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A negativity bias in detail generation during event simulation

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Abstract

Novel negative events are simulated in more event-specific detail than novel positive events. In the present study, we set out to assess whether this negative event detail bias is specific to simulations of personal events or whether evoking negative valence, in the context of simulations of personal and non-personal events, is sufficient for boosting simulated event detail. Participants simulated novel negative and positive events that might take place in their future, the future of an acquaintance, or the future of a familiar individual with whom they have not had prior contact. Across two experiments, we found that novel negative events were simulated in more event-specific detail than novel positive events irrespective of whether the events under consideration were personal or non-personal. This pattern of results also emerged when negative and positive events did not differ on a subjective measure of arousal, indicating that negative valence may play a key role in encouraging detailed elaboration of novel negative events. Implications of our findings for the role of event simulation in adaptive behavior are discussed.

Keywords: Episodic simulation, future thinking, negative events, event detail

The ability to flexibly simulate hypothetical future scenarios, namely episodic simulation (Schacter et al., 2012; Suddendorf & Corballis, 2007; Szpunar, Spreng, & Schacter, 2014), represents an important cognitive capacity that can be leveraged to support adaptive behavior in the context of decision making (Benoit, Gilbert, & Burgess, 2011; Peters & Büchel, 2010), goal pursuit (Oettingen, 2012; Oettingen & Reininger, 2016), and emotion regulation (Jing, Madore, & Schacter, 2016; for a recent review, see Schacter, Benoit, & Szpunar, 2017). For instance, recent work has amply demonstrated the benefits of engaging in episodic simulation as a means of supporting health-oriented decision making, such as reducing excessive eating (Daniel, Stanton, and Epstein, 2013; Dassen, Jansen, Nerderkoorn & Houben, 2016; O'Neill, Daniel & Epstein, 2016), alcohol misuse (Snider, LaConte & Bickel, 2016) and smoking (Chiou & Wu, 2017; Stein, et al., 2016). Notably, the specificity with which future events are simulated may impact the extent to which simulations guide behavior. For instance, Bromberg, Wiehler, and Peters (2015) reported that the ability to simulate detailed future events was negatively correlated with temporal discounting rates, such that participants who imagined the future in greater detail were better able to resist making impulsive, short-sighted decisions. Such data highlight the need to identify conditions under which people may be more likely to imagine future events in greater detail.

A number of factors appear to increase the detail of simulations of future events. For example, Szpunar and Schacter (2013) demonstrated that repeated simulation of a future event boosts the level of subjective detail with which the event is represented (see also, Carroll, 1978). More recently, Madore, Schacter, and colleagues (Madore, Gaesser, & Schacter, 2014) have shown that practice with retrieving details about a recent experience (typically a video viewed in a controlled laboratory setting) can induce a retrieval orientation that increases the explicit detail

with which people subsequently describe future events (for a recent overview, see Schacter & Madore, 2016). Moreover, Madore, Schacter, and colleagues showed that the impact of their specificity induction was isolated to event-specific details such as details about where the event takes place, who is present, and the nature of any relevant interactions, but had little or no impact on extraneous details that people often report in the course of simulating future events (e.g., semantic or metacognitive comments about the event). Notably, both repeated simulation and specificity induction represent external manipulations that may be used to boost the level of simulated event detail. In the present paper, we focus on an additional factor that appears to play an important role in determining the level of detail with which future events are simulated, but that represents a feature of events themselves, namely emotional valence.

Prior work assessing phenomenological characteristics of simulated future events typically reported that positive events were more detailed than negative events (e.g., D'Argembeau & Van der Linden, 2004; Painter & Kring, 2015). However, much of this work did not control for factors such as frequency of prior thinking. As noted above, repeated simulation increases the detail with which future events are represented. Indeed, participants have been shown to report that positive as compared to negative events simulated in the lab are more likely to have been thought about before—outside of the laboratory (de Vito, Neroni, Gamboz, Della Sala, & Brandimonte, 2015; Rasmussen & Berntsen, 2013). This leaves open the possibility that many of the studies reporting a positive event detail bias were confounded by frequency of prior thinking. Some of these studies also exclusively relied on subjective ratings of detail (e.g., D'Argembeau & Van der Linden, 2004), making it difficult to know whether differences in detail between positive and negative events were related to event-specific details,

extraneous details that often accompany simulations of future events, or some combination of event-specific and extraneous detail.

We recently reported the results of two experiments that set out to address the above-noted limitations associated with prior demonstrations of a positive detail bias in event simulation (Puig & Szpunar, 2017). Specifically, we employed the use of an experimental recombination procedure that required participants to simulate novel future events related to person-location-object triads (Addis, Pan, Vu, Laiser, & Schacter, 2009; Szpunar, Addis, & Schacter, 2012). We also asked participants to describe their simulations in extensive detail and used an adapted Autobiographical Interview (AI) coding procedure to score their responses for the presence of event-specific and extraneous detail (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002). Of note, we found that when participants simulated novel events and when detail was scored in a more objective, experimenter-driven manner, participants simulated negative events in more event-specific detail than positive events.

While our findings were consistent with prior research indicating that people tend to devote more cognitive resources to processing negative as compared to positive events (Aspinwall & Taylor, 1997; Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Peeters & Czapinski, 1990; Rozin & Royzman, 2001; Taylor, 1991), additional work is needed to better understand *why* negative future scenarios encourage more detailed event elaboration than positive future scenarios. Here, we focus specifically on the possible role(s) of personal threat and valence. Some interpretations of cognitive processing advantages associated with negative as compared to positive stimuli have focused on the role of personal threat (Taylor, 1991). That is, more cognitive resources are devoted to processing negative stimuli because negative stimuli are more likely than positive stimuli to threaten the mental and/or physical health of the individual.

Accordingly, the individual stands to benefit from developing mental representations of negative events that are more reasoned out (Abele, 1985; Vohs, Aaker, & Catapano, 2018; see also, Rubin, 2014) and cognitively complex (Peeters & Czapinski, 1990), as a means of guiding behavior. The negative event detail bias observed in our prior work could certainly be interpreted under the purview of such adaptive processes. That is, the scenarios under consideration were personally relevant and negative more so than positive events likely highlighted possible sources of threat to mental and/or physical health. Alternatively, there also exists considerable evidence that negative as compared to positive *valence* encourages detail-oriented processing of focal features of stimulus events (for review, see Kensinger, 2009; see also, Bowen, Kark, & Kensinger, 2018). In the context of our prior work, it is possible that the experience of negative valence, and not the prospect of personal threat, spurred participants to provide additional details about the circumstances surrounding the events in question (e.g., where the event was imagined to take place, with whom the participant imagined interacting with, etc.).

The purpose of the present set of experiments was to tease apart the role(s) of personal threat and valence in bringing about the negative event detail bias in future event simulation. Valence was manipulated by varying whether participants simulated positive or negative events. Personal threat was manipulated by requiring participants to either imagine positive and negative scenarios revolving around their own interactions with others (i.e., personal events) or positive and negative scenarios revolving around the interactions of another person interacting with others (i.e., non-personal events). In Experiment 1, participants imagined positive and negative events that might happen in their own future, the future of an acquaintance, or the future of a familiar individual with whom they have not had previous contact (Barack Obama). If the negative event detail bias arises because simulations of negative scenarios illuminate possible

sources of personal threat, then participants should generate more internal (i.e., event-specific) details, as measured by the AI, for personal negative as compared to personal positive events, but not for non-personal negative as compared to non-personal positive events. Alternatively, if the negative event detail bias arises as a result of emotional valence, then the bias should emerge regardless of whether the scenario under consideration is personal or non-personal. That is, participants should generate more internal details for negative as compared to positive events, whether or not they are personally involved in the events under consideration. In Experiment 2, we extended the generality of our findings by conducting a within-subject comparison between a personal and a non-personal condition (i.e., Self versus Barack Obama).

In addition to personal threat and valence, we also examined the role of arousal in giving rise to the negative event detail bias. Our prior studies did not discriminate between valence and arousal (Puig & Szpunar, 2017), and so to the extent that valence plays a key role, it is possible that the negative event detail bias reflects an effect of valence, arousal, or a combination of the two. To address this point, participants in Experiment 2 were asked to provide ratings of arousal.

Experiment 1

Method

Participants and Design. Seventy-two undergraduate students ($N_{female} = 43$) were recruited through the University of Illinois at Chicago Psychology Subject Pool. Participants were asked to simulate novel negative and positive future events that might either occur to themselves, an acquaintance, or Barack Obama. That is, event valence was manipulated within subjects, whereas the subject around whom the simulations revolved was manipulated between subjects ($N = 24$ per condition). A power analysis (G*Power, Version 3.1) estimated that 11 participants per condition would be needed to replicate our previously reported negative event

detail bias in simulation of personal future events ($\alpha = .05$, $\beta = .95$, $d = 1.21$). However, given that the present study was also assessing whether this negative event bias might emerge in other conditions that involved simulations of non-personal events, we decided a priori to more than double the needed sample size per condition (i.e., $N = 24$). The results of one participant were excluded from analyses for not appropriately following task instructions, resulting in a final sample of 71 participants. The University of Illinois at Chicago Institutional Review Board approved all study procedures, and written consent was obtained prior to the study. Participants received course credit for their participation.

Materials and Procedure. The experiment consisted of two sections. First, upon arriving to the laboratory, participants in the Self and Acquaintance conditions were instructed to provide details that would serve as stimuli for subsequent simulation cues. For the Self condition, participants were instructed to provide lists of 14 familiar people who they would most likely interact with in the Chicago area, 14 familiar locations that they had visited and would likely visit again in the Chicago area (locations needed to be specific; e.g., “Chicago” would be too broad, whereas “The Art Institute” was a better example), and 14 familiar objects that they use on a daily basis (the objects had to be portable; e.g., “cell phone” was an adequate example, whereas “desk” was a poor example). For the Acquaintance condition, participants began by providing the name of an acquaintance (i.e., someone who they know but do not consider a close friend), and then provided lists of 14 people, 14 locations, and 14 objects that were relevant to that acquaintance. For the Barack Obama condition, simulation cues were extrapolated from experimenter-generated lists of 14 people (e.g., Malia Obama), 14 locations (e.g., White House rose garden), and 14 objects (e.g., briefcase) that were relevant to Barack Obama (as indicated by pilot testing)¹. In all three conditions, these lists were randomly reorganized to generate 14 novel

person-location-object triads that served as simulation cues for practice trials (2 events) and the experiment (12 events).

Second, participants were asked to imagine a specific future event in response to 12 simulation cues. Participants were given 2 min to simulate and verbally describe an event in response to each cue. For the Self condition, participants were asked to simulate a future event in response to each cue that involved themselves interacting with the specified person, in the specified location, and in a manner that involved the specified object. For the Acquaintance and Barack Obama conditions, participants were instructed to imagine a future event in response to each cue from the perspective of the acquaintance or Barack Obama (depending on the condition) that involved the acquaintance or Barack Obama interacting with the specified person, in the specified location, and that the interaction involved the specified object.

For all conditions, six of the simulation cues were paired with a positive label (the word “positive” presented above the simulation cue), and six cues were paired with a negative label (the word “negative” presented above the simulation cue). In the Self condition, participants were told that they should imagine an event that would result in them experiencing a positive emotion whenever the simulation cue was paired with a positive label and an event that would result in them experiencing a negative emotion whenever the simulation cue was paired with a negative label. In the Acquaintance and Barack Obama conditions, participants were instructed that the acquaintance or Barack Obama should be the individual experiencing the relevant emotion. In all conditions, participants were told that it was completely up to them to determine what it would be about the simulated events that would evoke a positive or negative reaction. Finally, for the Acquaintance and Barack Obama conditions, participants were instructed that they should never insert themselves into the simulated events.

All event descriptions were audio-recorded and later transcribed for analysis. Prior to the experimental trials, two practice trials were administered to ensure that participants were generating positive and negative events in which they, an acquaintance, or Barack Obama (depending on condition) were the person experiencing the emotion (the order of the positive and negative practice trials was counterbalanced across participants). During the experiment, positive and negative events were presented in random order. After simulating each event, participants were asked to provide ratings of subjective detail (1 = low detail, 5 = high detail), plausibility (1 = low plausibility, 5 = high plausibility), and strength of emotional reaction (1 = low positive, 5 = high positive for positive events; 1 = low negative, 5 = high negative for negative events; note that this rating is listed as *emotion* in Table 1). These ratings were presented in a random order following each event. After the experiment, participants were asked whether they had thought about any of the events reported in the study. All participants reported that they had not previously thought about any of the events. All stimuli were presented using E-Prime 2.0 software on a Dell desktop computer. The experiment lasted approximately 1 hr.

Event coding. Transcriptions of audio-recordings of each event were used to identify a central event and coded for the presence of internal and external details using an adapted version of the AI scoring procedure (Levine et al., 2002). Internal details were event-specific details, temporal, contextual, and perceptual details, and thoughts/feeling. External details were details that were extraneous to the central event. These included event-specific details that were unrelated to the central event (e.g., a secondary event mentioned in the context of the simulation), semantic or general knowledge, repetitions of details from the central event, and miscellaneous thoughts (e.g., metacognitions about the task). Two independent raters who were unfamiliar with the purpose of the present study were first trained to identify internal and

external details on a common set of 24 events from a previous study (Puig & Szpunar, 2017).

The coders achieved high inter-rater reliability (inter-class correlations = .90 for Internal details and .90 for External details). The raters then each coded half of the protocols for each condition.

Results

Autobiographical Interview

All data for this experiment, and the second experiment presented below, are freely available online through the Open Science Framework (<https://osf.io/afr5y/>). We conducted a 2 (detail category: internal, external) x 2 (valence: negative, positive) x 3 (condition: self, acquaintance, Barack Obama) mixed ANOVA on the number of details generated by participants, with detail category and valence serving as within-subjects factors and condition serving as a between-subjects factor. The results are summarized in Figure 1. There was a main effect of valence, $F(1,68) = 16.49, p < .001, \eta_p^2 = .20$, but this effect did not interact with detail category, $F(1,68) = 3.14, p = .081, \eta_p^2 = .04$ or condition, $F(2,68) = 0.22, p = .803, \eta_p^2 = .01$. Replicating our prior work, the main effect of valence was present for internal details, with participants generating more internal details for negative ($M = 31.8, SD = 21.2$) than positive ($M = 29.6, SD = 20.1$) events, $t(70) = 3.33, p = .001, 95\% CI = [0.88, 3.52], d = .40$ (Puig & Szpunar, 2017; for complete breakdown of internal subcategories, see Supplementary Table 1). However, unlike our previous findings, participants also generated more external details for negative ($M = 8.51, SD = 6.72$) as compared to positive ($M = 7.57, SD = 6.19$) events, $t(70) = 2.90, p = .005, 95\% CI = [0.30, 1.60], d = .34$. Notably, the external detail advantage for negative as compared to positive events was driven exclusively by additional repeated details (i.e., internal details that participants repeated and that were not counted toward the overall internal detail score, $M_{Neg} = 5.74, SD = 4.40$ vs. $M_{Pos} = 4.80, SD = 3.84, t(70) = 4.16, p < .001, 95\% CI =$

[0.49, 1.38], $d = .49$; for complete breakdown of external subcategories, see Supplementary Table 2).

There were also main effects of detail category, $F(1,68) = 166.01, p < .001, \eta_p^2 = .71$, and condition, $F(2,68) = 8.77, p < .001, \eta_p^2 = .21$, that interacted with one another, $F(2,68) = 15.32, p < .001, \eta_p^2 = .31$. The interaction between detail category and condition emerged because internal details were higher when participants described events revolving around Barack Obama ($M = 44.6, SD = 26.6$) as compared to events revolving around an acquaintance ($M = 28.6, SD = 13.3, t[45] = 2.61, p = .012, 95\% CI = [3.64, 28.2], d = .76$) and events revolving around themselves ($M = 19.5, SD = 9.3, t[45] = 4.34, p < .001, 95\% CI = [13.4, 36.7], d = 1.27$), and also higher when participants described events revolving around an acquaintance as compared to themselves, $t(46) = 2.74, p = .009, 95\% CI = [2.42, 15.8], d = .79$. On the other hand, the only reliable difference across condition in relation to external details was between events revolving around Barack Obama ($M = 9.7, SD = 5.6$) as compared to events revolving around an acquaintance ($M = 5.8, SD = 4.8, t[45] = 2.56, p = .014, 95\% CI = [0.83, 6.97], d = .75$). The finding that participants generated more internal details in relation to events revolving around other people as compared to events revolving around themselves was unexpected, and we address this pattern of data in Experiment 2.

Subjective Ratings

We conducted separate 2 (Valence: negative, positive) x 3 (Condition: self, acquaintance, Barack Obama) mixed ANOVAs on subjective ratings of detail, plausibility, and strength of emotional reaction. For each analysis, valence served as a within-subjects factor and condition served as a between-subjects factor. Subjective data from one participant were not collected due to computer error. Hence, the total N for these analyses was 70. The results are summarized in

the top portion of Table 1. There were no main effects or interactions related to subjective levels of detail and strength of emotional reaction, largest $F(2,67) = 1.45, p = .243, \eta_p^2 = .04$. These null findings are notable in two respects. First, they replicate our prior work showing that subjective evaluations of the detail and strength of emotional reaction of positive and negative events are often equivalent (Puig & Szpunar, 2017). Second, the data further speak to the importance of assessing the level of detail of simulated events using open-ended measures.

Notably, the analysis of the subjective plausibility of simulated events revealed main effects of valence, $F(1,67) = 14.19, p < .001, \eta_p^2 = .18$, and condition, $F(2,67) = 8.45, p < .001, \eta_p^2 = .20$, with no interaction between these factors, $F(2,67) = 0.28, p = .760, \eta_p^2 = .01$. The main effect of valence was driven by the fact that participants rated positive events ($M = 2.90, SD = 0.84$) as more plausible than negative events ($M = 2.56, SD = 0.85$). The main effect of condition reflected the fact that participants rated events revolving around themselves ($M = 3.19, SD = 0.63$) as more likely to occur as compared to events revolving around an acquaintance ($M = 2.61, SD = 0.73, t[46] = 2.91, p = .006, 95\% \text{ CI} = [0.18, 0.97], d = .84$) and events revolving around Barack Obama ($M = 2.37, SD = 0.71, t[44] = 4.13, p < .001, 95\% \text{ CI} = 0.42, 1.21, d = 1.22$).

Summary

In sum, the results of Experiment 1 replicate and extend our prior work by demonstrating that novel negative events are simulated in more event-specific detail than novel positive events, and that personal threat does not moderate this pattern of data. Although participants also generated more external details in relation to negative as compared to positive events, this appeared to be driven by repeated central event details that were classified by the AI coding procedure as external to the central event. We note that negative events may have been experienced as more emotionally arousing than positive events. In order to address this possible

confound, participants in Experiment 2 were asked to provide ratings of emotional arousal in relation to positive and negative simulations of personal and non-personal events.

One surprising aspect of the results was that participants generated more event-specific detail when simulating events related to other people as compared to events related to themselves. This was particularly surprising in terms of comparing the Self and Barack Obama conditions. Based on the parameters of the experiment, participants likely simulated events in these conditions in locations that were respectively high and low on familiarity. That is, participants would have had more relevant past experiences in the context of self-generated locations for the Self condition as compared to experimenter-generated locations for the Barack Obama condition. Along these lines, past work has consistently demonstrated that increases in location familiarity are associated with increases in event detail (e.g., Arnold, McDermott, & Szpunar, 2011; Robin & Moscovitch, 2014; Szpunar & McDermott, 2008). Hence, to the extent that familiar locations support detailed simulations of the future, events revolving around one's self should have been simulated in more event specific detail than events revolving around Barack Obama. However, there is another parameter of the current study that is important to take into account. Specifically, personal threat, operationalized as the level of personal involvement in the scenarios, was manipulated between subjects, and so it is possible that the differences in event detail across conditions reflect subject differences as opposed to condition differences. In order to address this possibility, Experiment 2 manipulated personal threat in a within-subjects design.

Experiment 2

Method

Participants. Twenty-four undergraduate students ($N_{female} = 14$) were recruited through the University of Illinois at Chicago Psychology Subject Pool. Given that this sample size was sufficient to reveal a negative event detail bias across all conditions in Experiment 1, we decided a priori that it would be prudent to collect data from the same number of participants in this study. The University of Illinois at Chicago Institutional Review Board approved all study procedures, and written consent was obtained prior to the study. Participants received course credit for their participation.

Materials and procedure. The procedures for Experiment 2 were similar to those of Experiment 1, with the following exceptions. Specifically, half of the to-be-simulated events revolved around the participant (Self) and the remaining half revolved around Barack Obama. We decided to compare these two conditions as they provide the most salient contrast in terms of of personal threat among the conditions employed in Experiment 1. That is, negative as compared to positive personal events should be more likely to highlight some threat to participants' mental and/or physical well-being, whereas negative as compared to positive non-personal events should bear little to no relevance to participants' mental and/or physical well-being. Upon arriving to the laboratory, participants were instructed to provide lists of 8 familiar people, 8 familiar places, and 8 familiar objects (see Materials and Procedures for Experiment 1 for additional details). These details were randomly reorganized to generate 8 novel person-location-object triads that served as self-simulation cues (2 practice trial, 6 experimental trials). In addition, 8 novel experimenter-generated person-location-object triads served as simulation cues for events that revolved around Barack Obama (2 practice trial, 6 experimental trials; see Materials and Procedures for Experiment 1 for additional details). Event simulation proceeded as with Experiment 1. Half of the Self and half of the Barack Obama simulation cues were paired

with a positive or negative label. The four practice trials and twelve experimental trials were presented in random order. Finally, in addition to providing ratings of detail, plausibility, and strength of emotional reaction (note that as with Experiment 1, this rating is listed as *emotion* in Table 1), participants also provided ratings of strength of emotional arousal (1 = low arousal, 5 = high arousal). The four ratings were presented in random order after each trial.

After the experiment, participants were asked whether they had thought about any of the events reported in the study. All participants reported that they had not previously thought about any of the events. All stimuli were presented using E-Prime 2.0 software on a Dell desktop computer. The experiment lasted approximately 1 hr.

Event coding. As in Experiment 1, transcriptions of audio-recordings of each event were used to identify a central event and coded for the presence of internal and external details using an adapted version of the AI scoring procedure (Levine et al., 2002; see Event Coding for Experiment 1 for additional details). As with Experiment 1, two new independent raters who were unfamiliar with the purpose of the present study were first trained to identify internal and external details on a common set of 24 events from a previous study (Puig & Szpunar, 2017). The coders achieved high inter-rater reliability (inter-class correlations = .93 for Internal details and .90 for External details). The raters then each coded half of the protocols.

Results

Autobiographical Interview

We conducted a 2 (detail category: internal, external) x 2 (valence: negative, positive) x 2 (condition: self, Obama) within-subjects ANOVA on the number of details generated by participants. The results are summarized in Figure 2. Replicating the results of Experiment 1, there was a main effect of valence, $F(1,23) = 7.35$, $p = .012$, $\eta_p^2 = .24$, that did not interact with

detail category or condition, largest $F(1,23) = 0.30$, $p = .0589$, $\eta_p^2 = .01$. As with the results of Experiment 1, the main effect of valence was present for internal details ($M_{Neg} = 14.2$, $SD = 6.8$; $M_{Pos} = 13.4$, $SD = 6.5$; $t(23) = 2.44$, $p = .023$, 95% CI = [0.13, 1.58], $d = .50$; for complete breakdown of internal subcategories, see Supplementary Table 1) and external details ($M_{Neg} = 7.4$, $SD = 5.7$; $M_{Pos} = 6.7$, $SD = 5.4$; $t(23) = 2.34$, $p = .029$, 95% CI = [0.08, 1.30], $d = .48$). Further replicating the results of Experiment 1, the external detail advantage for negative as compared to positive events was driven primarily by repeated details from the central event, $M_{Neg} = 6.2$, $SD = 5.2$ vs. $M_{Pos} = 5.5$, $SD = 4.3$, $t(23) = 2.02$, $p = .055$, 95% CI = [-0.02, 1.48], $d = .41$ (for complete breakdown of external subcategories, see Supplementary Table 2).

There was also a main effect of detail category, $F(1,23) = 89.34$, $p < .001$, $\eta_p^2 = .80$, that interacted with condition, $F(1,23) = 4.65$, $p = .042$, $\eta_p^2 = .17$. This pattern of results reflected the fact that whereas participants generated a near identical number of internal details for the Self ($M = 13.9$, $SD = 6.7$) and Barack Obama ($M = 13.8$, $SD = 6.7$) conditions, $t(23) = 0.20$, $p = .842$, $d = .04$, they tended to generate more external details in relation to the Barack Obama condition ($M = 7.5$, $SD = 5.6$) as compared to the Self condition ($M = 6.5$, $SD = 5.7$), $t(23) = 1.84$, $p = .080$, 95% CI = [-0.13, 2.15], $d = .38$. Notably, the lack of difference between the Self and Barack Obama conditions in terms of the number of internal details generated suggests that the differences observed in Experiment 1 may have been an artifact of the between-subjects design. Nonetheless, participants generated an equal number of internal details in these conditions. We address this aspect of our results in further detail below.

Subjective Ratings

We conducted separate 2 (valence: negative, positive) x 2 (condition: self, Barack Obama) within-subjects ANOVAs on subjective ratings of detail, plausibility, strength of

emotional reaction, and arousal. Subjective data from one participant were not collected due to computer error. Hence, the total N for these analyses was 23. The results are summarized in the bottom portion of Table 1. With regard to subjective detail, there were marginally significant effects of condition, $F(1,22) = 3.78, p = .065, \eta_p^2 = .15$, and valence, $F(1,22) = 3.74, p = .066, \eta_p^2 = .15$, such that participants tended to rate events revolving around themselves ($M = 3.4, SD = 0.6$) as more detailed than events revolving around Barack Obama ($M = 3.0, SD = 0.6$), and negative events ($M = 3.3, SD = 0.6$) as more detailed than positive events ($M = 3.1, SD = 0.4$). With regard to plausibility, there was a main effect of condition, $F(1,22) = 7.77, p = .011, \eta_p^2 = .26$, such that participants rated events revolving around themselves ($M = 3.3, SD = 0.8$) as more likely to occur than events revolving around Barack Obama ($M = 2.7, SD = 0.9$). However, unlike the findings reported in Experiment 1, there was no effect of valence, $F(1,22) = 0.26, p = .619, \eta_p^2 = .01$. With regard to strength of emotional reaction, there was a significant interaction between condition and valence, $F(1,22) = 7.23, p = .013, \eta_p^2 = .25$. This interaction was driven by the fact that whereas participants rated their reactions to negative ($M = 3.3, SD = 0.7$) and positive ($M = 3.4, SD = 0.9$) events revolving around themselves as equally emotional, their reactions to positive events revolving around Barack Obama ($M = 2.8, SD = 0.9$) were less emotional than their reactions to negative events revolving around Barack Obama ($M = 3.3, SD = 0.9$). Finally, there were no main effects or interaction in relation to subjective ratings of arousal, largest $F(1,22) = 0.72, p = .405, \eta_p^2 = .03$.

General Discussion

Across two studies, we found that novel negative events were simulated in more event-specific detail than novel positive events. While there was also a tendency for participants to generate more external detail in relation to negative as compared to positive events, this appeared

to have been driven exclusively by the repetition of details relevant to the central event. These patterns of results arose irrespective of the personal threat posed by the scenarios under consideration. That is, participants generated more detailed negative than positive events when simulating scenarios about their possible future, the possible future of an acquaintance, or the possible future of Barack Obama. Finally, positive and negative events did not differ in terms of their overall arousal, suggesting that the negative event detail bias was more specifically tied to emotional valence.

Our findings fit neatly with prior research demonstrating that people tend to devote more cognitive resources to processing negative as compared to positive events (Baumeister et al., 2001; Taylor, 1991). One common account of this general pattern of results is that negative events receive additional processing resources because they require careful appraisal of possible threat (Rozin & Royzman, 2001; Taylor, 1991). However, the results of Experiments 1 and 2 revealed that the negative detail bias in event simulation emerged whether or not the events under consideration revolved around the participant. Hence, it appears that it may be the negative valence rather than the threat to personal well being that drives the negative event detail bias, at least in the context of future event simulation.

This valence-based interpretation of our findings aligns more closely with demonstrations that negative, more so than positive, valence encourages detail-oriented processing (Berntsen, 2002; Bowen, Kark, & Kensinger, 2018; Kensinger, 2009). For instance, Kensinger and Schacter (2008) found greater neural activity in a visual object region during encoding of subsequently remembered as compared to forgotten negative, but not positive or neutral, items. We note that in our study the additional details generated in relation to negative as compared to positive scenarios tended to be associated with event happenings (i.e., what is occurring in the event) and

not necessarily sensory/perceptual details associated with those happenings. Nonetheless, much like the sensory details that participants might remember about objects, event happenings are focal rather than external to the stimulus of interest (Kensinger, 2009). It may be interesting for future work to more systematically assess the manner in which focal details are processed as a function of stimulus or event complexity.

Across both studies the average magnitude of the negative event detail bias was approximately two additional event-specific details. While this effect of valence was highly consistent across participants (72% of participants generated more event-specific details in relation to negative as compared to positive events, despite considerable individual differences in the amount of detail generated across participants), it will be important for future studies to assess whether manipulations of other variables not considered here might moderate this pattern of data. For instance, although the experimental recombination procedure was able to ensure the simulation of novel scenarios, it is also likely that the random nature of these scenarios bore little relation to participants' personal future goals (e.g., Lehner & D'Argembeau, 2016). Whether goal relevance impacts the magnitude of the negative detail bias in event simulation remains an open question. It will be important for studies that address the role of goal relevance to attempt to equate the frequency of prior thinking between goal-relevant and goal-irrelevant simulations of the future. Moreover, we note that participants in the present study rated their present emotional reaction to simulated future events (i.e., anticipatory emotion) and not how those events would make them feel in the future (i.e., anticipated emotion) (Baumgartner, Pieters, & Bagozzi, 2008). Recent work has demonstrated that the anticipated future may be especially likely to be characterized by positive rather than negative emotion (Barsics, Van der Linden, & D'Argembeau, 2016), and that anticipated more so than anticipatory emotions impact judgment

and behavior (DeWall, Baumeister, Chester, & Bushman, 2016). Whether the negative detail bias extends to simulations of anticipated reactions to future events also remains an open question. Finally, a post-hoc lexical analysis (Pennebaker, Boyd, Jordan, & Blackburn, 2015) across both experiments indicated that although less than 1% of all words generated pertained to threat, participants were nonetheless more likely to use threat-related terminology when describing negative as compared to positive events ($d = .90$). Future studies employing more direct manipulations of personal threat might identify a stronger role for this variable in espousing detailed event simulation than was observed in the present study. Related to this point, we further note that participants in the present study were not asked to place their simulations within a specific time window (e.g., next week, next year, etc.). This aspect of the design may have resulted in a conservative estimate of the negative event detail bias as people tend to imagine negative events as taking place in the more distant future than positive events (e.g., Rasmussen & Berntsen, 2013), and greater temporal distance is typically associated with reductions in concrete event detail (Trope & Liberman, 2003). It would be interesting to assess whether the negative detail bias varies as a function of the closeness of the event, and hence the imminence of any possible personal threat.

One surprising aspect of our data was that even in the context of a within-subjects design (Experiment 2), participants generated similar amounts of event-specific detail for scenarios that took place in locations with which they had considerable past experience (Self condition; e.g., locations around Chicago) and locations with which they had limited past experience (Obama condition; e.g., White House rose garden). Although prior work has shown that location familiarity modulates the level of detail with which events are simulated, it is possible that adopting the perspective of another person (Barack Obama) for whom a personally unfamiliar

location is nonetheless relevant (White House rose garden) could help participants to focus on generating details that are pertinent to a simulated interaction. Future studies that manipulate who the simulation revolves around and where the simulation is taking place in a fully crossed design will be needed to better unravel the nature of this unexpected finding. Nonetheless, regardless of whom events revolved around or where events were imagined to take place, participants in our study consistently imagined negative events in more event-specific detail than positive events.

The average adult tends to be rather positive and optimistic about their future (Weinstein, 1980). That is not to say, however, that simulations of negative events cannot serve a useful function in supporting adaptive behavior. Indeed, we believe that our findings may have important implications for research related to judgment and decision-making. Recent work on temporal discounting has demonstrated that imagining the future (e.g., achieving a goal weight) can help people to avoid making shortsighted decisions (e.g., overeating) (e.g., Daniel et al., 2013). Moreover, a recent study found that the detail with which people could simulate the future was inversely related to their propensity to make shortsighted decisions (Bromberg et al., 2015; see also, O'Donnell, Daniel, & Epstein, 2017). Accordingly, if negative valence encourages detail-oriented processing of future event simulations, it stands to reason that simulations of negative consequences of making shortsighted decisions may serve as a more powerful tool for guiding adaptive behavior than simulations of positive consequences of avoiding shortsighted decisions.

Notably, Liu, Feng, Chen, and Li (2013) found that simulations of negative events increased rather than decreased the tendency for people to make shortsighted decisions. However, simulated events in that study were not contextually tied to the decision being made

(i.e., participants were making monetary decisions while thinking about negative events that were unrelated to the decision task; e.g., a car accident). Hence, it will be important for future decision-making research to assess the impact of negative and positive episodic simulations that are contextually relevant to choices that may have a long lasting impact on the future.

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Footnote

1. The study was carried out while Barack Obama was still president of the United States.

Table 1. Mean phenomenological ratings for positive and negative simulations of future events in Experiments 1 and 2 as a function of condition.

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Experiment 1	<i>Self</i>	<i>Acquaintance</i>	<i>Obama</i>

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<u><i>Positive</i></u>			
Detail	3.5 (0.6)	3.3 (0.8)	3.2 (0.8)
Plausibility	3.4 (0.7)	2.8 (0.8)	2.5 (0.8)
Emotion	3.2 (0.5)	3.1 (0.7)	2.8 (0.8)
 <u><i>Negative</i></u>			
Detail	3.5 (0.8)	3.2 (0.7)	3.3 (0.7)
Plausibility	3.0 (0.8)	2.5 (0.9)	2.2 (0.8)
Emotion	3.2 (0.8)	3.0 (0.6)	3.1 (0.8)

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Experiment 2	<i>Self</i>	<i>Obama</i>	

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<u><i>Positive</i></u>			
Detail	3.3 (0.8)	2.9 (0.6)	
Plausibility	3.2 (0.8)	2.8 (1.1)	
Emotion	3.4 (0.9)	2.8 (0.9)	
Arousal	3.1 (0.9)	2.8 (0.9)	
 <u><i>Negative</i></u>			
Detail	3.4 (0.7)	3.1 (0.7)	
Plausibility	3.3 (1.0)	2.6 (1.0)	
Emotion	3.3 (0.7)	3.3 (0.9)	
Arousal	2.9 (0.7)	2.8 (1.1)	

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Note. Standard deviations are presented in parentheses.

Figure Captions

Figure 1. Mean number of internal and external details generated in relation to future events as a function of condition (self, acquaintance, Obama) and valence. Error bars represent 95% confidence intervals.

Figure 2. Mean number of internal and external details generated in relation to future events as a function of condition (self, Obama) and valence. Error bars represent 95% confidence intervals.

Figure 1.

Figure 2.