Memory

ISSN: 0965-8211 (Print) 1464-0686 (Online) Journal homepage: http://www.tandfonline.com/loi/pmem20

A role for affect in the link between episodic simulation and prosociality

Brendan Gaesser, Haley D. DiBiase & Elizabeth A. Kensinger

To cite this article: Brendan Gaesser, Haley D. DiBiase & Elizabeth A. Kensinger (2017) A role for affect in the link between episodic simulation and prosociality, Memory, 25:8, 1052-1062, DOI: 10.1080/09658211.2016.1254246

To link to this article: http://dx.doi.org/10.1080/09658211.2016.1254246

Published online: 13 Nov 2016.

MEMORY, 2017
VOL. 25, NO. 8, 1052–1062
http://dx.doi.org/10.1080/09658211.2016.1254246

Routledge
Taylor & Francis Group

A role for affect in the link between episodic simulation and prosociality

Brendan Gaesser[a], Haley D. DiBiase[a] and Elizabeth A. Kensinger[a,b]

[a]Department of Psychology, University at Albany, State University of New York, Albany, NY, USA; [b]Department of Psychology, Boston College, Chestnut Hill, MA, USA

ABSTRACT
Prospection and prosociality are hallmarks of our species. Little is known, however, about how our ability to imagine or simulate specific future events contributes to our capacity for prosociality. Here, we investigated this relationship, revealing how the affective response that arises from a simulated prosocial event motivates a willingness to help a person in need. Across two experiments, people reported being more willing to help in specific situations after simulating future helping events that elicited positive (versus negative or neutral) affect. Positive affect increased engagement of theory of mind for the person in need, which in turn informed prosocial responses. Moreover, the subjective experience of scene imagery and theory of mind systematically couple together depending on the affective valence of future simulations, providing new insight into how affective valence guides a prosocial function of episodic simulation.

ARTICLE HISTORY
Received 2 August 2016
Accepted 24 October 2016

KEYWORDS
Episodic memory; episodic future thinking; emotion; morality; theory of mind

Humans are a remarkably future-oriented and social species. We frequently shift attention beyond the immediate environment and simulate or imagine events that could occur in our futures (i.e., episodic simulation a form of episodic future thinking; Atance & O'Neill, 2001; Baird, Smallwood, & Schooler, 2011; Schacter et al., 2012; Suddendorf & Corballis, 2007). Episodic simulation relies on many of the same cognitive processes as episodic memory, in part because we draw on details from past events (Conway, 2009; Schacter et al., 2012; Szpunar, 2010) and similar constructive scene processes (Hassabis, Kumaran, & Maguire, 2007) to make predictions about the novel future events (see Irish & Piguet, 2013 for contribution of semantic memory). Although there is a rich literature examining how the cognitive phenomenology (e.g., vividness of imagery) of simulations can influence decision-making, relatively less research has examined a potentially important role of the affective signal that arises from these simulations. Yet simulating how future events could play out enables us to preview the emotional experience and subjective value a future event may hold, inducing motivational incentives that guide decision-making (Benoit, Gilbert, & Burgess, 2011; Benoit, Szpunar, & Schacter, 2014). We are also rampantly prosocial, cooperating to an extent and range that exceeds other species (Nowak & Highfield, 2011). A great deal of attention has been paid to the role of theory of mind (i.e., adopting the thoughts and feelings of another person; akin to perspective taking and mentalising) in facilitating prosociality (Coke, Batson, & McDavis, 1978; Decety, 2005; Zaki & Ochsner, 2012). Strikingly little is known, however, about how our ability to simulate future social interactions – and the affective tinge of those simulations – contributes to our capacity for prosociality. Here, we are particularly interested in whether the overall affective state associated with a simulated future prosocial event informs decisions to help a person in need.

Although no study has addressed this particular question, emerging research has found that people make more prosocial decisions (i.e., are more willing to help a person in need) after simulating helping in that situation in the future (Gaesser & Schacter, 2014; Gaesser, Horn, & Young, 2015). Specifically, as the imagery of the simulated helping event becomes more vividly represented it heightens prosocial intentions by increasing the perceived plausibility and likelihood that one will help in that event. This effect is thought to be consistent with previous studies on imagination inflation and related work that demonstrate a robust link between the sensory vividness of imagined events and the subjective likelihood that the event will occur (Carroll, 1978; Crisp & Turner, 2009; D'Argembeau & Van der Linden, 2012; Garry & Polaschek, 2000; Hyman & Pentland, 1996; Mazzoni & Memon, 2003; see Rebetez, Barsics, Rochat, D'Argembeau, & Van der Linden, 2016 for recent work on procrastination).

The extent to which this prior research informs our understanding of how simulating or imagining the future relates to prosocial decision-making has been limited to cognitive processes such as scene imagery. Gaesser and Schacter (2014) did include measures of emotional

CONTACT Brendan Gaesser bgaesser@albany.edu Department of Psychology, University at Albany, State University of New York, SS 395, 1400 Washington Ave., Albany, NY 12222, USA
Supplemental data for this article can be accessed at doi:10.1080/09658211.2016.1254246.

concern (e.g., tenderness and sympathy), not finding a consistent relationship between these emotions and an effect of episodic simulation on willingness to help. Yet, this lack of consistent correlational results for a few emotions does not preclude the possibility of a role for affective valence more broadly. While the role of affective valence in supporting a prosocial effect of simulated future events is currently unknown, decades of research have improved our understanding of the role of affective valence in judgement and decision-making and in imagination; however, these lines of research make divergent predictions about how the positive and negative valence associated with a simulated prosocial interaction (i.e., feeling good or bad about a future helping event) would inform decisions to help a person in need.

Although the influence of affect on cognition was once considered peripheral, research suggests that affect often guides decision-making (Frijda, 1986; Sanfey, 2007; Zeelendberg & Pieters, 2006). One role of affect is that it assigns an overall positive or negative value to experiences, influencing how we evaluate our decision options and motivating us to engage in or refrain from a given scenario (Schwarz & Clore, 1988; Sharot, 2011; Slovic, Finucane, Peters, & MacGregor, 2002). With regard to prosocial decision-making, positive affect preferentially fosters decisions to help others (Isen, Shalker, Clark, & Karp, 1978; see Lyubomirsky, King, & Diener, 2005 for a review). Positive affect increases one's confidence in the ability to help and focuses expectations on the positive outcomes and rewards of helping rather than the potential costs (Andreoni, 1990; Clark & Waddell, 1983; Taylor & Brown, 1988). Based on these findings, then, one might predict that simulating a helping event that evokes positive affect in particular would heighten prosocial decisions in that situation. However, research on imagination suggests a broader role for affective valence in heightening prosocial decisions.

Research on imagination has shown that it increases estimates of event plausibility and likelihood (i.e., imagination inflation). Such imagination inflation effects are thought to operate for events in general, agnostic to the event type or domain. This research has paid little direct attention to the role of affect in informing judgements of whether or not an imagined event will occur, focusing instead on the role of sensory and meta-cognitive aspects of an event (Garry & Polaschek, 2000). However, vividly imagining events such as tooth extraction, choking on a toy, and skin removal – ostensibly negative experiences for most people – have been shown to increase the subjective likelihood of the event (Mazzoni, Loftus, & Kirsch, 2001; Mazzoni & Memon, 2003). Recent work directly examining the influence of simulating affective events on subjective event likelihood reported that simulation increases sensory detail and event likelihood, for positive *and* negative events, but not for neutral events (Szpunar & Schacter, 2013). Mapping these results to a prosocial context, they suggest two things. First, they suggest that ratings of sensory quality for simulated helping events will be associated with the subjectively likelihood that one will help only when the simulated helping event evokes an affective state – regardless of whether the affect is positively or negatively valenced. Second, these results predict that positive and negative simulated helping events should increase the subjective likelihood that one will help to the same extent.

Thus, juxtaposing research on judgement and decision-making with research on imagination leads to divergent predictions and reveals gaps in our understanding of the mechanisms supporting prosocial decision-making on the one hand, and the social functions of future simulation on the other. In two experiments, we tested contrasting hypotheses: positive affect of the simulated event will selectively increase prosocial intentions, as predicted by work on judgement and decision-making and prosociality, or positive *and* negative affect of the simulated event will increase prosocial intentions to a similar degree, as predicted by work linking imagination and subjective event likelihood.

We also tested for possible cognitive mechanisms supporting the link between affect and prosocial intentions by exploring the influence of affective valence on the subjective experience of scene imagery (i.e., vividly representing visuospatial details of the helping event), which was previously shown to be associated with prosocial intentions (Gaesser & Schacter, 2014; Gaesser, et al., 2015). Moreover, we tested whether an influence of affective valence was independent from or interacting with theory of mind (i.e., mentally adopting the thoughts and feelings of the person in need; Coke et al., 1978; Decety, 2005; Zaki & Ochsner, 2012). Previous research suggests that people are often motivated to vicariously adopt others' positive emotional experiences, and that this can sometimes facilitate prosocial responses (Morelli, Lieberman, & Zaki, 2015; Zaki, 2014). Conversely, inducing a positive mood has been shown to reduce perspective taking compared to inducing a negative mood (Converse, Lin, Keysar, & Epley, 2008) Thus, the affective valence of a simulated helping event may impact theory of mind or scene imagery: heightening or attenuating one or both of these cognitive processes. Better understanding the relation between affect, scene imagery, and theory of mind, not only enables researchers to sharpen theoretical accounts of how episodic simulation can contribute to social decision-making, but it has potential to inform how best to facilitate prosocial responses outside the lab.

Experiment 1

Method

Participants

We recruited a total of 47 local college students to participate in Experiment 1, described as a study investigating how people respond to stories adapted from online

media. We ran the experiment until we had collected 30 participants who provided complete data sets that were then used for analysis (age: $M = 18.9$, $SD = 1.18$; 21 female). A power analysis of the effect size ($d = 1.32$) for the primary contrast of interest in related prior work (i.e., the difference in willingness to help for episodic vs. control conditions, $n = 15$) (Gaesser & Schacter, 2014) indicated that a sample of 30 participants conservatively allows for detection of differences between conditions (power > .80). To ensure participants comprehended task instructions and paid attention in the present study, we applied the same criteria as used in related work on episodic processes and prosocial intentions (Gaesser & Schacter, 2014; Gaesser, et al., 2015). Participants (17) who did not complete the study providing only partial data or inappropriate responses (e.g., imagined helping on a control condition trial) on more than 20% of the trials, or who failed to provide appropriate descriptions of what they generated were not considered for data analysis. Participants received $10 per hour or course credit for their participation. All participants provided informed written consent in accord with the Boston College Institutional Review Board.

Procedure

After reading instructions (see Supplemental Materials), participants completed practice trials containing one trial (story of need + experimental task) for each condition to familiarise them with the general structure and specific tasks of the study. If necessary, practice trials were repeated until participants demonstrated task comprehension and felt comfortable with the task. Participants were then presented with a series of 20 brief (i.e., one to two sentence 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) for 10 seconds. Stories were a subset of those used in previous work (Gaesser & Schacter, 2014; see Rameson, Morelli, & Lieberman, 2012 for related materials); each story was then followed by one of four possible experimental tasks (Simulate Helping Negative; Simulate Helping Positive, Conceptual Helping Negative; and Conceptual Helping Positive) using a within-subjects design.

For the experimental tasks participants were prompted to imagine helping events or generate helping comments that elicited positive or negative emotion: (i) imagining an event of helping the person in need in the future that elicits negative emotion (Simulate Helping Negative); (ii) imagining an event of helping the person in need in the future that elicits positive emotion (Simulate Helping Positive); (iii) visualising the media website the story of need came from (e.g., blogs, twitter, and a newspaper) and discussion board comments recommending how the person in need could be helped that elicit negative emotion (Conceptual Helping Negative); (iv) visualising the media website the story of need came from (e.g., blogs, twitter, and a newspaper) and discussion board comments recommending how the person in need could be helped that elicit positive emotion (Conceptual Helping Positive). No specific emotions or examples of emotionally positive or negative events were provided to the participant, instead participants self-defined positive and negative emotion. Given that the same event could evoke different emotional responses across individuals, and that we were interested in capturing overall affective valence, we intentionally took this approach in order to elicit events that extended across the breadth of positive and negative affective valence. One possible drawback to this approach is that it made the tasks more difficult for subjects to learn without the support of concrete examples and specific feedback regarding emotional experiences. Nevertheless, the majority of participants were able to comprehend task instructions and successfully completed the experiment.

Participants had one minute to generate imagined helping events (Simulate Helping conditions) or helping comments (Conceptual Helping conditions) in their mind. The Conceptual Helping condition (akin to the Estimate Helping condition in Gaesser & Schacter, 2014) was designed to recruit semantic retrieval, social cognition, and the conceptual priming of helping responses (Macrae & Johnston, 1998; Nelson & Norton, 2005). Moreover, by having subjects *visualise* the media website and corresponding comments, the Conceptual Helping condition controls for generating basic visual imagery (Kosslyn, Ganis, & Thompson, 2001). In contrast, the simulate conditions alone required imagining an episode that is specific in time and place, forming a coherent and complex scene (Hassabis et al., 2007; Summerfield, Hassabis, & Maguire, 2010). The order of stories of need and experimental tasks were randomised for every subject, mitigating the possibility of order and stimulus-level effects across conditions.

After all trials were completed, participants were re-presented with the stories of need and made various ratings on 1–7 Likert scales such as their intentions to help in that situation, emotional valence, and, for the imagine helping conditions, the phenomenological aspects of the imagined events. Stories were re-presented in the same order that they were presented in during the trials, and measures were presented in a fixed order 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 story. *Affect valence* was assessed for the responses that participants generated (i.e., the imagined event or generated comments) by asking: how emotionally positive or negative were the events you imagined or the comments you visualised? (1 very negative – 7 very positive). We also collected measures of affect valence for the story itself (see Supplemental Material). For sensory quality of the imagined scenes, participants rated 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). Participants

also rated theory of mind experienced during the imagined event (i.e., mentalising, perspective taking, cognitive empathy) (When imagining helping did you consider the person's thoughts and feelings? 1 = not at all – 7 = strongly considered). In addition to ratings for each story, participants provided brief descriptions of what the events they imagined or the comments they generated for each trial (see Supplemental Materials for examples). Trials were excluded if the description did not depict a helping event or referred to a condition other than the condition of that trial (i.e., a description about a helping episode specific in time and place for a trial in the Conceptual Helping condition). After finishing the study, participants were debriefed and thanked for their time.

Results

Affective valence manipulation

To test whether we effectively manipulated affective valence associated with imagining events, we ran a paired-samples *t*-test for the subjective ratings of the affective valence elicited by simulating future helping events in the Simulate Helping Positive condition ($M = 5.18$; SE = .17, 95% confidence intervals (CI) = 4.83, 5.53) compared to affective valence elicited in the Simulate Helping Negative condition ($M = 2.97$; SE = .13, CI = 2.69, 3.25, $t(29) = 10.18$, $p < .001$, $\eta_p^2 = .781$). This analysis demonstrated that we successfully manipulated affective valence of imagined future helping events (see Supplemental Material for additional support using linguistic word analysis to code for affective valence). A 2 (Helping: Simulate and Conceptual) × 2 (Affect: Negative, and Positive) ANOVA showed a main effect of affect condition, $F(1, 29) = 128.75$, $p < .001$, $\eta_p^2 = .816$, with no main effect of helping condition, $F(1, 29) = 0.12$, $p = .727$, $\eta_p^2 = .004$, and a trending interaction, $F(1, 29) = 3.43$, $p = .074$, $\eta_p^2 = .106$, such that affective valence was slightly less exaggerated (i.e., negative more negative and positive more positive) in the Simulate Helping condition.

Willingness to help by condition

To test the hypotheses that imagining helping contributes to prosocial decision-making and how affective valence relates to this effect, we conducted a 2 (Helping: Simulate and Conceptual) × 2 (Affect: Negative and Positive) ANOVA with willingness to help as the dependent variable (Figure 1). This revealed a main effect of helping condition, $F(1, 29) = 32.58$, $p < .001$, $\eta_p^2 = .529$. Participants reported being more willing to help after imagining a future event of helping a person in need ($M = 5.51$; SE = .13, CI = 5.25, 5.78) compared to conceptually thinking of ways the person in need could be helped ($M = 4.62$; SE = .16, CI = 4.30, 4.94). We also observed a main effect of affect condition, $F(1, 29) = 8.68$, $p = .006$, $\eta_p^2 = .230$. Consistent with the notion that positive affect generally promotes prosocial responses, positive valence ($M = 5.28$; SE = .15, CI = 4.97, 5.58) increased willingness to help compared to negative valence ($M = 4.86$; SE = .13, CI = 4.59, 5.12) across imagine and conceptual helping conditions. No interaction between helping and affect conditions was observed, $F(1, 29) = 1.34$, $p = .256$, $\eta_p^2 = .044$. Next, we examined whether affective valence modified the sensory quality of the imagined helping event and the extent to which theory of mind for person in need was engaged – cognitive mechanisms previously found to support the effect of episodic simulation on prosocial decision-making.

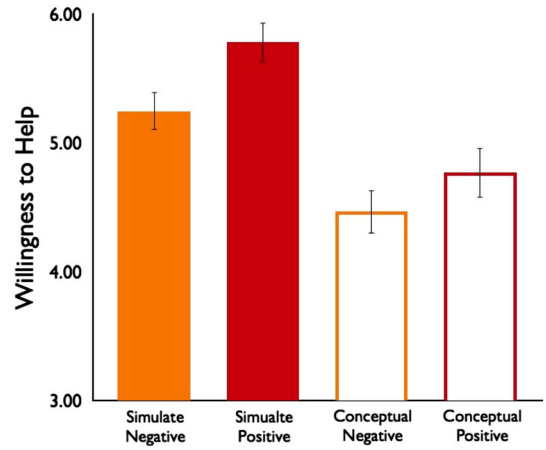

Figure 1. Willingness to help ratings were the highest for positive events in the Simulate condition Experiment 1. There was no significant difference between emotion conditions in the Conceptual condition. Willingness to help ratings, given on a 1–7 scale, are shown here on a 3–6 scale to graphically emphasise similarities and differences across conditions. Error bars represent the standard error of the mean.

Scene imagery

Reliability analysis showed that measures of sensory quality (i.e., scene coherence, and scene detail) were highly related (Cronbach's Alpha, Simulate Helping Positive = .741 and Simulate Helping Negative = .917); thus, we averaged these items to form a scene imagery index consistent with previous work (Gaesser & Schacter, 2014). Scene imagery was significantly higher in the Simulate Helping Positive condition ($M = 5.31$; SE = .15, CI = 5.01, 5.61) than in the Simulate Helping Negative condition ($M = 4.94$; SE = .20, CI = 4.54, 5.34), $t(29) = 2.21$, $p = .035$, $\eta_p^2 = .144$, suggesting that positive affect may have heighted the sensory vividness of imagined events. Using conventional and bootstrapping path modelling, we tested whether the affective valence of simulated helping events increases willingness to help by heightening scene imagery (Preacher & Hayes, 2008). Willingness to help was entered as the dependent variable, affective valence condition entered as the independent variable, and scene imagery entered as a mediator. No indirect path from affective valence to scene imagery to willingness to help was observed (CI = –.01, .22; Sobel test, $b = .08$, $Z = 1.42$, $p = .156$; see Supplemental Analyses for additional evidence using trial-level analyses).

We then examined how scene imagery of the simulated helping event tracked with willingness to help across affective valence. The vividness of scene imagery was associated with willingness to help in the Simulate Helping Positive condition ($r(28) = 0.56$, $p < .001$). Interestingly, the vividness of scene imagery was also associated with willingness to help in the Simulate Helping Negative condition ($r(28) = 0.40$, $p = .027$). Steiger's test for comparing the difference in correlational coefficients did not show a difference in the strength of the association between scene imagery and willingness to help in the Simulate Helping Negative compared to Simulate Helping Positive condition ($z = 1.06$, $p = .291$). The more vividly the imagined helping scene is represented, the more willing people are to help, even when people feel negatively about helping.

Theory of mind

Theory of mind was significantly higher in the Simulate Helping Positive condition ($M = 5.64$; SE = .18, CI = 5.27, 6.02) than in the Simulate Helping Negative condition ($M = 4.98$; SE = .20, CI = 4.57, 5.39), $t(29) = 3.18$, $p = .003$, $\eta_p^2 = .259$, suggesting that positive affect facilitated considering the thoughts and feelings of the person in need. Theory of mind was associated with willingness to help in the Simulate Helping Positive ($r(28) = 0.42$, $p = .021$) and Simulate Helping Negative conditions ($r(28) = 0.55$, $p = .002$). No difference in the strength of these correlations was found (Steiger's test, $z = -0.71$, $p = .478$). The more that people considered the thoughts and feelings of the person in need, the more willing they were to help. Interestingly, path modelling analysis revealed an indirect path from affective valence through theory of mind to willingness to help (CI = .03, .32; Sobel test, $b = .13$, $Z = 2.14$, $p = .032$; entering willingness to help as the dependent variable, affective valence condition as the independent variable, and theory of mind as a mediator), suggesting that the positive affective valence of simulated helping events increases willingness to help by, in part, by heightening theory of mind (Preacher & Hayes, 2008).

Dynamic coupling between scene imagery and theory of mind through affective valence

An intriguing, though admittedly exploratory, question is whether affective valence impacts not just scene imagery and theory of mind independently, as shown above, but whether affective valence impacts how scene imagery and theory of mind dynamically interact with one another. Thus we examined whether the coupling between scene imagery and theory of mind varied across affective valence. Scene imagery was significantly associated with theory of mind in the Simulate Helping Positive condition ($r(28) = 0.64$, $p < .001$), but not in the Simulate Helping Negative condition ($r(28) = 0.25$, $p = .18$). There was a significant difference in the strength of the association between scene imagery and theory of mind between the two affective valence conditions (Stieger's test: $z = 2.05$, $p = .04$), raising the possibility that, when simulating a prosocial event, scene imagery and theory of mind couple together in dynamic ways that can depend on the affective valence associated with the event.

In sum, results from Experiment 1 support the hypothesis that positive affect associated with an imagined event preferentially increases prosocial decision-making rather than positive *and* negative affect associated with an imagined event equally heightening prosocial decision-making, and provide insight into the dynamic impact of affect valence on underlying cognitive mechanisms. Left unaddressed in Experiment 1 is whether positive valence is driving prosocial responses higher, whether negative valence is driving prosocial responses lower, or whether some combination of the two exists. In Experiment 2, we added a neutral affect condition in order to tease apart whether a particular valence was driving prosocial decision-making, enabling us to test whether positive affect was facilitating prosocial decision-making or whether negative affect was inhibiting prosocial decision-making relative to an emotional neutral baseline, or both.

Experiment 2

Method

Participants

We recruited a total of 43 local college students to participate in Experiment 2. The same comprehension checks and inclusion criteria used in Experiment 1 were used for Experiment 2. We ran participants until we had collected 30 participants who provided complete data sets that were then used for analysis (age: $M = 19.37$, SD = 1.43; 23 female). Participants received $10 per hour or course credit for their participation. All participants provided informed written consent in accord with the Boston College Institutional Review Board.

Procedure

After reading instructions and completing practice trials, thirty stories describing everyday events of people in need were presented for 10 seconds each followed by one of six conditions in a within-subjects design. Stories were the same as in Experiment 1 with 10 stories added from previous work (Gaesser & Schacter, 2014). In addition to the four conditions used in Experiment 1 (Simulate Helping Negative; Simulate Helping Positive; Conceptual Helping Positive; and Conceptual Helping Negative), Experiment 2 included two neutral affect conditions (Simulate Helping Neutral and Conceptual Helping Neutral). As in Experiment 1, participants had 60 seconds to either imagining helping or generating comments about helping. Following the experimental trials, participants were asked to complete a post-task survey that collected ratings identical to the survey used in Experiment 1. After finishing the study, participants were debriefed and thanked for their time.

Results

Affective valence manipulation

A one-way ANOVA (Simulate Helping Positive, Simulate Helping Neutral, and Simulate Helping Negative) for the subjective affective ratings confirmed that we successfully manipulated affective valence of imagined future helping events (Simulate Helping Positive, $M = 4.81$, SE = .20, CI = 4.41, 5.22; Simulate Helping Neutral, $M = 3.87$, SE = .09, CI = 3.67, 4.06; and Simulate Helping Negative $M = 2.90$, SE = .14, CI = 2.62, 3.18), $F(1, 29) = 47.29$, $p < .001$, $\eta_p^2 = .620$; see Supplemental Material for additional support using linguistic word analysis to code for affective valence). Subsequent paired-samples *t*-test demonstrated that affective valence ratings in the Simulate Helping Positive condition were significantly more positive than those in the Simulate Helping Neutral, $t(29) = 5.26$, $p < .001$, $\eta_p^2 = .488$, and Simulate Helping Negative, $t(29) = 7.58$, $p < .001$, $\eta_p^2 = .665$. Affective valence ratings in the Simulate Helping Negative condition were also significantly more negative than those for the Simulate Neutral Helping condition, $t(29) = 6.82$, $p < .001$, $\eta_p^2 = .616$. A 2 (Helping: Simulate and Conceptual) × 3 (Affect: Negative, Neutral, and Positive) ANOVA showed a main effect of affect condition, $F(2, 29) = 111.42$, $p < .001$, $\eta_p^2 = .793$, a main effect of helping condition, $F(2, 58) = 4.59$, $p = .041$, $\eta_p^2 = .137$, and a qualifying interaction, $F(2, 58) = 10.50$, $p < .001$, $\eta_p^2 = .266$. Specifically, positive comments ($M = 5.44$, SE = .14, CI = 5.15, 5.73) were rated as more positive than positive imagined events, $t(29) = 3.26$, $p = .003$, $\eta_p^2 = .264$, and negative comments ($M = 2.64$, SE = .13, CI = 2.38, 2.90) were significantly more negative than negative imagined events, $t(29) = 2.14$, $p = .041$, $\eta_p^2 = .137$. These results demonstrate that our manipulation increased affective valence for both the Simulate Helping and Conceptual Helping conditions with a slightly stronger manipulation of affective valence in the Conceptual Helping condition. Such a pattern of affective valence may work against finding differences in willingness to help across Simulate Helping Positive and Conceptual Helping Positive conditions, and thus differences that arise from this contrast may indicate a conservative estimate.

Willingness to help by condition

Willingness to help across conditions was analysed using a 2 (Helping: Simulate and Conceptual) × 3 (Affect: Negative, Neutral, and Positive) ANOVA. This showed a main effect of helping condition, $F(1, 29) = 76.97$, $p < .001$, $\eta_p^2 = .634$, a main effect of affect condition, $F(2, 58) = 12.27$, $p < .001$, $\eta_p^2 = .313$, and no interaction effect, $F(2, 58) = 0.17$, $p = .84$, $\eta_p^2 = .006$; see Figure 2. Subsequent *t*-tests revealed that participants were significantly more willing to help when they imagined positive events ($M = 5.74$; SE = .14, CI = 5.46, 6.03) compared to imagined neutral events ($M = 5.15$; SE = .14, CI = 4.86, 5.45), $t(29) = 3.74$, $p = .001$, $\eta_p^2 = .326$, and numerically more willing to help when they imagined positive events compared to imagined negative events ($M = 5.37$; SE = .16, CI = 5.05, 5.69), $t(29) = 1.96$, $p = .059$, $\eta_p^2 = .117$. Participants were no more willing to help when they imagined negative events compared to when they imagined neutral events, $t(29) = 1.36$, $p = .186$, $\eta_p^2 = .060$. Next, we examined whether affective valence impacted the sensory quality of the imagined helping event and the extent to which theory of mind for person in need was engaged.

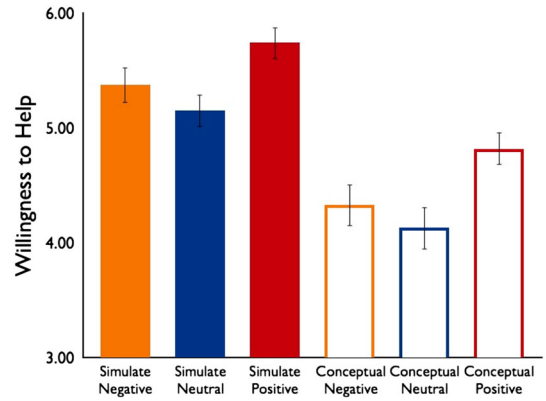

Figure 2. Willingness to help ratings for generated events and comments in Experiment 2 were highest in the positive affect condition. Willingness to help ratings given on a 1–7 scale shown here on a 3–6 scale to graphically emphasise similarities and differences across conditions. Error bars represent the standard error of the mean.

Scene imagery

Similar to the results from Experiment 1 and previous work, reliability analysis showed that measures of scene imagery (i.e., scene coherence and scene detail) were highly related (Cronbach's Alpha, Simulate Helping Positive = .922; Simulate Helping Neutral = .931; and Simulate Helping Negative = .918), and were averaged into a scene imagery index. A one-way (Valence: Negative, Neutral, and Positive) ANOVA using scene imagery as the dependent variable revealed an effect of affect condition, $F(2, 58) = 6.12$, $p < .001$, $\eta_p^2 = .144$. Scene imagery was significantly higher in the Simulate Helping Positive condition ($M = 5.34$; SE = 14, CI = 5.06, 5.63; $t(29) = 2.96$, $p = .006$, $\eta_p^2 = .232$) and Simulate Helping Negative condition ($M = 5.29$; SE = .14, CI = 5.01, 5.57; $t(29) = 2.94$, $p = .006$, $\eta_p^2 = .229$) compared to Simulate Helping Neutral condition ($M = 4.93$; SE = .16, CI = 4.61, 5.25). Though, scene imagery did not vary between the Simulate Helping Positive and Simulate Helping Negative conditions, $t(29) = 0.33$, $p = .742$, $\eta_p^2 = .004$, suggesting that affective valence overall increased scene imagery rather than positive or negative affect in particular. Path modelling analysis did not find an indirect path from affective valence to scene imagery to willingness to help (CI = –.10, .14; Sobel test, $b = .02$, $Z = .27$, $p = .789$; see Supplemental Analyses for additional evidence using trial-level analyses).

Correlational analysis revealed that scene imagery of the imagined helping event tracked with willingness to help across affective valence. The vividness of scene

imagery was associated with willingness to help in the Simulate Helping Positive condition ($r(28) = 0.68$, $p < .001$), Simulate Helping Neutral condition ($r(28) = 0.62$, $p < .001$), and Simulate Helping Negative condition ($r(28) = 0.36$, $p = .054$). Steiger's test for comparing the difference in correlational coefficients did not show a difference in the strength of the association between scene imagery and willingness to help in the Simulate Helping Negative compared to Simulate Helping Positive ($z = 1.80$, $p = .071$) and Simulate Helping Neutral conditions ($z = 1.74$, $p = .082$). Thus, while affective valence may heighten the sensory quality of imagined events it does not appear to influence the association between the sensory quality of the imagined event and willingness to help.

Theory of mind

A one-way (Affect: Negative, Neutral, and Positive) ANOVA using theory of mind as the dependent variable showed an effect of affect condition on theory of mind, $F(2, 58) = 11.96$, $p < .001$, $\eta_p^2 = .292$. Theory of mind was significantly higher in the Simulate Helping Positive condition ($M = 5.43$; SE = .16, CI = 5.12, 5.75) than in the Simulate Helping Neutral ($M = 4.79$; SE = .15, CI = 4.48, 5.10; $t(29) = 4.08$, $p < .001$, $\eta_p^2 = .365$), and Simulate Helping Negative conditions ($M = 4.57$; SE = .20, CI = 4.16, 4.97; $t(29) = 4.50$, $p < .001$, $\eta_p^2 = .411$). However, theory of mind did not differ between Simulate Helping Negative and Simulate Helping Neutral conditions, $t(29) = 1.12$, $p = .272$, $\eta_p^2 = .041$, suggesting that positive affect in particular may have facilitated adopting the thoughts and feelings of the person in need. Path modelling again revealed an indirect path from affective valence to theory of mind to willingness to help (CI = .07, .31; Sobel test, $b = .18$, $Z = 2.95$, $p = .003$), suggesting that the affective valence of simulated helping events increases willingness to help, in part, by heightening theory of mind.

Theory of mind was associated with willingness to help in the Simulate Helping Positive ($r(28) = 0.62$, $p < .001$) and Simulate Helping Negative conditions ($r(28) = 0.55$, $p = .002$), but not the Simulate Helping Neutral condition ($r(28) = 0.19$, $p = .317$). The difference in the strength of the association between theory of mind and willingness to help in the Simulate Helping Neutral compared to Simulate Helping Positive ($z = 2.58$, $p = .010$) and Simulate Helping Negative conditions was significant ($z = 2.00$, $p = .046$).

Dynamic coupling between scene imagery and theory of mind across affective valence

Positive affect increased the degree to which cognitive processes previously shown to support the prosocial effect of episodic simulation were recruited: simulated events eliciting positive affect heightened both the vividness of scene imagery and the extent to which participants considered the thoughts and feelings of the person in need. Next, we examined how scene imagery was associated with theory of mind across affective valence. Reinforcing and expanding results from Experiment 1, we found that scene imagery was significantly associated with theory of mind in the Simulate Helping Positive condition, $r(28) = 0.48$, $p = .007$, and in Simulate Helping Neutral condition, $r(28) = 0.38$, $p = .040$. Scene imagery was once again not associated with theory of mind in the Simulate Helping Negative condition, $r(28) = 0.13$, $p = .492$, though Steiger's test did not reach significance and trial-level analyses showed an association across conditions. Nonetheless, the overall pattern of correlations across experiments suggests that affective valence may play a role in whether scene imagery and theory of mind couple together (i.e., are correlated) when simulating future prosocial events. Specifically, scene imagery and theory of mind may be uncoupled (i.e., are not correlated) when the simulated prosocial event elicits negative affect.

In sum, the results of Experiment 2 replicated the effects of Experiment 1, revealing that simulating helping events that elicit positive affect increased willingness to help to a greater extent than simulating helping events that elicit negative affect. These results lend additional support to the hypothesis that positive affect associated with an imagined event preferentially increases prosocial decision-making. Critically, Experiment 2 further demonstrated that this difference emerged because positive affect facilitates willingness to help rather than negative affect inhibiting a willingness to help relative to a neutral baseline.

Discussion

Across two experiments we examined how the overall affective state associated with a simulated prosocial interaction informs a willingness to help a person in need. Condition differences provide support for the hypothesis – predicted by research on judgement and decision-making – that positive affect of the simulated event would selectively increase a willingness to help. The results did not support the alternate hypothesis – predicted by research on imagination inflation – regarding condition differences that positive and negative affect of the imagined event would increase a willingness to help to an equal degree.

Yet, our results are not completely incongruent with work on imagination inflation. Specifically, research on imagination inflation shows that the sensory quality and vividness of an imagined event is associated with the plausibility or likelihood that an event will occur (Garry & Polaschek, 2000; Mazzoni et al., 2001; Mazzoni & Memon, 2003; Rebetez et al., 2016; Szpunar & Schacter, 2013). Here, we found that – across affective valence conditions – the more vividly a simulated prosocial event is represented, the more willing people were to help in that event. Although the positive association between scene imagery and willingness to help was trending in the negative affect condition, it is interesting to note that the association was in the positive direction at all. Moreover, trial-level analyses lend further support, finding scene imagery significantly associated with willingness to

help for all affective valence conditions. Thus, the pattern of correlations between scene imagery and willingness to help are broadly consistent with the imagination inflation literature, suggesting that the sensory quality of the simulated event may positively contribute to prosocial decision-making, even when people feel negatively about the event, by making the helping representation more accessible and the likelihood of engaging in the prosocial event more plausible.

The current findings begin to shed light on how affective valence elicited by simulated events interacts with different cognitive mechanisms previously shown to support the effect of future simulation on prosocial intentions. Specifically, we found evidence that affective valence of a simulated helping event contributes to prosocial intentions, in part, by regulating the deployment of theory of mind during the simulated event. Path modelling analyses indicated an indirect path from affective valence to theory of mind to willingness to help. This aligns nicely with prior work, which has found that people are particularly motivated to consider the thoughts and feelings of others when it evokes positive affect (Morelli et al., 2015; Zaki, 2014). While there are some data that suggest the sensory detail and the spatial temporal clarity of imagined events can increase for events that evoke positive affect compared to negative affect (positive vs. negative: D'Argembeau & Van der Linden, 2004; desirable vs. undesirable: de Vito, Neroni, Gamboz, Della Sala, & Brandimonte, 2014), the difference is not always observed (Szpunar & Schacter, 2013). Here, we observed mixed support across experiments for a condition effect of affective valence on our related measure of scene imagery, leaving open the question of how and when positive affect directly increases scene imagery and sensory quality more broadly. At the present, the findings provide converging evidence that the affective valence of a simulated event may motivate the degree to which participants engage in theory of mind of the person in need, which in turn facilitates prosocial responses.

Exploratory analysis revealed that affective valence not only influences theory of mind, but might dynamically influence a coupling of scene imagery and theory of mind. When imagining future prosocial events that elicit positive (or neutral) affect, scene imagery and theory of mind were consistently tracking with one another. However, this association broke down when imagining future prosocial events that elicit negative affect. This pattern suggests that negative affect uncouples scene imagery with theory of mind, perhaps as a result of decreasing theory of mind. Precisely how affect modulates this coupling for simulated prosocial events, and, more broadly, whether affect's impact on scene imagery and theory mind extends beyond prosociality to other domains of social interaction will be exciting questions to explore moving forward.

Another avenue to explore is whether these effects will similarly be observed for episodic memory. Given that episodic simulation and episodic memory draw on many of the same cognitive processes (Atance & O'Neill, 2001; Conway, 2009; Hassabis et al., 2007; Schacter et al., 2012; Szpunar, 2010), it raises the possibility that the effect of affective valence elicited by simulated future events on prosocial intentions will likely extend to remembered past events (though see de Vito, Buonocore, Bonnefon, & Della Sala, 2015 for potentially relevant differences in spatial imagery). We are particularly interested to see how affective asymmetries between simulating future events and remembering past events will shape their effects on prosocial decision-making. For instance, there are at least two affective asymmetries across future and past events that we know of that may differentially influence an effect of episodic simulation and episodic memory on prosocial decision-making. First, people tend to experience emotions more intensely when they anticipate future events than when they reflect on past events (Carsuo, 2010; Van Boven & Ashworth, 2007). Second, simulated future events tend to be emotionally more positive and idyllic than remembered past events (Berntsen & Bohn, 2010; D'Argembeau & Van der Linden, 2004; Gallo, Korthauer, McDonough, Teshale, & Johnson, 2011; Rasmussen & Berntsen, 2013). We have previously shown that simulating future and remembering past helping events increases prosocial intentions to a similar extent (Gaesser & Schacter, 2014). However, disparate affective forces may belie this similarity across episodic processes. An exciting direction for future research will be to elucidate a role of affect valence in episodic memory on prosocial decision-making and possible differences with episodic simulation.

A related question is whether affective valence would have a similar effect for seemingly atemporal imagine helping events (i.e., events not thought to be anchored to a particular time). While there is some evidence suggesting that future imagined events and atemporal imagined events may recruit similar cognitive processes relevant to the present findings (e.g., scene imagery) in young adults (de Vito et al., 2012; Rendell et al., 2012), little to nothing is known about the affective quality of atemporal imagined events, let alone potential affective differences between atemporal and future events. To the extent that atemporal imagined helping events evoke scene imagery, we suspect that these events may also influence a willingness to help others. However, whether or not atemporal imagined helping events evoke similar affective and prosocial decisions as future imagined events remains an open question.

Of applied importance, future work could examine how the mechanisms and prosocial intentions examined in the present studies translate to actual prosocial behaviour outside the lab. While peoples' moral intentions do not always translate into actual behaviour (e.g., not shocking someone at a cost to the self, FeldmanHall et al., 2012), previous studies on imagination and behaviour outside of the lab demonstrate that imagining an action increases the

likelihood that the action will be taken in the future (Gregory, Cialdini, & Carpenter, 1982; Libby, Shaeffer, Eibach, & Slemmer, 2007).

Another open question is the role of specific emotions in driving the effect of simulated events on prosocial intentions. Previous research did not find a role for emotional concern (Gaesser & Schacter, 2014), and here we found a role for overall affective valence, but neither finding rules out a role for specific emotions influencing this effect. While future studies may benefit from investigating the effects of discrete emotions on future simulation and prosocial decision-making, a recent review calls into question a link between discrete emotions and moral (including helping) judgements, positing that ostensible effects of specific emotions arise because of domain-general features such as affective valence and conceptual content (Cameron, Lindquist, & Gray, 2015). Relatedly, in the present studies, we intentionally did not constrain the specifics of the simulated helping event in response to particular scenarios of need (other than the simulated helping events had to be specific in time and place, involve successfully helping the person, and evoke positive, negative, or neutral emotion). This approach generated an array of simulated helping events within conditions that vary in their specifics. While this variability precludes attributing specific emotions, event features, or strategies to an impact on prosocial responses for simulated helping events (though see Supplemental Analysis for *post hoc* qualitative and descriptive analyses), it underscores a role of overall affective valence which was explicitly measured and consistently the same within an affective condition.

Our findings may have implications for differences in populations as consequences of flattened or heightened affective valence. One particularly intriguing population to consider along these lines is older adults. Older adults simulate future events as more positively valenced than young adults (Gallo et al., 2011) and thus may show an increased willingness to help when imagining prosocial events as a consequence of increased positive affect. However, older adults also simulate future events less vividly and with fewer details than young adults (Gaesser, Sachetti, Addis, & Schacter, 2011; Gallo et al., 2011), and therefore may show decreased willingness to help when imagining prosocial events as a consequence of decreased sensory vividness. How increased positive affect and decreased sensory quality of simulated events shape age-related differences in prosocial decision-making is an open question raised by the present findings that has not previously been considered. While healthy adults often think about their futures in a positive manner (Sharot, 2011), patients with affective disorders (e.g., anxiety and depression) tend to simulate negatively biased future events (MacLeod, Tata, Kentish, & Jacobsen, 1997; Williams et al., 1996). However, previous studies have not investigated how these negatively biased simulations impact prosocial intentions in these disorders.

Humans are remarkably prospective and prosocial. Understanding when and how the affective signals arising from simulations of the future guide a willingness to help others, can bolster our understanding of the relationship between affect, episodic simulation, theory of mind, and one day perhaps be applied to foster prosociality. The present studies begin to reveal how the overall affective signal that arises from simulating future events contributes to our capacity for prosociality. When a simulated future prosocial event elicits positive affect, this can bolster prosocial decision-making, heighten theory of mind, and facilitate a coupling between scene imagery and theory of mind. It seems that we are more willing to help others in need when we imagine a positive prosocial future.

Acknowledgements

We thank E. Hynds for her help with stimuli preparation and data collection as a research assistant. We thank E. Herder, and the Cognitive and Affective Neuroscience Lab at Boston College for helpful discussions on drafts of the manuscript. This work was partially supported by Martin Seligman through a Templeton Science of Prospection Award to B. Gaesser, L. Young, and E. Kensinger.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by John Templeton Foundation, Science of Prospection Award.

References

Andreoni, J. (1990). Impure altruism and donations to public goods: A theory of warm-glow giving. *The Economic Journal*, *100*, 464–477.

Atance, C. M., & O'Neill, D. K. (2001). Episodic future thinking. *Trends in Cognitive Sciences*, *5*, 533–539.

Baird, B., Smallwood, J., & Schooler, J. W. (2011). Back to the future: Autobiographical planning and the functionality of mind-wandering. *Consciousness and Cognition*, *20*, 1604–1611.

Benoit, R. G., Gilbert, S. J., & Burgess, P. W. (2011). Neural mechanism mediating the impact of episodic prospection on farsighted decisions. *The Journal of Neuroscience*, *31*, 6771–6779.

Benoit, R. G., Szpunar, K. K., & Schacter, D. L. (2014). Ventromedial prefrontal cortex supports affective future simulation by integrating distributed knowledge. *Proceedings of the National Academy of Sciences*, *111*, 16550–16555.

Berntsen, D., & Bohn, A. (2010). Remembering and forecasting: The relation between autobiographical memory and episodic future thinking. *Memory & Cognition*, *38*, 265–278.

Cameron, C. D., Lindquist, K. A., & Gray, K. (2015). A constructionist review of morality and emotions: No evidence for specific links between moral content and discrete emotions. *Personality and Social Psychology Review*, *19*, 371–394.

Carroll, J. S. (1978). The effect of imagining an event on expectations for the event: An interpretation in terms of the availability heuristic. *Journal of Experimental Social Psychology*, *14*, 88–96.

Carsuo, E. M. (2010). When the future feels worse than the past: A temporal inconsistency in moral judgment. *Journal of Experimental Psychology: General*, *139*, 610–624.

Clark, M. S., & Waddell, B. (1983). Effects of moods on thoughts about helping, attraction and information acquisition. *Social Psychology Quarterly*, *46*, 31–35.

Coke, J. S., Batson, C. D., & McDavis, K. (1978). Empathic mediation of helping: A two-stage model. *Journal of Personality and Social Psychology*, *36*(7), 752–766.

Converse, B. A., Lin, S., Keysar, B., & Epley, N. (2008). In the mood to get over yourself: Mood affects theory-of-mind. *Emotion*, *8*, 725–730.

Conway, M. A. (2009). Episodic memories. *Neuropsychologia*, *47*, 2305–2313.

Crisp, R. J., & Turner, R. N. (2009). Can imagined interactions produce positive perceptions? *American Psychologist*, *64*(4), 231–240. doi:10.1037/a0014718

D'Argembeau, A., & Van der Linden, M. (2004). Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: Influence of valence and temporal distance. *Consciousness and Cognition*, *13*, 844–858.

D'Argembeau, A., & Van der Linden, M. (2012). Predicting the phenomenology of episodic future thoughts. *Consciousness and Cognition*, *21*, 1198–1206.

Decety, J. (2005). Perspective taking as the royal avenue to empathy. In B. F. Malle & S. D. Hodges (Eds.), *Other minds: How humans bridge the divide between self and others* (pp. 135–149). New York, NY: Guilford Publishers.

FeldmanHall, O., Mobbs, D., Evans, D., Hiscox, L., Navrady, L., & Dalgleish, T. (2012). What we say and what we do: The relationship between real and hypothetical moral choices. *Cognition*, *123*(3), 434–441.

Frijda, N. H. (1986). *The emotions*. New York, NY: Cambridge University Press.

Gaesser, B., Horn, M., & Young, L. (2015). When can imagining the self increase willingness to help others? Investigating whether the self-referential nature of episodic simulation fosters prosociality. *Social Cognition*, *33*, 562–594.

Gaesser, B., Sachetti, D. C., Addis, D. R., & Schacter, D. L. (2011). Characterizing age-related changes in remembering the past and imagining the future. *Psychology and Aging*, *26*, 80–84.

Gaesser, B., & Schacter, D. L. (2014). Episodic simulation and episodic memory can increase intentions to help others. *Proceedings of the National Academy of Sciences*, *111*, 4415–4420.

Gallo, D. A., Korthauer, L. E., McDonough, I. M., Teshale, S., & Johnson, E. L. (2011). Age-related positivity effects and autobiographical memory detail: Evidence from a past/future source memory task. *Memory*, *19*, 641–652.

Garry, M., & Polaschek, D. L. L. (2000). Imagination and memory. *Current Directions in Psychological Science*, *9*, 6–10.

Gregory, W. L., Cialdini, R. B., & Carpenter, K. M. (1982). Self-relevant scenarios as mediators of likelihood estimates and compliance: Does imagining make it so? *Journal of Personality and Social Psychology*, *43*, 89–99.

Hassabis, D., Kumaran, D., & Maguire, E. A. (2007). Using imagination to understand the neural basis of episodic memory. *The Journal of Neuroscience*, *27*(52), 14365–14374.

Hyman, I. E., & Pentland, J. (1996). The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language*, *35*, 101–117.

Irish, M., & Piguet, O. (2013). The pivotal role of semantic memory in remembering the past and imagining the future. *Frontiers in Behavioral Neuroscience*, *7*, 27. doi:10.3389/fnbeh.2013.00027

Isen, A. M., Shalker, T. E., Clark, M., & Karp, L. (1978). Affect, accessibility of material in memory, and behavior: A cognitive loop? *Journal of Personality and Social Psychology*, *36*, 1–12.

Kosslyn, S. M., Ganis, G., & Thompson, W. L. (2001). Neural foundations of imagery. *Nature Reviews Neuroscience*, *2*, 635–642.

Libby, L. K., Shaeffer, E. M., Eibach, R. P., & Slemmer, J. A. (2007). Picture yourself at the polls: Visual perspective in mental imagery affects self-perception and behavior. *Psychological Science, 43*, 89–99.

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin*, *131*, 803–855.

MacLeod, A. K., Tata, P., Kentish, J., & Jacobsen, H. (1997). Retrospective and prospective cognitions in anxiety and depression. *Cognition & Emotion*, *11*, 467–479.

Macrae, C. N., & Johnston, L. (1998). Help, I need somebody: Automatic action and inaction. *Social Cognition*, *16*(4), 400–417.

Mazzoni, G., & Memon, A. (2003). Imagination can create false autobiographical memories. *Psychological Science*, *14*, 186–188.

Mazzoni, G. A. L., Loftus, E. F., & Kirsch, I. (2001). Changing beliefs about implausible autobiographical events: A little plausibility goes a long way. *Journal of Experimental Psychology: Applied*, *7*, 51–59.

Morelli, S. A., Lieberman, M. D., & Zaki, J. (2015). The emerging study of positive empathy. *Social and Personality Psychology Compass*, *9*, 57–68.

Nelson, L. D., & Norton, M. I. (2005). From student to superhero: Situational primes shape future helping. *Journal of Experimental Social Psychology*, *41*, 423–430.

Nowak, M. A., & Highfield, R. (2011). *Supercooperators: Altruism, evolution, and why we need each other to succeed*. New York, NY: Simon and Schuster.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*, 879–891.

Rameson, L. T., Morelli, S. A., & Lieberman, M. D. (2012). The neural correlates of empathy: Experience, automaticity, and prosocial behavior. *Journal of Cognitive Neuroscience*, *24*(1), 235–245.

Rasmussen, A. S., & Berntsen, D. (2013). The reality of the past versus the ideality of the future: Emotional valence and functional differences between past and future mental time travel. *Memory & Cognition*, *41*, 187–200.

Rebetez, M. M., Barsics, C., Rochat, L., D'Argembeau, A., & Van der Linden, M. (2016). Procrastination, consideration of future consequences, and episodic future thinking. *Consciousness and Cognition*, *42*, 286–292.

Rendell, P. G., Bailey, P. E., Henry, J. D., Phillips, L. H., Gaskin, S., & Kliegel, M. (2012). Older adults have greater difficulty imagining future rather than atemporal experiences. *Psychology and Aging*, *27*(4), 1089–1098.

Sanfey, A. (2007). Social decision-making: Insights from game theory and neuroscience. *Science*, *318*, 598–602.

Schacter, D. L., Addis, D. R., Hassabis, D., Martin, V. C., Spreng, R. N., & Szpunar, K. K. (2012). The future of memory: Remembering, imagining, and the brain. *Neuron*, *76*, 677–694.

Schwarz, N., & Clore, G. L. (1988). How do I feel about it? The informative function of mood. In K. Fiedler & J. Forgas (Eds.), *Affect, cognition, and social behavior* (pp. 44–62). Toronto: C. J. Hogrefe.

Sharot, T. (2011). The optimism bias. *Current Biology*, *21*, 941–945.

Slovic, P., Finucane, M., Peters, E., & MacGregor, D. G. (2002). The affect heuristic. In T. Gilovich, T. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of Intuitive judgment* (pp. 397–420). New York, NY: Cambridge University Press.

Suddendorf, T., & Corballis, M. C. (2007). The evolution of foresight: What is mental time travel, and is it unique to humans? *Behavioral & Brain Sciences*, *30*, 299–313.

Summerfield, J. J., Hassabis, D., & Maguire, E. A. (2010). Differential engagement of brain regions within a 'core' network during scene construction. *Neuropsychologia*, *48*, 1501–1509.

Szpunar, K. K. (2010). Episodic future thought: An emerging concept. *Perspectives on Psychological Science*, *5*(2), 142–162.

Szpunar, K. K., & Schacter, D. L. (2013). Get real: Effects of repeated simulation and emotion on the perceived plausibility of future experiences. *Journal of Experimental Psychology: General*, *142*, 323–327.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin*, *103*, 193–210.

Van Boven, L., & Ashworth, L. (2007). Looking forward, looking back: Anticipation is more evocative than retrospection. *Journal of Experimental Psychology: General*, *136*, 289–300.

de Vito, S., Buonocore, A., Bonnefon, J. F., & Della Sala, S. (2015). Eye movements disrupt episodic future thinking. *Memory*, *23*(6), 796–805.

de Vito, S., Gamboz, N., Brandimonte, M. A., Barone, P., Amboni, M., & Della Sala, S. (2012). Future thinking in Parkinson's disease: An executive function? *Neuropsychologia*, *50*(7), 1494–1501.

de Vito, S., Neroni, M. A., Gamboz, N., Della Sala, S., & Brandimonte, M. A. (2014). Desirable and undesirable future thoughts call for different scene construction processes. *The Quarterly Journal of Experimental Psychology*, *68*(1), 75–82.

Williams, J. M. G., Ellis, N. C., Tyers, C., Healy, H., Rose, G., & MacLeod, A. K. (1996). The specificity of autobiographical memory and imaginability of the future. *Memory & Cognition*, *24*, 116–125.

Zaki, J. (2014). Empathy: A motivated account. *Psychological Bulletin*, *140*, 1608–1647.

Zaki, J., & Ochsner, K. N. (2012). The neuroscience of empathy: Progress, pitfalls and promise. *Nature Neuroscience*, *15*(5), 675–680. and erratum (2013) 16(12):1907.

Zeelendberg, M., & Pieters, R. (2006). *Feeling is for doing: A pragmatic approach to the study of emotions in economic behavior*. In D. De Cremer, M. Zeelenberg, & K. Mumighan (Eds.), *Social psychology and economics* (pp. 117–137). Mahwah, NJ: Erbaum.