (99) = 8.73, $p < .001$. Correlational analysis showed that the more vividly participants imagined the helping scene the more willing they were to help (Strong Context Helping condition (r (98) = 0.61, $p < .001$; Weak Context Helping condition, r (98) = 0.36, $p < .001$).

4.2.3. Modeling the effect of spatial context on willingness to help through scene imagery

Path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery entered as a proposed mediator (Preacher & Hayes, 2008; Sobel, 1982) revealed a significant indirect path from spatial context condition to scene imagery to willingness to help (Sobel test, $b = 8.84$, $SE = 1.69$ $Z = 5.22$, $p < .001$; 95% CI = 5.60, 12.93). The direct effect of spatial context condition on willingness to help ($b = 11.98$, $SE = 2.55$, $p < .001$) significantly diminished when scene imagery was included in the model ($b = 3.13$, $SE = 2.61$, $p = .232$), indicating that the effect of spatial context on willingness to help is mediated by the vividness of scene imagery and replicating Experiments 1 and 2 (Fig. 2).

4.2.4. Interaction between scene imagery and theory of mind

Next, we examined the relationship between scene imagery and theory of mind. Correlational analysis again showed that scene imagery was associated with theory of mind (Strong Context Helping (r (98) = 0.77, p < .001); Weak Context Helping (r (98) = 0.79, p < .001), with no significant difference in the strength of the association between scene imagery and theory of mind across conditions (Steiger's test: z = 0.34, p = .734).

4.2.5. Modeling the effect of spatial context on willingness to help through scene imagery and theory of mind

A path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery *and* theory of mind entered as proposed mediators (Preacher & Hayes, 2008; Sobel, 1982) showed that the indirect path from spatial context condition to theory of mind to willingness to help was significant (Sobel test, $b = 3.05$, $SE = 1.12$, $Z = 2.72$, $p = .007$; 95% CI = 1.30, 6.68). Replicating Experiment 2, this pattern suggests that manipulating the spatial context of the imagined helping episode may affect theory of mind for the person in need and in turn willingness to help, but that the effect is not strong enough to significantly detect using smaller sample size such as Experiment 1. The indirect path from spatial context condition to scene imagery to willingness to help remained significant with theory of mind included in the model (Sobel test, $b = 4.76$, $SE = 1.52$, $Z = 3.13$, $p = .002$; 95% CI = 1.84, 8.45), further bolstering evidence for an effect of scene imagery on willingness to help, independent of theory of mind, converging with the results of Experiments 1 and 2.

4.2.6. Modeling the effect of imagining on willingness to help through theory of mind

To test whether the broader effect of imagining helping on willingness to help was mediated by theory of mind, we conducted a path modeling analysis with willingness to help entered as the dependent variable, imagine helping condition (Strong Context Helping and Weak Context Helping vs. No Helping) entered as the independent variable, and theory of mind entered as a proposed mediator (Preacher & Hayes, 2008; Sobel, 1982). The indirect meditation path from imagine helping condition to theory of mind to willingness to help was significant (Sobel test, $b = 13.23$, $SE = 1.91$, $Z = 6.93$, $p < .001$; 95% CI = 8.95, 18.20), underscoring a role for theory of mind in the broader effect of imagining helping, consistent with results from Experiments 1 and 2.

4.2.7. Relationship between theory of mind, agency, and experience

Experiments 1–3 provided evidence that imagining a helping episode engaged theory of mind for the person in need, increasing the experience of adopting the mental states of the person in need (i.e., considering what the person is thinking and feeling). Next, we examined the mental states of agency and experience to determine whether one or the other or both might be driving the observed effects. Correlational analysis showed that theory of mind was associated with attributions of experience to the person in need (Strong Context Helping (r (98) = 0.67, p < .001); Weak Context Helping (r (98) = 0.34, p < .001), with a significant difference in the strength of the association across conditions (Steiger's test: z = 3.64, p < .001). Correlational analysis showed that theory of mind was also associated with attributions of agency to the person in need for the Strong Context Helping condition (r (98) = 0.38, p < .001) but not for the Weak Context Helping condition (r (98) = 0.15, p = .13), with a trending difference in the strength of the association across conditions (Steiger's test: z = 1.94, p = .052).

4.2.8. Modeling the effect of spatial context on willingness to help through scene imagery, theory of mind, experience, and agency

A path modeling analysis with willingness to help entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery, theory of mind, experience, and agency entered as proposed mediators (Preacher & Hayes, 2008; Sobel, 1982) showed that the indirect path from spatial context condition to experience to willingness to help was not significant (Sobel test, $b = 0.87$, $SE = 0.67$, $Z = 1.29$, $p = .199$; 95% CI = −0.07, 3.30). The indirect path from spatial context condition to agency to willingness to help was also not significant (Sobel test, $b = 0.35$, $SE = 0.43$, $Z = 0.81$, $p = .418$; 95% CI = −0.20, 1.65). Importantly, the indirect paths from spatial context condition to scene imagery to willingness to help (Sobel test, $b = 4.26$, $SE = 1.50$, $Z = 2.84$, $p = .005$; 95% CI = 1.55, 7.93) and from spatial context condition to theory of mind to willingness to help remained significant (Sobel test, $b = 2.25$, $SE = 0.98$, $Z = 2.29$, $p = .022$; 95% CI = 0.37, 5.83) when experience and agency were included in the model, providing additional evidence for an independent effects of scene imagery and theory of mind on willingness to help.

4.2.9. Modeling the effect of imagining on willingness to help through theory of mind, experience, and agency

To test whether the broader effect of the imagining helping on willingness to help was mediated by theory of mind, experience, and agency, we conducted a path modeling analysis with willingness to help entered as the dependent variable, imagine helping condition (Strong Context Helping and Weak Context Helping vs. No Helping) entered as the independent variable, and theory of mind, experience, and agency entered as proposed mediators (Preacher & Hayes, 2008; Sobel, 1982).

The indirect meditation path from imagine helping condition to theory of mind to willingness to help was significant (Sobel test, $b = 12.15$, $SE = 1.95$, $Z = 6.24$, $p < .001$; 95% CI = 7.48, 18.15), consistent with the findings from Experiments 1 and 2. The indirect meditation path from imagine helping condition to experience to willingness to help was also significant (Sobel test, $b = 3.71$, $SE = 1.20$, $Z = 3.08$, $p = .002$; 95% CI = 1.39, 6.81). The indirect meditation path from imagine helping condition to agency to willingness to help was marginally significant (Sobel test, $b = 1.43$, $SE = 0.73$, $Z = 1.97$, $p = .049$; 95% CI = 0.38, 3.27).

4.2.10. Donations by condition

A repeated-measures ANOVA (Strong Context Helping; Weak Context Helping; No Helping) of donations across conditions revealed a significant effect of condition, F (2, 99) = 33.37, $p < .001$, $\eta_p^2 = 0.252$ (Fig. 3). Paired-samples t-tests showed participants donated more in the Strong Context Helping condition (M = 65.82 SE = 3.50) compared to the No Helping (M = 46.78 SE = 3.12) condition (t (99) = 7.08, $p < .001$) and the Weak Context Helping condition (M = 58.66 SE = 3.12), t (99) = 4.31, $p < .001$. Participants also donated more in the Weak Context Helping (M = 58.66 SE = 3.12) condition compared to the No Helping (M = 46.78 SE = 3.12) condition, t (99) = 4.61, $p < .001$. Correlational analysis did not show a relationship between the vividness of the helping scene imagery and the amount donated[1] (Strong Context Helping condition (r (98) = 0.10, $p = .341$; Weak Context Helping condition, r (98) = 0.08, $p = .451$). Correlational analysis, however, did show a relationship between willingness to help and the amount donated (Strong Context Helping condition (r (98) = 0.33, $p = .001$; Weak Context Helping condition, r (98) = 0.38, $p < .001$).

To explore whether our manipulation affected willingness to help to a greater extent than the amount donated, we ran a repeated-measures 3 (Helping Condition: Strong Context Helping; Weak Context Helping; No Helping) × 2 (Prosocial Measure: Willingness to Help × Donation) ANOVA and found a significant condition by measure interaction, F (2, 99) = 24.77, $p < .001$, $\eta_p^2 = 0.200$, such that Helping Condition had a larger impact on willingness to help than on donations. Paired-samples t-tests showed that the difference between Strong Context Helping and No Helping was greater for willingness to help (M = 34.56 SE = 2.82) than donation (M = 19.04 SE = 2.69), t (99) = 6.12, $p < .001$). The difference between Strong Context Helping and Weak Context Helping was also greater for willingness to help (M = 11.98 SE = 1.83) than donation (M = 7.16 SE = 1.66, t (99) = 2.66, $p = .009$). Similarly, the difference between Weak Context Helping and No Helping was greater for willingness to help (M = 22.58 SE = 2.59) than donation (M = 11.88 SE = 2.58), t (99) = 4.53, $p < .001$.

Thus, our manipulation of the imagining helping in a spatial context increased both willingness to help and donation amount, but increased willingness to help to a greater extent.

4.2.11. Modeling the effect of imagining on donations through willingness to help

To test whether the broader effect of the imagining helping on donations was mediated by changes in willingness to help, we conducted a path modeling analysis with donations entered as the dependent variable, imagine helping condition (Strong Context Helping and Weak Context Helping vs. No Helping) entered as the independent variable, and willingness to help entered as proposed mediator (Preacher & Hayes, 2008; Sobel, 1982). The indirect meditation path from imagine helping condition to willingness to help to donations was significant (Sobel test, $b = 14.30$, $SE = 2.59$, $Z = 5.52$, $p < .001$; 95% CI = 9.67, 19.60). The direct effect of imagining helping on donations ($b = 10.23$, $SE = 3.91$, $p = .009$) significantly diminished when willingness to help was included in the model ($b = 4.06$, $SE = 4.27$, $p = .342$) indicating that the effect of imagining on donations is partially mediated by changes in willingness to help.

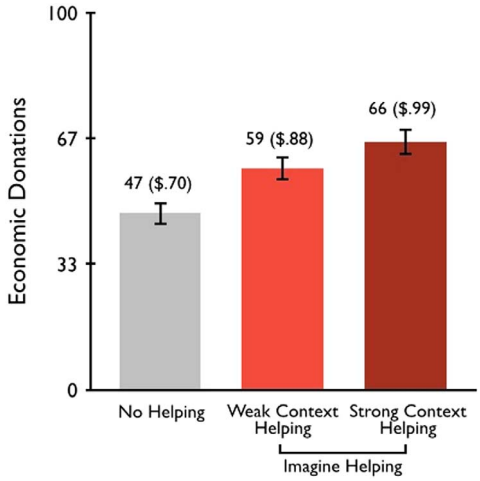

Fig. 3. In Experiment 3, imagining helping episodes set in a strong spatial context (Strong Context condition) increased the amount of money donated to people in need compared to baseline control (No Helping condition) and imagining helping episodes set in a weak spatial context (Weak Context condition). This suggests that the effect of episodic simulation and spatial context on willing to help extends to prosocial behavior—though the effect on prosocial behavior is notably weaker and accounts for less variance compared to the effect on willingness to help. Amount donated was measured on a 0–100-point scale. Error bars indicate standard error of the mean. Each point was worth $0.15. Mean points value for each condition is displayed above the corresponding bars along with the equivalent dollars donated in parentheses.

4.2.12. Modeling the effect of imagining on donations through theory of mind, experience, and agency

To test whether the broader effect of the imagining helping on donations was mediated by theory of mind, experience, and agency, we conducted a path modeling analysis with donations entered as the dependent variable, imagine helping condition (Strong Context Helping and Weak Context Helping vs. No Helping) entered as the independent variable, and theory of mind, experience, and agency entered as proposed mediators (Preacher & Hayes, 2008; Sobel, 1982). The indirect meditation path from imagine helping condition to theory of mind to donations was significant (Sobel test, $b = 7.40$, $SE = 1.52$, $Z = 2.89$, $p = .004$; 95% CI = 1.68, 13.32). Neither the indirect meditation path from imagine helping condition to agency to donations (Sobel test, $b = -0.26$, $SE = 1.15$, $Z = -0.32$, $p = .750$; 95% CI = −2.60, 1.59) nor the path from imagine helping condition to experience to donations was significant (Sobel test, $b = 0.40$, $SE = 0.90$, $Z = 0.25$, $p = .799$; 95% CI = −2.71, 3.71), indicating that the effect of imagining on donations is partially mediated by theory of mind.

4.3. Experiment 3 discussion

Results from Experiment 3 converge with and inform findings from Experiment 1 and 2. The results from Experiment 3 replicated the finding that manipulating the strength of the spatial context of imagined events contributes to prosocial decision-making. Path modeling analyses demonstrated that the increased vividness of scene imagery for imagined helping events set in strong spatial contexts consistently

[1] Path modeling analysis with donation entered as the dependent variable, spatial context condition (Weak Context Helping vs. Strong Context Helping) entered as the independent variable, and scene imagery entered as a proposed mediator (Preacher & Hayes, 2008; Sobel, 1982) did not reveal a significant indirect path from spatial context condition to scene imagery to donation (Sobel test, $b = 3.03$, $SE = 2.59$, $Z = 1.17$, $p = .243$; 95% CI = −1.70, 7.71), though the direct effect of spatial context condition on donations did diminish in the expected direction when scene imagery was entered in the model from ($b = 7.16$, $SE = 4.69$, $p = .129$) to ($b = 4.13$, $SE = 5.35$, $p = .441$).

facilitates a willingness to help. Moreover, this effect cannot be fully accounted for by changes in theory of mind for the person in need or changes in their perceived mental capacities for experience and agency, strengthening evidence for a scene-based mechanism supporting the prosocial effect of episodic simulation.

Consistent with Experiment 2 and in contrast to Experiment 1, we observed a partial effect of spatial context on willingness to help through changes in theory of mind. Considering that both Experiments 2 and 3 have larger sample sizes and thus greater power to detect differences than Experiment 1, the overall pattern suggests strong spatial context may make it easier to consider the thoughts and feelings of the person in need—though this effect was statistically weaker than the effect of scene imagery (see Supplemental Materials for additional analysis).

Notably in Experiment 3, we observed an effect of spatial context not only on willingness to help, but also on actual helping behavior. The amount of money participants donated to people in need depended on whether they imagined helping the person and the spatial context in which the helping episode is located. Although willingness to help predicted donations, the effect of imagination on donation behavior was not as strong as the effect on willingness to help, and its relationship with scene imagery ratings was weaker.

Considered together, the experiments reveal that imagining helping episodes can affect prosocial thoughts and behavior with changes in scene imagery consistently impacting a willingness to help even when accounting for changes in perceptions of the person in needs mental states. Furthermore, the experiments consistently revealed a broader effect of theory of mind on willingness to help (Experiments 1–3) and costly donation behavior (Experiment 3).

5. General discussion

Extant research in moral psychology has focused on how our perceptions and characterizations of people in need inform decisions to help others. This work has overlooked the contribution of the way that we mentally construct the surrounding environment of the helping episode in which the person is embedded. In the present studies, we found that people are more willing to help others after imagining specific helping episodes. Manipulating the spatial contexts of imagined episodes increased heightened the vividness of scene imagery, a willingness to help others, and actual donations. The effect of vivid scene imagery on willingness to help persisted when statistically controlling for theory of mind for the person in need, individual differences in prosocial and empathic traits, and attributions of a person in need's capacity for experience and agency. Interestingly, theory of mind did contribute more generally to an effect of imagining a helping episode on willingness to help and donations, regardless of spatial context, providing evidence for multiple paths by which episodic simulation can contribute to prosocial intentions and behavior. Here, we consider these findings in the context of relevant literatures and discuss new directions for future research.

5.1. Imagination and decision-making

Consistent with previous research (Gaesser & Schacter, 2014; Gaesser et al., 2015; Gaesser et al., 2017), in the experiments reported here, we observed greater willingness to help a person in need after participants imagined themselves helping in a future episode. Critically, the current work provides greater insight into the cognitive mechanisms underlying this effect. Experiments 1–3 provide evidence that directly manipulating the spatial context of the imagined helping episode can affect the vividness of scene imagery and in turn prosocial decisions. Moreover, Experiment 3 suggests manipulating the spatial context of the imagined helping episode can affect actual helping behavior in the form of costly economic decisions.

The finding that the vividness of scene imagery affects willingness to help aligns with previous research on imagination inflation (and related work), demonstrating a relationship between the vividness and subjective likelihood that an event will occur (Carroll, 1978; Crisp & Turner, 2009; D'Argembeau & Van der Linden, 2012; Garry & Polaschek, 2000; Husnu & Crisp, 2010; Hyman & Pentland, 1996; Mazzoni & Memon, 2003; Szpunar & Schacter, 2013; Weiler et al., 2010). This finding may also be considered in light of prior work on judgment and decision-making, establishing that imagining an event makes the event more accessible (Anderson, 1983; Kappes & Morewedge, 2016; Koehler, 1991; Tversky & Kahneman, 1973). Perhaps imagined helping episodes anchored in stronger spatial contexts may be brought to mind more easily, increasing the subjective likelihood of helping. In line with this possibility, people are faster to bring to mind episodes based on highly familiar landmarks, compared to episodes based on less familiar landmarks (Robin & Moscovitch, 2014). Strengthening the spatial representation of the imagined episode likely makes the helping scene easier to construct and then more accessible at the time of deciding whether or not one would be willing to help someone, thereby providing "evidentiary value" (Kappes & Morewedge, 2016) that the one will help in that situation. While researchers in cognitive psychology and neuroscience have emphasized spatial processing as a critical feature for vivid imagined episodes (e.g., Addis & Andrews-Hanna et al., 2010; Schacter, 2012; Hassabis & Maguire, 2007, 2009, 2011; Maguire & Mullally, 2013; Rubin & Umanath, 2015), the present studies suggest that this feature has important implications for prosocial decision-making.

5.2. Insight into mechanisms: scenes and minds

An open question has been whether the effect of episodic simulation on willingness to help depends on theory of mind (Gaesser, 2013). Previous research on overall episodic and theory of mind abilities points to independent pathways (Rosenbaum, Stuss, Levine, & Tulving, 2007), and work on episodic simulation and willingness to help in particular has generated mixed answers. Some studies have shown that theory of mind does not fully account for the effect (based on the pattern of condition differences: Gaesser & Schacter, 2014; Gaesser et al., 2015), while other studies have observed correlations between scene imagery and theory of mind when people imagine helping episodes (Gaesser et al., 2017). Here we provide evidence for a novel model (Fig. 4) that begins to delineate when and how episodic simulation interacts with theory of mind to facilitate prosocial decisions. Episodic simulation can contribute to willingness to help through: (i) the vividness of scene imagery, consistent with the account that as the helping episode becomes more vivid and is brought to mind more easily the perceived plausibility of the imagined helping event increases, and (ii) by recruiting and increasing theory of mind for the person in need. A few points are worth noting. This model argues against the account that the spatial context and vividness of an imagined episode affects prosocial decisions *solely* by making it easier to consider of the thoughts and feelings of the person in need, and instead suggests that vividness can inform willingness to help independent of theory of mind. That said, this model also points to a possible role for theory of mind insofar as imagining a helping episode (versus not) also enhances theory of mind and thus willingness to help.

The model based on the present findings is certainly not intended to be comprehensive in capturing all aspects of the relationship between episodic simulation and theory of mind in supporting a willingness to help others. Nor is the model intended to be immutable and conclusive. Instead we more modestly propose the model represents a key starting point for research moving forward that will inevitably hone our understanding of this relationship and expand to include other potential variables of interest (e.g., psychological closeness). At present, our findings suggest that episodic simulation can directly affect prosocial thoughts and also indirectly affect prosocial thoughts via theory of mind. Interestingly, the broader literature on imagination and future

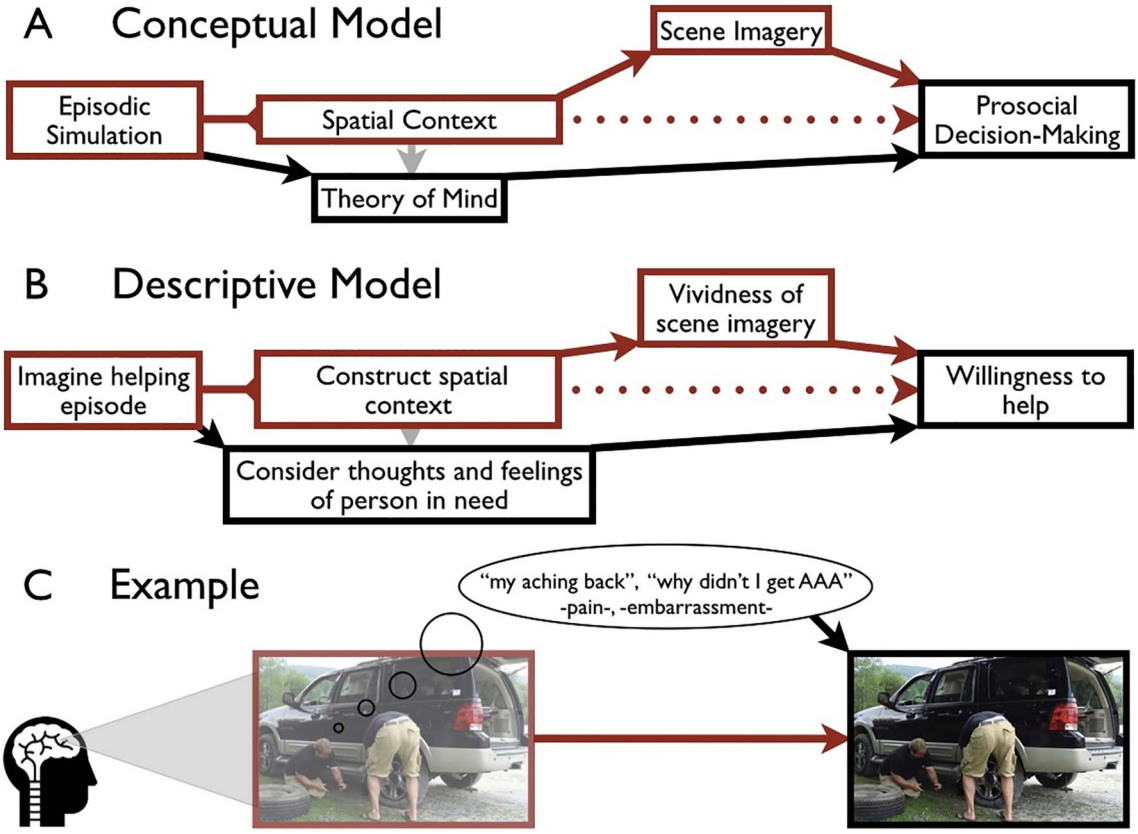

Fig. 4. (A) Based on the consistent pattern of findings across experiments, we propose a model that depicts two avenues by which episodic simulation can contribute to prosocial responses: (i) episodic simulation can facilitate prosocial decisions by enhancing the vividness of scene imagery; (ii) episodic simulation can also facilitate prosocial decisions by engaging theory of mind. (B) Imagining a helping episode involves constructing a spatial context. As the vividness of the imagined helping scene increases, so too does willingness to help. Imagining a helping episode also increases willingness to help by enhancing consideration of the thoughts and feelings of the person in need. (C) For example, imagining helping a person change a flat tire increases willingness to help the person by vividly experiencing the spatial and episodic details in which the person in need is embedded, and indirectly increases the willingness to help the person by augmenting considerations of the thoughts and feelings of the person in need in that particular situation.

thinking would not have predicted the second path of this model, as this work has not considered a potential influence of theory of mind on event likelihood judgements that involve social interactions, instead focusing on sensory based mechanisms agnostic to the role of theory of mind (Carroll, 1978; Crisp & Turner, 2009; D'Argembeau & Van der Linden, 2012; Garry & Polaschek, 2000; Husnu & Crisp, 2010; Hyman & Pentland, 1996; Mazzoni & Memon, 2003; Szpunar & Schacter, 2013; Weiler et al., 2010).

5.3. Limitations and future directions

To our knowledge, this is the first study to demonstrate that episodic simulation can guide costly prosocial behavior. Specifically, we found the amount of money participants donated to people in need depended on whether they imagined helping the person and the spatial context in which the helping episode is located. This was not a foregone conclusion given that peoples' moral intentions can fall short of actual behavior (Batson et al., 1999; Epley & Dunning, 2000; FeldmanHall et al., 2012; Forsythe, Horowitz, Savin, & Sefton, 1994). Two things are worth noting: (i) the effect of episodic simulation on donation behavior is not as potent as the effect on willingness to help, (ii) although scene imagery predicts willingness to help and willingness to help predicts charitable donation and the pattern of mediation results is in the expected direction, the correlation between scene imagery and donation amount fall short of statistical significance and thus claims should be appropriately cautious at present. Manipulations of imagined episodes nevertheless affected donations. Overall, the donation results are an important step toward examining how an effect of episodic simulation on willingness to help translates into actual helping behavior and highlighting the boundaries of such an effect.

To be clear, we do not expect interactions between episodic simulation and theory of mind to enhance prosocial decision-making in all circumstances. Indeed, there are examples of when engagement of theory of mind can reduce prosocial responses (Epley, Caruso, & Bazerman, 2006; Pierce, Kilduff, Galinsky, & Sivanathan, 2013), and there may be situations when episodic simulation has the same effect (Gaesser, 2013). Here, we make the more tempered claim that episodic simulation and theory of mind can interact to facilitate prosocial responses. Elucidating the dynamics of when and under what conditions episodic simulation interacts with theory of mind to enhance prosocial decision-making will be an exciting avenue to explore moving forward.

It is an open question whether objective measures of scene representation or theory of mind ability, like the subjective experience of vivid scene imagery or engagement of theory of mind measured in the present work, also predict willingness to help. While we did collect brief descriptions of events generated by subjects, these descriptions were too brief to allow precise assessment of objective levels of detail; however, it will be interesting to see whether objective scene representation and theory of mind ability show similar patterns or whether the phenomenological experiences of these processes themselves are more central.

Relatedly, how episodic simulation interacts with mind perception will be a focus of future research. Here, we were primarily interested in understanding whether a scene-based effect of episodic simulation on prosocial decisions could be accounted for by modulating attributions of experience and agency to a person in need. In light of the current data, this does not appear to be the case. However, there is some evidence of a relationship with the vividness of scene imagery for helping

episodes tracking with mind attributions, as well as condition differences (Supplemental Material for additional analysis and discussion). Understanding how episodic processes recruit and interact with perceptions of agents' specific mental states will be an exciting avenue for future research in social cognition.

The present findings raise intriguing implications for clinical populations. For example, amnesic patients exhibiting deficits in episodic simulation, imagining impoverished scenes that lack vividness and coherence (Hassabis et al., 2007; Maguire & Hassabis, 2011; Mullally et al., 2012; Race, Keane, & Verfaellie, 2011; Rosenbaum et al., 2000), may be less willing to help others in need after imagining helping. Along these lines, attenuated prosocial responses in amnesic patients have been recently observed (Beadle, Tranel, Cohen, & Duff, 2013) though the roles of spatial context and scene imagery were not directly examined. Another clinical population that would be interesting to examine would be patients with semantic dementia. Patients with semantic dementia have been shown to exhibit deficits in imagining scenes (Irish, Addis, Hodges, & Piguet, 2012) but also exhibit impaired theory of mind with intact episodic memory (Irish, Hodges, & Piguet, 2014). The clinical implications of our studies invite investigations into possible prosocial deficits, but beyond this the present findings provide a model that generates testable predictions about the role of episodic processes and subjective experience in prosocial decision-making.

The aim of the present studies was to better understand cognitive mechanisms that contribute to prosocial decisions, but that is not to say that we are a wholly benevolent social species. There are ample instances of our prosocial failures (Allport, 1954; Cuddy, Rock, & Norton, 2007; Latané & Darley, 1968; Harris & Fiske, 2006; Zaki, 2014), and, in some cases, even enjoyment in others' suffering (Cikara, Bruneau, & Saxe, 2011; Cikara, Bruneau, Van Bavel, & Saxe, 2014; Singer et al., 2006). Rather than overshadowing our capacity for helping others, our antisocial shortcomings serve to underscore the importance of elucidating and understanding the cognitive mechanisms that can be used to foster a willingness to help others in need and in some cases actual helping.

6. Conclusion

In sum, the present studies revealed that people are more willing to help others after imagining specific helping episodes—particularly when those episodes are set in strong spatial contexts, as well as prosocial behavior. It seems episodic simulation can facilitate prosocial responding via multiple pathways by enhancing the vividness of scene imagery and by engaging theory of mind. With any luck and a richer understanding of the cognitive processes that affect prosocial decision-making, we will be able to navigate toward a brighter prosocial future a little more easily.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.cognition.2017.11.004.

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