HHS Public Access

Author manuscript

Memory. Author manuscript; available in PMC 2018 October 01.

Published in final edited form as:

Memory. 2017 October ; 25(9): 1272–1278. doi:10.1080/09658211.2017.1288746.

Effects of aging on the relation between episodic simulation and prosocial intentions

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Abstract

Imagining helping a person in need can facilitate prosocial intentions. Here we investigated how this effect can change with aging. We found that, similar to young adults, older adults were more willing to help a person in need when they imagined helping that person compared to a baseline condition that did not involve helping, but not compared to a conceptual helping control condition. Controlling for heightened emotional concern in older adults revealed an age-related difference in the effect of imagining on willingness to help. While we observed age-related condition effects, we also found that the subjective vividness of scene imagery predicted willingness to help for both age groups. Our findings provide insight into the relations among episodic simulation, healthy aging, emotion, and prosociality. Implications for effects of episodic memory and aging on social decision-making are discussed.

Keywords

future thinking; episodic memory; social cognition; morality; prosociality

Episodic simulation is a form of future thinking or prospection that allows humans to imagine specific future events (cf., Schacter, & Addis, & Buckner, 2008; Szpunar, Spreng, & Schacter, 2014). Episodic simulation is tightly linked to episodic memory (Atance & O'Neil, 2001; Schacter et al., 2012; Szpunar, 2010), and it is well established that episodic memory declines with aging (Denise & Gutchess, 2005; Craik & Salthouse, 2000; Hartshorne & Germine, 2015; Hedden & Gabrieli, 2004). Recent studies have shown that older adults exhibit a parallel reduction in episodic simulation, generating fewer episodic details than young adults when they imagine future experiences (Addis, Wong, & Schacter, 2008; Cole, Morrison, & Conway, 2013; Gaesser, Sacchetti, Addis, & Schacter, 2011; Madore, Gaesser, & Schacter, 2014; Gallo, Korthauer, McDonough, Teshale, & Johnsohn, 2011; Rendell, et al., 2012; for review, see Schacter, Gaesser, & Addis, 2013).

Studies concerning episodic simulation in both young and old adults have focused mainly on elucidating underlying mechanisms; considerably less has been learned about the adaptive functions of episodic simulation (see Schacter, 2012 for review). Recently, interest in social

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functions of episodic simulations has emerged in studies that have examined how age-related differences in episodic memory and episodic simulation impact social problem solving (Madore & Schacter, 2014; Sheldon, McAndrews, & Moscovitch, 2011).

Here we expand the domain of research on aging and social functions of episodic simulation. Our specific motivation comes from experiments showing that episodic simulation increases prosocial intentions in young adults (Gaesser & Schacter, 2014; Gaesser, DiBiase, & Kensinger, in press; Gaesser, Horn, & Young, 2015). When young adults were presented with a situation where a person was in need of help, their prosocial intentions to help increased after they had imagined a specific future event of helping that person, compared with a conceptual helping condition where they estimated ways in which the person could be helped. Moreover, episodic simulation increased the subjective vividness and accessibility of the imagined helping scene, in turn heightening the perceived plausibility that one would help in that situation. Such a mechanism aligns with previous research on imagination inflation (Hyman & Pentland, 1996; Mazzoni & Memon, 2003; Garry & Polaschek, 2000) and related work showing a link between the sensory vividness of imagined future events and subjective of likelihood (D'Argembeau & Van der Linden, 2012; Szpunar & Schacter, 2013).

In light of the foregoing findings, a straightforward prediction is that older adults' prosocial intentions will not benefit from episodic simulation to the same extent as young adults. However, because older adults are still able to imagine future events and subjectively experience sensory vividness, we would expect some prosocial benefit from episodic simulation. Moreover, age-related differences in prosocial intentions attributable to episodic simulation may be masked by age-related differences in emotion. Indeed, older adults may even be equally or more willing to help in general compared to young adults as a consequence of age-related changes in heightened emotional processing (Charles & Carstensen, 2010; Mather & Carstensen, 2005). For example, Richter and Kunzmann (2011) found that compared to younger adults, older adults displayed more sympathy when they watched a film clip of a person discussing an emotionally difficult topic (e.g., death in the family, divorce, moving to a new city). Similarly, Sze, Gyurak, Goodkind, and Levenson (2012) found linear increases across the lifespan for emotional concern and prosocial decisions directed at the person in need (see also Bailey, Ruffman, & Rendell, 2013).

In the present experiment, we investigated whether prosocial intentions would increase after imagining future helping events relative to control conditions. Based on older adults' reduced episodic simulation, older adult participants may be less likely to express willingness to help a person in need when they imagine helping the person compared to younger adults. However, based on heightened emotional processing in older adults, older adults may be equally or more willing to help a person in need when they imagine helping the person compared to young adults.

Method

Participants

We recruited 31 younger adult participants (M = 21.97, SD = 2.51, between the ages of 18–27) and 39 older adult participants (M = 74.00, SD = 6.58, between the ages of 65–86), with a total of 70 participants. Data collection continued until we had collected 30 participants with full data sets that we could then analyze (see Supplemental Material for power analysis, inclusion criteria, recruitment procedures, and neuropsychology scores). Older adults had experienced more years of education (M = 18, SD = 2.61) than young adults (M = 15.41, SD = 1.43), $t(57) = 4.21$, $p < .001$. However, years of education was unrelated with the main dependent variable of interest: willingness to help ($r(57) = .09$, $p = .521$. All participants had normal or corrected-to-normal vision, were fluent in English, and no history of neurological impairment.

Procedure

Participants were presented with short stories adapted from the news and social media of everyday events where a person needs help. For each scenario, participants were instructed to imagine a specific future episode of them helping the person (Imagine Helping condition), write down how the person could be helped (Conceptual Helping condition), or identify the media source they thought the story came from based on the writing style (No Helping condition). The No Helping condition, modeled after media control conditions used in empathy research (e.g., Coke, Batson, & McDavis, 1978) to provide a neutral baseline condition, aimed to prevent participants from generating a helping episode while controlling for exposure to the story of need. The Conceptual Helping condition provided a control condition for recruiting semantic retrieval, social cognition, basic imagery, and, critically, conceptual priming of helping responses (Macrae & Johnston, 1998; Nelson & Norton, 2005). By comparison, the Imagine Helping condition required simulating an episode that is specific in time and place. Indeed, the Imagine Helping condition was directly informed by previous neuroimaging and behavioral research using similar instructions and protocol to successfully prompt subjects to generate events set in a specific time and place (e.g., Addis et al., 2008, Addis et al., 2011; Gaesser et al., 2011; Rendell et al., 2012).

Participants reviewed instructions and completed at least 3 practice trials, one for each condition, to familiarize themselves with the task. Stories were presented one at a time for 10 seconds each, followed by the condition prompt for 60 seconds. If necessary, practice trials were repeated for participants to facilitate task comprehension with feedback provided by the experimenter after each trial. Following the practice trials, participants were randomly shown 9 trials, 3 for each of the conditions.

After completion of all trials, participants filled out a self-paced paper-and-pencil survey, rating each story on a Likert scale from 1 to 7 (see Supplemental Material for rating scales). For each of the stories, participants were asked how likely they would be to help out in the situation (1 = not at all, 7 = very willing). Participants also rated the sensory quality of scene imagery by rating their imagined events for scene coherence (the imagined scene in your mind was?; 1 vague - 7 coherent and clear) and scene detail (the imagined scene in your

mind was?; 1 simple – 7 detailed) of their imagined events that were averaged to form a composite scene imagery index (see Gaesser et al., in press, for a similar approach; and Supplemental Material for relevant analysis in the present study). Examples were provided for scene imagery measures to facilitate comprehension and encourage participants to use the full range of the scales (see below). Participants' ratings for emotional concern consisted of an average of the degree to which they experienced different emotions associated with the same underlying construct: emotional concern or empathy for others (e.g., sympathetic, compassionate, softhearted, moved, tender, and warm; see Batson, Early, Salvarani, 1997 and Batson, 2011 for extensive use and justification of this measure) on a scale from 1 to 7 (1= not at all, 7 = extremely) for each person in need. Ratings for theory of mind (akin to perspective taking and mentalizing) for the person in need were also collected, did you consider the person's thoughts and feelings (1 = not at all, 7 = strongly considered).

Lastly, participants were asked to provide a very brief description (e.g., one sentence or two sentences) of how they imagined helping (e.g., I imagined helping to create a flyer with a picture of a dog), how someone could help (e.g., someone could contact the fire department), or how they identified the media for each of the stories (e.g., It was probably from a blog or social media. The syntax was somewhat unusual or incorrect.) in response to each experimental trial depending on which condition was presented for that story. These descriptions were used to ensure that subjects complied with task instructions (i.e. a participant imagined how they would help the person in the Imagine Helping condition). After finishing the study participants were debriefed and thanked for their time. Data were analyzed using conventional hypothesis testing as well as including newer statistical approaches such as confidence intervals (Cumming, 2013).

Results

We first conducted an Age (Young, Older) by Condition (Imagining Helping, Conceptual Helping, No Helping) ANOVA on willingness to help as an initial test of the relationship between episodic simulation, agining, and prosocial intentions. There was a main effect of Condition, $F(1,59) = 45.12$, $p < .001$, $\eta_p^2 = .433$, and no main effect of Age, $F(1,59) = .02$, $p = .897$, $\eta_p^2 < .001$, or interaction, $F(1,59) = 1.64$, $p = .205$, $\eta_p^2 = .027$. Pairwise t-tests revealed participants were in general more willing to help a person in need when they imagined helping the person (Imagine Helping condition, M = 5.11; SE = .16, 95% Confidence Intervals (CI) = 4.79, 5.42) than when they were merely exposed to the plight of others by considering the writing style and media source of the stories of need (No Helping condition, M = 3.62; SE = .19, 95% CI = 3.23, 4.01), $t(60) = 8.68$, $p < .001$, $\eta_p^2 = .56$. Participants were also more willing to help when they wrote about how the person could be helped (Conceptual Helping condition, M = 4.83; SE = .15, 95% CI = 4.53, 5.13) compared to when they were exposed to the plight of others by considering the writing style and media source of the stories of need (No Helping condition), $t(60) = 6.78$, $p < .001$, $\eta_p^2 = .434$. Participants were marginally more willing to help a person in need when they imagined helping the person (Imagine Helping condition) compared to when they wrote about how the person could be helped (Conceptual Helping condition), $t(60) = 1.90$, $p < .063$, $\eta_p^2 = .057$.

To more directly contrast these findings with results based on previous research with young adults, we examined these condition effects in young adults only. Replicating previous research, young adults indicated they were more willing to help a person in need when they imagined helping the person (Imagine Helping condition, M = 5.20; SE = .24, 95% Confidence Intervals (CI) = 4.70, 5.70) than when they were merely exposed to the plight of others by considering the writing style and media source of the stories of need (No Helping condition, M = 3.61; SE = .25, 95% CI = 3.11, 4.12), $t(29) = 6.62$, $p < .001$, $\eta_p^2 = .602$). Young adults' willingness to help also increased when they wrote about how the person could be helped (Conceptual Helping condition, M = 4.69; SE = .21, 95% CI = 4.26, 5.12) compare to when they were exposed to the plight of others by considering the writing style and media source of the stories of need (No Helping condition), $t(29) = 4.47$, $p < .001$, $\eta_p^2 = .408$. Importantly, however, their willingness to help was greater when they imagined helping the person (Imagine Helping condition) compared to when they wrote about how the person could be helped (Conceptual Helping condition), $t(29) = 2.16$, $p < .039$, $\eta_p^2 = .139$.

Exploratory analyses for older adults only and willingness to help revealed that they were also more willing to help a person in need when they imagined helping the person (Imagine Helping condition, M = 5.02; SE = .21, 95% CI = 4.60, 5.44) compared to being exposed to the plight of others (No Helping condition, M = 3.62; SE = .30, 95% CI = 3.01, 4.24), $t(30) = 5.62$, $p < .001$, $\eta_p^2 = .513$. Similarly, older adults were more willing to help when they wrote about how the person could be helped (Conceptual Helping condition, M = 4.96; SE = .21, 95% CI = 4.53, 5.40) compared to, being exposed to the plight of others (No Helping condition, $t(30) = 5.06$, $p < .001$, $\eta_p^2 = .461$. Nonetheless, older adults were not significantly more willing to help in the imagine helping condition compared to conceptual helping condition, $t(30) = .34$, $p = .74$, $\eta_p^2 = .004$, suggesting that older adults' prosocial intentions may not benefit from imagining a helping event as in young adults. However, because the Age x Condition interaction was not significant, this finding requires interpretative caution.

Next, we examined the role of emotional concern on an effect of episodic simulation on willingness to help. Consistent with past work on emotional concern, scale reliability analysis showed that individual emotions directed at the welfare of a person in need (i.e., sympathetic, compassionate, softhearted, moved, tender, and warm; see Batson, Early, & Salvarani, 1997; Batson, 2011) were highly related (Cronbach's Alpha = .958), and thus were averaged to form an emotional concern index. Given previous evidence that older adults tend to exhibit heightened emotional and empathic responses compared to young adults, we assessed whether age-related differences in emotional concern obscured age-related differences in the effect of episodic simulation on prosocial intentions.

Older adults reported significantly greater emotional concern for people in need than did young adults (Young M = 2.80, SE = .20, 95% CI = 2.40, 3.19; Older M = 4.15, SE = .20, 95% CI = 3.76, 4.54), $t(1,59) = 4.78$, $p < .001$, $\eta_p^2 = .289$; see Supplemental Material for additional analyses). To control for age-related differences in emotional concern affecting willingness to help, we ran a hierarchical regression analysis with willingness to help in the Imagine Helping condition as the outcome variable, entered emotional concern as the first predictor variable, and then entered age group (young, old) as the second predictor variable. This analysis revealed that emotional concern was a significant predictor of willingness to

help after imagining a future helping event (Emotional concern $B = .35$; R-squared = .136, F (1, 58) = 9.33, $p = .003$). Critically, when controlling for differences in emotional concern young adults were indeed significantly more willing to help after imagining a future helping event compared to older adults (Age $B = -.74$, R-squared = .208, change in R-squared = .072, F (1, 58) = 5.26, $p = .025$). Note that when emotional concern was not controlled in a simple regression analysis with age group (young, old) as the predictor and willingness to help in the Imagine Helping condition as the outcome variable, age did not predict willingness to help (Age $B = -.178$, $p = .577$).

Finally, no age-related differences emerged for subjective scene imagery of imagined helping events ($t(59) = .54$, $p = .592$). Subjective scene imagery was similarly associated with willingness to help in both young adults ($r(28) = .68$, $p < .001$) and older adults ($r(29) = .48$, $p = .006$). Partial correlations revealed that scene imagery remained associated with willingness to help in both young adults ($pr(27) = .59$, $p < .001$) and older adults ($pr(28) = .49$, $p = .006$) when scene imagery and emotional concern were entered in the same regression model as predictors of willingness to help. Directly comparing the difference in correlation coefficients across age groups did not show a difference in the strength of the association between scene imagery and willingness to help for young and older adults ($z = 1.12$, $p = .263$; Preacher, 2002). No age-related differences emerged for subjective theory of mind for imagined helping events ($t(59) = .28$, $p = .782$); however, there was a trending effect for a difference in the association between theory of mind and willingness to help (Young, $r(28) = .71$, $p < .001$; Old, $r(29) = .35$, $p = .052$; $z = 1.92$, $p = .055$), suggesting that the vividness of scene imagery may have a more similar impact on willingness to help across ages than theory of mind.

Discussion

Our results replicate previous findings that episodic simulations focused on helping individuals in need significantly increase subsequent prosocial intentions to help those individuals. Older adults, like young adults, showed increased prosocial intentions following episodic simulation compared with the no helping control, but unlike younger adults, did not show a significant increase in prosocial intentions compared with the conceptual helping condition. Perhaps this pattern occurred because older adults' prosocial intentions in the Imagine Helping condition were driven to a similar extent by conceptual processing or priming of prosociality as in the conceptual helping condition, and may be related to the more general age-related shift to a more conceptual mode of thinking about the future (as reflected by findings of increased semantic details in older adults future thinking; Schacter et al., 2013). Although the Age x Condition interaction was not statistically significant, and thus interpretations of age-related differences require caution, controlling for heightened emotional concern in older adults revealed that younger adults exhibited greater willingness to help than older adults following episodic simulation. While these results point to a possible age-related condition effect, we also found evidence for a shared mechanism contributing an increase in willingness when imagining future helping events: the subjective experience of scene imagery.

Consistent with previous research, we found that measures of subjective scene imagery (how detailed and coherently an imagined event is experienced) predicted willingness to help for young adults (Gaesser & Schacter, 2014; Gaesser et al., 2015). Building on these results, we found that this relationship was also present in older adults, revealing that subjective scene imagery similarly predicted willingness to help in both older and young adults, whereas theory of mind may differentially contribute to willingness to help across age groups. These data suggest that, regardless of age, as scene imagery of the helping event becomes subjectively more vivid, the perceived plausibility of the imagined helping event increases, enhancing decisions to help others in need. We think that deficits in objective measures of episodic detail (i.e., the Autobiographical Interview; Levine et al., 2002) that have been consistently observed when older adults imagine future events (Addis et al., 2008; Cole et al., 2013; Gaesser et al., 2011; Madore et al., 2014; Gallo et al., 2011; Rendell, et al., 2012; Schacter et al., 2013) likely play a role in the condition differences in prosocial intentions observed here. It is an open question whether objective measures of episodic detail, like subjective measures, also predict willingness to help. While we did collect brief descriptions of events generated by subjects to ensure that they generated condition appropriate events, these descriptions were too brief to allow assessment of objective levels of detail with any sort of precision; however, this approach should be pursued in future research. Relatedly, whereas subjective scene imagery is similarly associated with willingness to help for both young and older adults, the results provide some evidence that theory of mind may be less strongly linked to older adults' willingness to help directly than young adults; however, future work will be needed to fully address this possibility.

The present findings align with previous work that found increased emotional concern for the welfare of a person in need in older adults compared to young adults (Bailey et al., 2013; Richter & Kunzmann, 2011; Sze et al., 2012). Although we did not observe an overall increase in prosocial responses for older adults compared to young adults, our findings are consistent with the notion that older adults show heighted socio-emotional responses and place an increased emphasis on emotion in decision making (Charles & Carstensen, 2010; Mather & Carstensen, 2005). We recently found that imagining future helping events that elicited positive affect in particular (compared negative or neutral) bolstered willingness to help in young adults (Gaesser et al., in press). Given that older adults tend to imagine future events as more positively valenced than young adults (Gallo et al., 2011), an interesting possibility for future research is to examine how this age-related shift in affective valence of imagined future events impacts older adults' prosocial decisions.

The present study has possible implications for understanding the effect of memory on prosocial decisions in older adults. Because episodic simulation and episodic memory rely on many of the same cognitive processes and content (Schacter et al., 2012), an interesting question for future research to explore is whether the effect of imagining future helping events on prosocial intentions will extend to remembering *past* helping events for older adults. Our prior research has found that imagining future and remembering past events increases prosocial responses to the same degree in young adults (Gaesser & Schacter, 2014). Moreover, perceived scene imagery ratings for remembered past events correlated with willingness to help, similar to imagined future events, suggesting a common mechanism underlying the prosocial effect of episodic simulation and memory. Considering

that older adults' abilities to remember past events and imagine future events largely decline in parallel (Addis et al., 2008; Gaesser et al., 2011; Madore, et al., 2014; Gallo, et al., 2011; Rendell, et al., 2012; Schacter, et al., 2013), older adults may show a similar prosocial response when remembering past helping events as they do when imagining future helping events—though future work should be careful to tease apart age-related differences in episodic processes from differences in narrative style and communicative goals (see Schacter & Madore, 2016 for relevant discussion).

Although imagining and remembering fostered prosocial intentions to a similar extent in young adults, in our earlier study we observed a flexible advantage in the range of prosocial events for imagining facilitated compared to remembering (Gaesser & Schacter, 2014). Specifically, there were some helping scenarios that the younger adults had not experienced before and therefore could not remember. On these failed memory trials, willingness to help dropped to baseline levels. An important issue to explore is whether this empathic gap in younger adults between remembering and imagining also exists in older adults. Given that older adults have lived longer than younger adults and thus are likely to have encountered a larger variety of helping situations, to the extent that older adults are able to retrieve these events, the flexible advantage for imagining helping events compared to remembering helping events on prosocial decisions may be lessened in older adults compared to younger adults. While older adults' episodic memory is generally considered to decline compared to younger adults (Denise & Gutchess, 2005; Craik & Salthouse, 2000; Hartshorne & Germine, 2015; Hedden & Gabrieli, 2004), their prosocial decisions may in fact benefit from their broader experiences and the richer variety of memories they can draw on when evaluating prosocial decisions.

Here we investigated the effect of episodic simulation on hypothetical decisions about helping someone in need. Future work with older adults will be needed to investigate whether these decisions will translate into actual prosocial behavior. While prosocial intentions do not always translate into prosocial action (FeldmanHall, Mobbs, Evans, Hoscox, Navrady, & Dalgleish, 2012), initial work with young adults indicates that imagining helping can increase costly prosocial behavior, increasing the number of charitable donations an individual makes at a financial cost to themselves. In sum, while there is still work to be done, our findings provide a starting point for future studies investigating how social decision-making in older adults is influenced by both emotion and imagery.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

We thank E. Herder for helpful discussions, and/or comments on drafts of the manuscript. This work was partially supported by a Science of Prospection Award from the John Templeton Foundation to B.G and by National Institute on Aging grant AG08441 to D.L.S.

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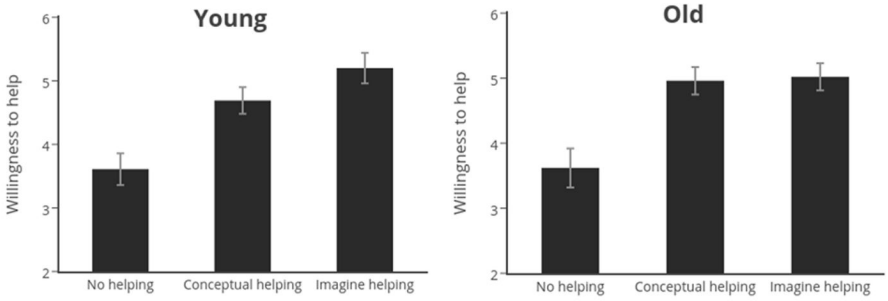

Figure 1.

Willingness to help by Age (Young, Old) by Condition (Imagining Helping, Conceptual Helping, No Helping). Y-axis is shown here to fit participant ratings for willingness to help measured on 1–7 scales.

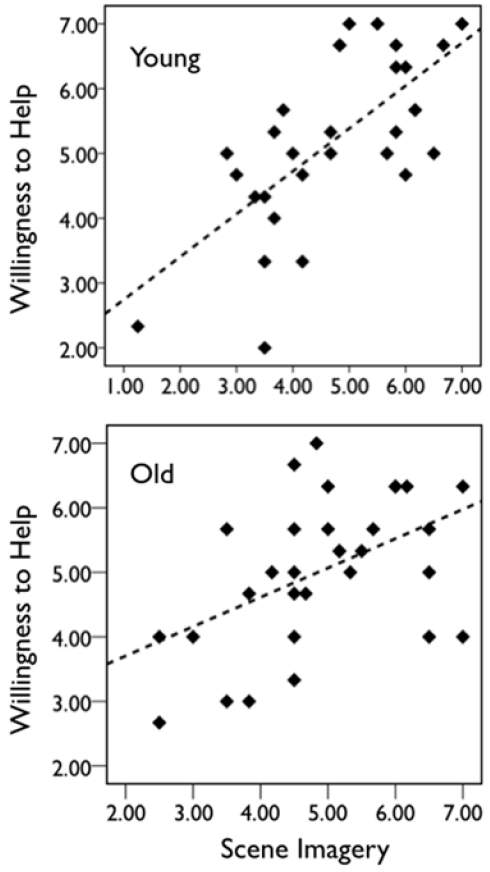

Figure 2.

Subjective scene imagery for imagined helping episodes predicts willingness to help for both young ($r(28) = .68$, $p < .001$) and older ($r(29) = .48$, $p = .006$) adults. Axes are shown here to fit participant ratings for willingness to help and scene imagery measured on 1–7 scales.