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ORIGINAL ARTICLE

My future is brighter than yours: the positivity bias in episodic future thinking and future self-images

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Abstract

Numerous studies on episodic future thinking have demonstrated that individuals perceive their future as more positive and idyllic than their past. It has been suggested that this positivity bias might serve a self-enhancement function. Yet, conflicting findings and lack of systematic studies on the generalizability of the phenomenon leave this interpretation uncertain. We provide the first systematic examination of the positivity bias across different domains and tasks of future thinking. First, we use the same tasks in two different domains of future thinking, representing an episodic (events) and a semantic dimension (self-images), respectively. Second, we use two different measures of positivity bias (i.e., frequency of positive versus negative instances and their distance from present). Third, we contrast each measure in each domain for events/self-images related to self versus an acquaintance. Experiments 1 and 2 showed a strong, general tendency for the generation of positive future events/self-images, but most pronounced for self, relative to an acquaintance. Experiments 3 and 4 demonstrated that positive future events/self-images were dated closer to present, whereas negative ones were pushed further into the future, but only for self and not for an acquaintance. Our results support the idea that the positivity bias in future thinking serves a self-enhancement function and that this bias likely represents a similar underlying motivational mechanism across different domains of future thinking, whether episodic or semantic. The findings add to our understanding of the motivational functions served by different forms of future thoughts in relation to the self.

Introduction

Episodic future thinking is the ability to project oneself into the future and to mentally simulate specific events that are likely to happen in one's future life (Atance & O'Neill, 2001; Tulving, 1985, 2002; see Szpunar, 2010 for a review), such as "I will have dinner with my friend on his birthday next Saturday". Numerous studies have compared episodic future thinking with the ability to remember personal events in the past, and found that the two processes are highly similar with regard to both their neural underpinnings (e.g., Addis, Wong, & Schacter, 2007; Botzung, Denkova, & Manning, 2008; Okuda et al., 2003; Szpunar, Watson, & McDermott, 2007) and how they respond to a range of behavioral manipulations (e.g., D'Argembeau & Van der Linden, 2004b; Schacter, Gaesser, & Addis, 2013; Spreng & Levine, 2006; see Szpunar, 2010 for a review).

However, in spite of these similarities, important differences have also been identified. One well-established finding is that future events are viewed as considerably more emotionally positive and idyllic compared with memories of past events (e.g., Berntsen & Bohn, 2010; Berntsen & Jacobsen, 2008; D'Argembeau & Van Der Linden, 2004a; Newby-Clark & Ross, 2003; Rasmussen & Berntsen, 2013). This effect has been found when employing a variety of experimental paradigms. For example, when personal events are reported in response to emotionally neutral cues, future events are consistently rated as more positive than past events (e.g., Berntsen & Bohn, 2010; Berntsen & Jacobsen, 2008; Finnbogadóttir & Berntsen, 2011). Similarly, when participants are asked to generate positive and negative events from their past and future, positive future events are seen as more central to life story and identity than are both negative and positive past events (see Rasmussen & Berntsen, 2013). Studies have also found that generating positive future events requires significantly less amount of time than generating negative events (e.g.,

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Newby-Clark & Ross, 2003). Furthermore, this positivity bias has also been observed for thoughts of future events that come to mind spontaneously (e.g., Berntsen & Jacobsen, 2008; Cole, Staugaard, & Berntsen, 2016). Finally, when participants are asked to assess the temporal distance for positive and negative future and past events, positive future events are judged as temporally closer to the present than negative future events (e.g., Rasmussen & Berntsen, 2013; Sharot, Riccardi, Raio, & Phelps, 2007). This bias for closer positive future events seems to be preserved as people age (e.g., Gaesser, Sacchetti, Addis, & Schacter, 2011; Gallo, Korthauer, McDonough, Teshale, & Johnson, 2011; Schacter et al., 2013). As research has demonstrated that events closer to the present are more likely to be considered part of the current sense of self (Ross & Wilson, 2002), it has been suggested that praising closer positive events, might help maintaining a more positive self-image (Strahan & Wilson, 2006; Wilson & Ross, 2001).

Although the findings regarding positivity bias in episodic future thinking are consistent, they leave a number of questions unresolved. First, it is unclear to what extent the positivity bias found in episodic future thinking shares similar underlying mechanisms with the positivity bias found in other types of future thinking tasks. For example, related findings have been reported for a non-episodic form of future thinking, namely 'possible selves' or future self-images (Markus & Nurius, 1986). Whereas episodic future thinking is concerned with the ability to imagine discrete events in one's personal future, future self-images address the ways we imagine ourselves developing in the future. The specific self-images that may evolve over time could be notions such as "I will be a grandfather" or "I will be a successful accountant". In addition, future self-images encompass both hoped-for (e.g., "I will be successful") and feared (e.g., "I will be alone") future self-representations. They enable people to describe different elements and roles of their identity and to decide which are important to the definition of their own current self (e.g., 'I am a father', 'I am an architect'; see Kuhn & McPartland, 1954; Linville, 1985; Markus & Wurf, 1987).

Similar to research on episodic future thinking, research on future self-images has also demonstrated that when people are asked to freely generate future self-images, they usually produce a higher proportion of positive than negative self-images (Rathbone, Conway, & Moulin, 2011; Rathbone, Salgado, Akan, Havelka, & Berntsen, 2016). In addition, there is evidence suggesting that this bias favoring the generation of positive self-images is found across young, middle-age and older adults (Salgado & Berntsen, 2018), and that positive self-images are dated to emerge closer to the person's present regardless of age (Chessell, Rathbone, Souchay, Charlesworth, & Moulin, 2014; Smith & Freund, 2002).

The similarity in findings on both domains of future thinking are in line with research showing that future self-images encompass elements of the episodic domain, and might be considered as a hybrid between episodic and semantic autobiographical knowledge (see Prebble, Addis, & Tippett, 2013; Szpunar, Spreng, & Schacter, 2014). However, because no direct comparisons with similar experimental manipulations have been used for both episodic future thinking and future self-images tasks, it is unclear to what extent this apparent positivity bias in both domains of future thinking reflects a similar underlying motivational mechanism. Thus, to address this question, it is important to systematically examine the positivity bias across both domains of future thinking while using similar tasks. This is an important aim of the present series of experiments.

A second unresolved question is what causes the positivity bias found in both domains of future thinking, or what are the underlying mechanisms driving it. At least two different groups of explanations are possible (see Özbek, Bohn, & Berntsen, 2017 for a review). It has been suggested that because the future is less constrained by actual experience (Robinson & Ryff, 1999), it may be a mental space for overly positive and untenable illusions that might manifest themselves irrespective of the target of the future thought; that is, irrespective of whether the imagined event concerns oneself or another person. Alternatively, the positivity bias may reflect a self-enhancement function (Alicke & Sedikides, 2009; Sedikides & Gregg, 2008) and thus be sensitive to the target of the future thought by showing this effect exclusively, or at least more clearly, when the target is oneself rather than another.

A body of work has demonstrated that the target of thought (whether self or an acquaintance) biases how people appraise current and past qualities (e.g., Ross & Wilson, 2002; Wilson & Ross, 2001). However, very few studies have used the self versus other manipulation in relation to future thinking. We identified only the following four studies.

Wilson et al. (2012) asked university students to evaluate either themselves or an acquaintance in the near or distant future, and on six different attributes. The authors manipulated the subjective feeling of time by holding the calendar time constant but changing its spatial representation on a depicted time line. They found that future appraisals were more positive for self than for other in a close temporal condition. However, they did not find a significant difference on appraisals in a distant future condition for either self or other, as both were judged equally positive. Wilson et al. (2012) proposed that self-enhancement motives are underlying people's tendency to praise subjectively close future selves.

Kanten and Teigen (2008) asked college students to evaluate either themselves or an acquaintance on desirable and

undesirable attributes at 6 months and 2 years from now, and in both past and future directions. They found that participants evaluated themselves with improvement equal to their acquaintances from past to the present. Yet, when considering future attributes, participants judged that that they would improve significantly more compared to their acquaintances in the distant future. Critically, and in contrast to Wilson et al. (2012), participants' evaluations of their attributes in their close future were significantly less positive than those in their distant future.

Similarly, Grysman, Prabhakar, Anglin and Hudson (2013) found an increase in positivity with increased time for self, but not for others. They asked participants to write about four events in a close distance condition (1 month to 1 year from now) and in a long distance condition (5–10 years from now), and for both the past and future. They also manipulated the target of the events' narratives in terms of three categories: self, close-friend or acquaintance. Grysman et al. found that the positivity of the events increased analogously to the time intervals, with events in the distant past being rated as less positive and events in the distant future rated as significantly more positive. The increase in positivity with time was significantly more pronounced for narratives in which the target was the self and a close-friend, compared to narratives in which the target was an acquaintance. When the target of the events was an acquaintance, participants judged the events' positivity to also increase with time, but not as markedly as when they did it for themselves or for a close-friend. The authors concluded that the increase in positivity with time is due to a self-enhancement bias that helps individuals to believe he/she is in a constant path of improvement.

Finally, Durbin, Barber, Brown, and Mather (2018) found that when asking about similar future age (85 years old) young and older participants expected their own future at that age to be more positive than other's future at the same age, despite older participants being significantly closer to age 85 than the younger participants. Durbin et al. asked participants to forecast to either their own future at age 85 or to the average person's future also at age 85. Participants were then asked to describe one of these imagined futures as detailed as possible for 2 min. Next, they were also asked to endorse a series of words (positive and negative) according to how relevant each word would be to the future they imagined for either themselves or other person, depending on the condition. The authors found that when the target of the future scenario was the self, both young and older participants included a greater percentage of positive words in their descriptions than when the target of the future scenario was other. In addition, participants endorsed more negative words as associated with the future of the other and assessed more positive words as associated with their own future. The authors concluded that it is unclear whether individuals are overly optimistic about their own future or more pessimistic about the future of others.

In sum, the few studies using the self versus other manipulation in relation to future thinking have found mixed results with some findings suggesting differences in the close future and other in the distant future. At the same time, most of the studies explain their findings in terms of a positivity bias in future thinking that likely serves self-enhancement. Yet, no study has tested this assumption systematically using tasks, with a natural open-ended future life span time perspective; tasks that ask participants to freely generate self-images or events; and/or experiments using equivalent tasks across different domains of future thinking.

Furthermore, the fact that a positivity bias is found in different domains of future thinking suggests at least two possible conclusions. First, that a positivity bias is probably a natural feature of all domains of future thinking and; second, that this positivity bias is likely driven by a similar underlying motivational mechanism (e.g. self-enhancement) across different forms of future thinking. To examine this, different types of experimental manipulations should be used across domains of future thinking, as the positivity bias and its possible self-enhancement function may vary, not only with respect to the domain of future thought being studied (e.g., episodic vs. self-images), but also depending on the specific features of the tasks used in the studies (e.g., asking for temporal distance estimates or simple occurrence frequencies).

To fill this gap in the literature, in the present series of experiments, we aimed to meet these criteria using two equivalent free generation tasks for two different kinds of future oriented thoughts (episodic vs. semantic). We tested each type of future thinking on two different measures of positivity bias, namely frequency of future events/self-images, and distance from present judged in real years using an open-ended lifespan perspective. To test whether this positivity bias reflects self-enhancement in different domains of future thinking, we contrasted each measure to those generated for an acquaintance.

The present study

The primary goals of the present series of experiments were, first, to investigate whether the positivity bias found in episodic future thinking and other kinds of future thoughts (e.g., self-images) serves a self-enhancement function across different domains of future thinking, and second, whether this bias has a similar underlying mechanism. Experiments 1 and 2 investigated the effects of emotional valence on the frequency of imagined future events or future self-images as function of their target, self versus other. In Experiments 3 and 4 we assessed the impact of emotional valence on the

estimated distance from present, for self versus other. Building on tasks used in the past (e.g., Rathbone et al., 2016), participants freely assessed the time of occurrence for each event or self-image in an open-ended lifespan perspective. Having equivalent tasks measuring both future events and future self-images across the four experiments allowed us to determine whether the positivity bias in these two domains of future thinking reflects similar underlying mechanisms. Moreover, having an "acquaintance condition" in all experiments permitted us to examine whether the positivity bias in future thinking reflects self-enhancement. Finally, having different tasks provided the opportunity to test whether the self-enhancement effect replicates across different measures of positivity bias (frequency vs. distance from present).

Following the idea of self-enhancement (e.g., Wilson & Ross, 2001), we hypothesized all of the main effects of valence and target (self versus other) across the four experiments to be qualified by interactions, indicating a stronger effect of emotional valence for self than for acquaintances. Specifically, we hypothesized the difference between the number of positive and negative future events (Experiment 1) and self-images (Experiment 2) would be larger for self than for an acquaintance. We also hypothesized that the distance from present for both future events (Experiment 3) and future self-images (Experiment 4) would be irregular and would favor positive future cognitions generated for self, but not for the acquaintance. To our knowledge, no study has systematically tested these hypotheses in regards to episodic future thinking as well as future self-images, and using free generation tasks with open-ended real lifespan horizons.

Experiment 1

In this experiment, we examined how emotional valence influences the frequency of future events people generated for themselves and for others using a free generation task. We hypothesized that participants would generate significantly more positive events for themselves than for their acquaintances. Such finding would support the idea of a positivity bias serving a self-enhancement function.

Method

Participants

A total of 200 participants were recruited through Amazon's Mechanical Turk (103 women, 97 men, $M_{age} = 35.60$, 95% CI [34.17, 37.02], age range 19–66 years old). The sample size was calculated based on previous studies using the self versus other manipulation in relation to future thinking (e.g., Grysman et al., 2013), as well as on studies recruiting participants from Amazon's Mechanical Turk, which aimed to detect a medium-size main effect of a single independent variable (target of the future projection) on a single dependent measure (frequency; e.g., Durbin et al., 2018; Rudert, Sutter, Corrodi, & Greifeneder, 2018). The chosen sample size allowed us to reach a power of at least 0.90 or higher. The experiment received ethical approval from the Review Board of the Center on Autobiographical Memory Research.

Materials

In two different tasks, participants were asked to generate up to eight specific future events that were likely to happen to them and to an acquaintance. They were also requested to rate each of the generated specific future events on different scales and to provide an estimated age of when these events might occur (see Procedure).

Procedure

A survey was created and advertised through Mechanical Turk. It briefly described to the potential participants the details of the tasks they would be required to complete, what was expected to be done, the approximate time that it might take, and the expected compensation they would receive if they completed the survey. Subjects who wanted to take part in the experiment were directed to an external website (Qualtrics) to complete the on-line survey. After providing informed consent and demographic information, participants were first presented with either the task asking for generating future events for themselves or the task asking for generating future events for an acquaintance. Participants completed the remaining task after they successfully completed the first one. The order of the tasks was counterbalanced. Participants who completed the survey successfully were paid 1.25 USD for their time.

In the acquaintance condition, and following Ross and Wilson (2002), participants were asked to choose one of their acquaintances who was about their same age and who was not a best friend or romantic partner. Participants provided the age and gender of their acquaintance, indicated how long they had known them, and finally rated their liking and closeness to their acquaintance on a rating scale from 1 to 7 (1 minimum; 7 maximum). In what followed, both tasks asked participants to freely generate in a list form a minimum of 1 and a maximum of 8 specific events for either themselves ('self' task) or an acquaintance ('acquaintance' task). Participants were asked to imagine and write down events from a specific time and place in the future, and which would last less than 24 h. This part was without time constraints. Once participants have generated the specific events for either themselves or the acquaintance, they continued to the next screen where they were presented with the first of the events they have generated. Participants

were asked to rate this specific future event on a rating scale (1–7) for positivity (1 very negative; 7 very positive) and emotional intensity (1 not emotionally intense at all; 7 really emotionally intense), and to state how old they or their acquaintance would be when the event in turn would happen. Once participants rated the event, they advanced to another screen where they were presented with the second event they generated and were asked to rate it on the same scales as with the first event. This procedure continued until participants rated all the events they generated at the beginning of the task. Once participants finished the first task successfully (self or acquaintance task), they were presented with the second one. All instructions in both tasks were kept as similar as possible, changing only the words related to the target of the future event (self or acquaintance).

Results

All together the participants generated a total of 1298 specific future events for themselves ($M = 6.49$, CI [6.21, 6.77]) and a total of 1278 specific future events for an acquaintance ($M = 6.39$, CI [6.10, 6.68]). Analyses on the acquaintance's characteristics demonstrated that participants did choose an acquaintance similar to their own age ($M_{\text{particiapants}} = 35.60$, CI [34.17, 37.02], $M_{\text{acquaintances}} = 35.51$, CI [34.01, 37.00]). They had known the acquaintance for a mean of 6.00 years (CI [5.47, 6.52]), liked him/her moderately ($M = 5.11$, CI [4.93, 5.29]) and felt reasonably close ($M = 3.80$, CI [3.58, 4.02]) to the person. As we were interested in investigating how the emotional valence of the specific future events interacts with the target of these events, self vs. acquaintance, the results are presented accordingly.

Overall, participants generated events for themselves that were in average more positive, compared to the events generated for their acquaintances ($M_{\text{self}} = 5.74$ (CI [5.58, 5.90]), $M_{\text{acquaintance}} = 5.33$ (CI [5.16, 5.50]; $p < 0.001$, $d = 0.35$). To examine this more carefully, all the future events generated by the participants were classified according to their emotional valence ratings; negative (from 1 to 3), neutral (4), and positive (from 5 to 7). The resulting number of future events that each participant generated in each of the valence categories were submitted to a 3 (valence category) × 2 (target of the future events) repeated-measures ANOVA with two within subjects factors. The results revealed a large main effect of valence, F (2, 398) = 422.20, $p < 0.001$, $\eta_p^2 = 0.68$, and a non-significant main effect of target of the future event, F (1, 199) = 1.14, $p > 0.250$, $\eta_p^2 = 0.054$. Yet, and importantly, the results indicated that the main effect of valence was qualified by a significant interaction between valence category and target of the future event, F (2, 398) = 11.37, $p < 0.001$, $\eta_p^2 = 0.054$, indicating that depending of the target of the future events, participants provided different number of events in each valence category.

Follow-up Helmert contrasts showed no main effect of valence category or interaction between this and the target of the future event when comparing negative to neutral future events, all Fs (1, 199) < 3.30, all ps > 0.071, all η_p^2 s < 0.016; meaning that participants generated the same amount of negative and neutral future events for themselves as for their acquaintances. Conversely, the results showed a large effect of valence category, when contrasting negative and neutral future events to positive ones, F (1, 199) = 550.54, $p < 0.001$, $\eta_p^2 = 0.74$, and a significant interaction with target of the future event, F (1, 199) = 15.14, $p < 0.001$, $\eta_p^2 = 0.071$. This last result showed that participants generated more positive future events than neutral or negative ones, and, conclusively, that participants generated significantly more positive future events for themselves than for an acquaintance ($p < 0.001$; see panel a in Fig. 1).[1]

In addition, we determined the average distance from present, calculated as the age of the future event minus the participant's age for events for self, as well as the age of the future event minus the acquaintance's age for events for the acquaintance. For example, if a participant/acquaintance aged 30 had a future event that might occur at age 36, the distance from present would be 6 years. The average distance in years between the current age of each participant/acquaintance and all their future events was calculated as such. Analyses of the mean distance from present of all generated events revealed that participants generated future events for themselves to occur in average in 4.44 (CI [3.87, 5.02]) years' time from their present. As for their acquaintances, participants dated events to occur in average 4.40 (CI [3.79, 5.02]) years' from their acquaintance present. This difference in distance from present was not statistically significant, t (199) = 0.174, $p > 0.250$, meaning that participants dated events to occur similarly in future time for either themselves or for their acquaintances.

Discussion

Our findings replicated well-established findings in the episodic future thinking literature, showing a bias in favor of emotionally positive events, when thinking about the personal future (e.g., Berntsen & Bohn, 2010; D'Argembeau & Van Der Linden, 2004b; Newby-Clark & Ross, 2003; Rasmussen & Berntsen, 2013). We extended these findings to events generated thinking about future events for an

[1] Given that the number of generated events varied across participants, we ran the analysis once more using the proportion of the events in each valence category rather than the raw frequency. The patterns and results did not change.

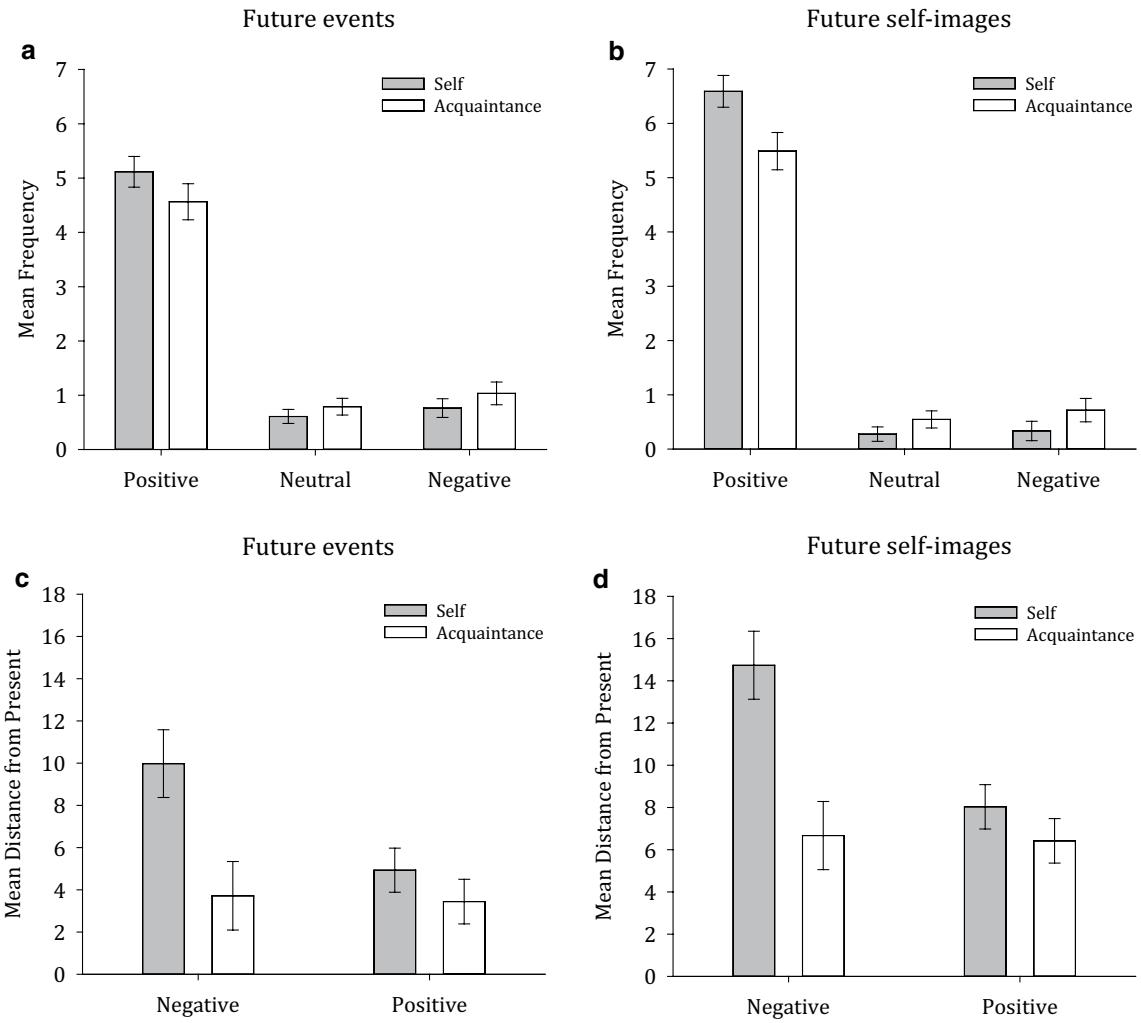

Fig. 1 Mean frequency for future events (**a**) and future self-images (**b**) according to valence categories and as function of self versus acquaintance. Also, mean distance from present for future events (**c**) and future self-images (**d**) according to valence categories and as function of self versus acquaintance; error bars represent 95% confidence intervals of the mean

acquaintance. We demonstrated that when participants freely generated future events for an acquaintance, they also nominated overwhelmingly more positive events to occur in their acquaintance's future than neutral or negative ones. However, the number of positive events was not as high for events generated for an acquaintance than it was for self. These results are in line with research suggesting that episodic future thinking likely serves an emotional self-regulatory purpose and can help maintaining a positive self-image by imagining future success, as opposed to future mistakes or failures (Rasmussen & Berntsen, 2013). The same positivity bias seems to hold true for the envisioning of future events of others, yet attenuated in comparison with one's own self (Grysman et al., 2013).

The analyses of distance from present indicated a relative shortening of perspective into the future for both self and other. Research in the episodic literature has demonstrated that people usually generate future events to occur in the next 5 years in their future and regardless of age (e.g., Spreng & Levine, 2006), yet, to our knowledge, the present experiment is the first one to extend this finding to when people think about another person's future. Altogether, the findings of Experiment 1 support the idea that the construction of future events might rely, not only on personal past experiences, but also on more schematic and semantic knowledge (Berntsen & Bohn, 2010; D'Argembeau & Mathy, 2011) that can be relevant and applicable to both one's own future and the future of others.

Experiment 2

In Experiment 1, we examined frequency of positive, negative and neutral events that participants generated for themselves versus for others. The aim of Experiment 2 was to extend these findings to another domain of future thinking, namely future self-images, using a task equivalent to the one used in Experiment 1. We expected to replicate the findings of Experiment 1, based on the idea that the construction of the future relies on schematic knowledge that generalizes beyond the construction of specific episodes. Thus, we hypothesized that participants would generate significantly more positive future self-images for themselves than for their acquaintances. Again, this finding would confirm a positivity bias serving a self-enhancement function also in this domain of future thinking.

Method

Participants

A total of 200 participants were recruited through Amazon's Mechanical Turk. As the aim of this second experiment was to extend the findings of Experiment 1 to another domain of future thinking (i.e., self-images), the sample size was calculated using the same strategy as in Experiment 1. Out of the 200 recruited participants, one participant was eliminated from the final sample as he failed an attention check (i.e., "In this question, we ask you specifically to select number 3 as your answer"), two were eliminated since they were not native English speakers, and nine participants were eliminated as their answers indicated they did not understand the task (e.g., future age was earlier than their current age). The final sample consisted of 188 participants (88 women, 100 men, $M_{age} = 34.07$, 95% CI [32.56, 35.58], range 18–68 years old). The experiment received ethical approval from the Review Board of the Center on Autobiographical Memory Research.

Materials

We used the *I will be task,* as well as the *He/She will be task*. The *I Will Be Task* (Rathbone et al., 2011) aims to examine future personal cognitions. In this task, participants are asked to generate future self-images of themselves in the form of 'I will be…' statements (e.g. I will be a father). They are also requested to rate each image on different scales and to provide an estimated age of when the generated future self-images might occur. The *He/She will be task* was developed for the purpose of the present experiment. It is a modified version of the *I will be task* that requires participants to generate future identities of an acquaintance in the form of "He/She will be" statements (e.g., He/She will be a doctor). Similarly, it asks participants to assess the phenomenological characteristics of the self-images generated for their acquaintance (see Procedure).

Procedure

A survey was created and advertised through Mechanical Turk. Participants were informed about the nature of the task and asked to provide informed consent and demographic information. Right after, participants were first presented with either the *I will be task* or the *He/She will be task*. Participants completed the remaining task after they successfully completed the first one. The order of *I will be* or *He/She will be* tasks was counterbalanced. Participants who completed the survey successfully were paid 1.25 USD for their time.

In the *He/She will be task* and following Ross and Wilson (2002), participants were asked to choose one of their acquaintances who was about their same age and who was not a best friend or romantic partner. The instructions and procedure were similar to those in Experiment 1, with the difference that this time, participants were asked to generate future self-images for both themselves and for an acquaintance. Participants freely generated in a list form a minimum of 1 and a maximum of 8 future self-images for either themselves ('self' task) or an acquaintance ('acquaintance' task). They were asked to imagine what they/their acquaintance might become in the future and to produce "I will be …" statements that might describe their identities in the future, but did not describe them at the present time. Participants were asked to rate each specific future self-image on a rating scale (1–7) for positivity (1 very negative; 7 very positive) and emotional intensity (1 not emotionally intense at all; 7 really emotionally intense), and to state how old they or their acquaintance would be when the future self-image in turn would happen. Once participants finished the first task successfully, they were presented with the second one. The two tasks were identical, with the wording of the items changed to reflect whether participants were providing/rating future self-images for themselves or for their acquaintance.

Results

The participants generated a total of 1354 future self-images ($M = 7.20$, CI [6.98, 7.43]) and a total of 1270 future self-images of an acquaintance ($M = 6.76$, CI [6.46, 7.05]). Preliminary analyses showed that participants did choose an acquaintance similar to their own age ($M_{participants} = 34.07$, CI [32.56, 35.58], $M_{acquaintances} = 33.07$, CI [31.55, 34.60]). They had known the acquaintance for a mean of 6.45 years (CI [5.91, 7.00]) and reported moderate liking ($M = 5.45$,

CI [5.27, 5.62]) and closeness ($M = 4.34$, CI [4.09, 4.58]) for the person.

As we were interested in how results from Experiment 1 extended to the domain of self-images, similar analyses were conducted on the frequency and type of future self-images generated for self vs. acquaintance. Generally, participants generated self-images for themselves that were in average more positive, compared to those generated for their acquaintances ($M_{self} = 6.22$ (CI [6.08, 6.35]), $M_{acquaintance} = 5.77$ (CI [5.59, 5.95]; $p < 0.001$, $d = 0.41$). To examine this more carefully, all the future self-images generated by the participants were classified according to their valence: negative (from 1 to 3), neutral (4), and positive (from 5 to 7). A 3 (valence category) × 2 (target of the future image) repeated-measures ANOVA, with two within subjects factors, was carried on the resulting number of future self-images that each participant generated in each category. The results revealed a large main effect of valence, F (2, 374) = 928.54, $p < 0.001$, $\eta_p^2 = 0.83$, and a main effect of target of the future self-image, F (1, 187) = 19.05, $p < 0.001$, $\eta_p^2 = 0.092$. Importantly, the results also indicated that these main effects were qualified by a significant interaction between valence category and target of the future self-image, F (2, 374) = 31.03, $p < 0.001$, $\eta_p^2 = 0.14$, suggesting that depending on the target of the future self-image, participants provided a different number of positive, neutral, or negative future self-images (see panel b in Fig. 1).

Follow-up Helmert contrasts revealed no main effect of valence category or interaction between this and the target of the future image when comparing negative to neutral future self-images, all Fs (1, 187) < 2.06, all ps > 0.153, all η_p^2s < 0.011; participants provided the same amount of negative and neutral future self-images for themselves as for their acquaintances. However, the results showed a large effect of valence category, when contrasting negative and neutral future self-images to positive ones, F (1, 187) = 1082.51, $p < 0.001$, $\eta_p^2 = 0.85$, and a significant interaction with target of the future self-image, F (1, 187) = 38.57, $p < 0.001$, $\eta_p^2 = 0.17$. This last contrast revealed that participants provided more positive future self-images overall than neutral or negative ones, and that participants generated significantly more positive future self-images for themselves than for an acquaintance ($p < 0.001$; see panel b in Fig. 1).[2]

The mean distance from present was calculated for all the future self-images generated for both self and acquaintance. Analyses of the mean distance from present showed that future self-images were dated to emerge on average 5.79 (CI [5.15, 6.43]) years from the participant's present while self-images of the acquaintances were dated to arise in average 5.45 (CI [4.83, 6.06]) years from the acquaintance's present. This difference in dating the self-images was not statistically significant, t (187) = 1.32, $p = 0.189$, and shows that participants dated future self-images to emerge similarly for either themselves or for their acquaintances.

Discussion

The findings of Experiment 2 echoed those in Experiment 1, but this time using future self-images instead of specific future events as a the target of the future cognition (see panels a and b in Fig. 1). Our results replicated the finding of an overwhelming dominance of positive self-images (e.g., Salgado & Berntsen, 2018) but added the novel finding that this dominance was less pronounced for future self-images generated for others, consistent with the hypothesis of self-enhancement function.

These results are in line with research on future selves showing that people envision their future selves based on positive opportunities and with reference to a desired future (Ruvolo & Markus, 1992). Our findings add that this is also the case for when people foresee future selves of others, but less markedly so compared with future self-images of themselves.

We replicated the shortening of future perspective found in Experiment 1 and in research addressing future self-images (e.g., Chessell et al., 2014; Rathbone et al., 2016; Salgado & Berntsen, 2018). Participants assessed both their future self-images and the self-images of their acquaintances to emerge during the first next 5–10 years from present. Importantly, to our knowledge, this is the first experiment to extend this finding to future self-images generated for others. The fact that both self-images for self and other happen to emerge in similar time proximity supports the idea that mental representations of the future may be generated from similar schematic knowledge across different tasks.

Altogether, the results of both Experiments 1 and 2 provided support for the idea that the positivity bias likely serves a self-enhancement function by positing the future as brighter but, crucially, more pronounced for self than for other regardless of the type of future thinking domain. The fact that both future events and future self-images were assessed to take place at similar periods of the future for self and for other, and that both showed the same favoritism to self relative to an acquaintance suggests that the mechanisms underlying these different mental constructions are governed by some of the same knowledge structures and motivational factors.

An overwhelming majority of positive future cognitions was generated for both self and other in the tasks employed in Experiments 1 and 2, which prevented us from analyzing

[2] As in Experiment 1, as the number of generated future self-images varied across participants, we ran the analysis once more using the proportion of the events in each valence category rather than the raw frequency. The patterns and results did not change.

distance from the present as a function of valence of the event. For that reason, Experiments 1 and 2 could not clarify whether distance from present is affected by the valence of these cognitions and whether this might interact with their target (self vs. other). To address this issue, in Experiments 3 and 4 we manipulated both the valence of the future cognitions (asking for specific positive and negative cognitions) as well as the number of future cognitions to be generated (three in each valence category). To avoid carryover effects from generating future cognitions for the self vs. future cognitions about other people, a between subjects design was preferred. Experiments 3 and 4 were designed to test the assumption that the positivity bias in future thinking serves a self-enhancement function by means of depicting positive, but not negative, future cognitions temporally closer to the present, for oneself but not for other.

Experiment 3

Experiment 3 examined how emotional valence of events influenced the distance from present with which participants anticipated future events for themselves versus for an acquaintance. We hypothesized that participants would judge positive events to occur closer to their present and assess negative events further into their future. Based on the assumption that this pattern serves self-enhancement, we did not expect it to generalize to positive versus negative events generated for an acquaintance. Thus, our hypothesis was that distance from present should not be affected by the emotional valence of events generated for an acquaintance.

Method

Participants

A total of 200 participants were recruited through Amazon's Mechanical Turk; 100 participants were randomly assigned to the self condition and 100 to the acquaintance condition. The sample size was calculated based on previous studies using the self versus other manipulation in relation to future thinking (e.g., Grysman et al., 2013), as well as on studies recruiting participants from Amazon's Mechanical Turk, which aimed to detect a medium-size main effects of two independent variables (target of the future projection × valence of the future projection) on a single dependent measure (distance from present; e.g., Durbin et al., 2018; Rudert et al., 2018). Four participants were eliminated as their answers indicated they did not understand the task (e.g., future age was earlier than their current age). The final sample consisted of 196 participants (90 women, 106 men, $M_{age} = 35.12$, 95% CI [33.70, 36.54], range 20–68). The chosen sample size allowed us to reach a power of at least 0.90 or higher. The experiment received ethical approval from the Review Board of the Center on Autobiographical Memory Research.

Design

We used a 2 target (self vs. acquaintance) × 2 valence (negative vs. positive) mixed design, with target as a between-subjects variable and valence as a within-subjects variable.

Materials

Participants answered either the self or the acquaintance task. In both tasks, they were asked to generate negative and positive future events that were likely to happen to them or to an acquaintance. Participants were also asked to rate the generated future events on different scales and to provide an estimated age of when these events might occur (see Procedure).

Procedure

A survey was created and advertised in Mechanical Turk. After providing informed consent and demographic information, participants were randomly assigned to either the self or to the acquaintance condition. Participants who completed the survey were paid 1.00 USD for their time.

In addition to manipulating the target of the future events, the aim of the experiment was to manipulate their valence. Hence, participants were asked to generate three negative future events for either themselves or an acquaintance (depending on the condition). Following a similar procedure as with the previous experiments, after participants had generated their set of future events, they were presented with each of the events, one at the time, and were asked to rate each future event for positivity and emotional intensity on a rating scale (1–7). They were also asked to state how old they or the acquaintance will be in each of the generated events. Participants were then asked to provide three positive future events for either themselves or an acquaintance (depending on the condition). They also rated each of these future events for positivity and emotional intensity, as they did for their negative future ones. For ethical reasons, participants were always asked to provide and rate the negative events first and positive events at the end, independently of the condition to which they were assigned (self vs. acquaintance). Therefore, the order of negative and positive events was not counterbalanced. In addition, participants were also instructed that if they felt uncomfortable providing extremely negative future events, providing mildly negative ones was acceptable. The same was true for the instructions regarding positive future events. All instructions in both tasks were kept as similar as

possible, changing only the words related to the target of the future event (self or acquaintance).

Results

Participants in the acquaintance condition selected persons similar to their age as their acquaintance ($M_{particiapants} = 35.08$, CI [33.03, 37.13], $M_{acquaintances} = 34.52$, CI [32.53, 36.50]). They had known this person for a mean of 6.73 years (CI [5.90, 7.56]) and, reported moderate liking ($M = 5.06$, CI [4.81, 5.32]) and closeness ($M = 3.98$, CI [3.67, 4.29]) for them. Analyses on the positivity for both self and acquaintance's future events demonstrated that participants did provide clearly negative ($M_{self} = 1.64$, CI [1.50, 1.77], $M_{acquaintance} = 2.22$, CI [1.99, 2.44]) and clearly positive future events ($M_{self} = 6.35$, CI [6.16, 6.54], $M_{acquaintance} = 6.22$, CI [6.06, 6.38]) in both conditions, both *t*s (96, 98) > 23.33, all *p*s < 0.001, all *d*'s > 4.14. This indicates that the manipulation for valence did work. Analyses also revealed that across conditions, participants were significantly less negative about events related to self than for events related to others [t (194) = −4.40, $p < 0.001$, $d = 0.63$]. This, however, was not the case for positive events. Participants in both conditions rated positive events as equally positive for both the self condition and the acquaintance condition [t (194) = 1.04, $p > 0.250$, $d = 0.15$].

Distance from present was calculated for all events, and submitted to a 2 (self vs. other) × 2 (negative vs. positive) mixed ANOVA, with self vs. other as a between subjects factor and negative vs. positive as a within subjects factor, to inspect how it varied as a function of valence and the target of the future events. The results showed that there was a significant effect of target, F (1,194) = 27.51, $p < 0.001$, $\eta_p^2 = 0.12$, and a significant effect of valence, F (1,194) = 28.08, $p < 0.001$, $\eta_p^2 = 0.13$. Importantly, the analyses demonstrated that these effects were qualified by a significant interaction between the valence of the future events and the target of them, F (1,194) = 22.34, $p < 0.001$, $\eta_p^2 = 0.10$. Inspection of the estimated marginal means indicated that participants dated negative futures events occurring to themselves significantly further in time than positive future events, which they dated to occur closer to their present ($p < 0.001$). This pattern, however, was not found for participants dating future events to occur to an acquaintance; participants dated future events for an acquaintance to occur equally close to the present, regardless of them being negative or positive ($p > 0.250$; see panel c in Fig. 1).

Discussion

Results of Experiment 3 replicated results of other research showing that people date positive future events to occur close to the present and assessed negative events to occur markedly later in the future (e.g., D'Argembeau & Van Der Linden, 2004a; Rasmussen & Berntsen, 2013). However, importantly, we demonstrated that this pattern was not present for events generated for an acquaintance. Positive and negative events generated for an acquaintance were assessed to occur equally close to the acquaintance's present. This interaction provides evidence in support of the hypothesis that the positivity bias in episodic future thinking serves a self-enhancement function by depicting positive future events closer to present only for self, and not for others.

Experiment 4

Experiment 3 demonstrated that the emotional valence influenced the distance from present of future events people generated for themselves but not for an acquaintance. In Experiment 4, we aimed to extend these results to the domain of self-images, using an analogous task. We hypothesized that participants would forecast positive self-images of themselves to emerge closer in time and to forecast negative self-images to emerge in their distant future. In parallel with findings in Experiment 3, we also had the hypothesis that this would not extend to future self-images of an acquaintance; participants should estimate both positive and negative future self-images to emerge in an equal distance from their acquaintance's present.

Method

Participants

A total of 200 participants were recruited through Amazon's Mechanical Turk; 100 participants were randomly assigned to the self condition and 100 to the acquaintance condition. As the aim of Experiment 4 was to extend the findings of Experiment 3 to another domain of future thinking (i.e., self-images), the sample size was calculated using the same strategy as in Experiment 3. Two participants were eliminated as their answers indicated they did not understand the task (e.g., future age was earlier than their current age). The final sample consisted of 198 participants (74 women, 124 men, $M_{age} = 34.28$, 95% CI [32.87, 35.70], range 19–63). The experiment received ethical approval from the Review Board of the Center on Autobiographical Memory Research.

Design

We used a 2 target (self vs. acquaintance) × 2 valence (negative vs. positive) mixed design, with Target as a between-subjects variable and Valence as a within-subjects variable.

Materials

We used the *I will be task* and the *He/She will be task* that were also used in Experiment 2. Participants in both tasks were asked to generate future identities of either themselves (I will be… statements) or of an acquaintance (He/She will be… statements). They were also asked to rate the generated future self-images on different scales and to provide an estimated age of when these self-images might occur (see Procedure).

Procedure

A survey was created and advertised in Mechanical Turk. After providing informed consent and demographic information, participants were randomly assigned to either the *I will be task* or the *He/She will be task*. Participants, who completed the survey, were paid 1.00 USD for their time.

The instructions and procedure were similar to the one in Experiment 3, with the difference that this time, participants were asked to generate negative and positive future self-images for either themselves or an acquaintance depending on the condition (self vs. acquaintance). After they had generated the future self-images, they were asked to rate each future self-image for positivity and emotional intensity on a rating scale (1–7), and to state how old they or their acquaintance will be when the future self-image would come true. For ethical reasons, participants provided and rated the negative self-images first and positive self-images second, independently of the target condition to which they were assigned. All instructions in both tasks were kept as similar as possible, changing only the words related to the target of the future self-image (self or acquaintance).

Results

Initial analyses on the acquaintance condition group showed similar results to the previous three experiments. Participants in the acquaintance condition selected an acquaintance with an age similar to their own ($M_{\text{participants}} = 35.85$, CI [33.77, 37.93], $M_{\text{acquaintances}} = 35.32$, CI [33.31, 37.34]). Also, they had known this person for a mean of 6.94 years (CI [6.14, 7.74]) and reported moderate liking ($M = 5.33$, CI [5.09, 5.58]) and closeness ($M = 4.18$, CI [3.87, 4.50]) for them. Preliminary analyses on the positivity for both self and acquaintance's future self-images showed that participants in both conditions rated negative future self-images ($M_{\text{self}} = 2.06$, CI [1.88, 2.24], $M_{\text{acquaintance}} = 2.31$, CI [2.13, 2.50]) as significantly more negative than positive ones ($M_{\text{self}} = 6.30$, CI [6.16, 6.44], $M_{\text{acquaintance}} = 6.01$, CI [5.84, 6.18]), all ts $(98) > 26.49$, all ps < 0.001, all ds > 4.12. This indicates that the manipulation for valence did work in both conditions; participants provided clearly negative and positive future self-images. Further analyses revealed that across conditions, participants rated negative future self images as equally negative for both self and other [$t(196) = -1.95$, $p = 0.053$, $d = 0.28$]. This, however, was not the case for positive self-images. Participants in the self condition rated positive self-images significantly more positive than participants in the acquaintance condition [$t(196) = 2.54$, $p = 0.012$, $d = 0.36$].

Distance from present was calculated for both conditions of future self-images (self vs. acquaintance) and submitted to a 2 (self vs. other) × 2 (negative vs. positive) mixed ANOVA, with self vs. other as a between subjects factor and negative vs. positive as a within subjects factor, to examine how it varied as a function of valence and the target of the future self-images. The results showed that there was a significant effect of target, $F(1,196) = 29.18$, $p > 0.001$, $\eta_p^2 = 0.13$, and a significant effect of valence, $F(1,196) = 38.07$, $p < 0.001$, $\eta_p^2 = 0.16$. Importantly, these effects were qualified by a significant interaction between the valence of the future self-images and the target of them, $F(1,196) = 32.82$, $p < 0.001$, $\eta_p^2 = 0.14$. Inspection of the estimated marginal means indicated that participants dated their negative self-images to occur significantly further in time than their positive future self-images, which they dated to occur closer to their present ($p < 0.001$). This, however, was not true for when participants dated future self-images of an acquaintance; participants dated future self-images of an acquaintance to occur equally close to the present, regardless of them being negative or positive ($p > 0.250$; see panel d in Fig. 1).

Discussion

The results of Experiment 4 showed that when participants are required to generate positive and negative future self-images, they assessed their positive future self-images to be closer in time compared with their negative future self-images. Importantly, we demonstrated that this was not true when dating future self-images of an acquaintance, as both positive and negative future self-images of their acquaintances were dated to be equally close to their acquaintance's present. These results supported our hypothesis that the positivity bias in future self-images serves a self-enhancement mechanism by drawing the positive future self-images closer to present and pushing the negative future self-images further in time, but only for self-images of one self and not for the self-images of the acquaintance.

As in the previous experiments, the correspondence of results between episodic future thinking and future self-images support the claim that the positivity bias is likely a general feature of different domains of future thinking and serves a self-enhancement function, across different

tasks. Experiments 3 and 4 provided analogous evidence showing that positive future cognitions are drawn closer to the present for self but not for other. Also, the similarities among results of these two experiments support the idea that different kinds of mental representations of the future may rely on shared schematic structures and be constrained by some of the same motivational factors.

Meta-analysis of experiments 1–4

The main purpose of this meta-analysis was to investigate how the two measures of positivity bias (frequency and distance from present) varied as a function of cognitive domain (i.e. event versus self-image). So far, our design consisted in analyzing the effect of valence and target on these measures and on each domain separately. Experiments 1 through 4 showed consistent effects of positive versus negative valence and consistent interactions between valence and whether the target of the future thought was oneself or an acquaintance. This was found in both domains, that is, both when participants were asked to generate events (Experiments 1 and 3) and self-images (Experiments 2 and 4). In order to focus on the role of self versus other and positive versus negative valence, as well as to show consistent replications across Experiments 1–4, we elected not to examine possible effects and, therefore, possible interactions, of the cognitive domain (i.e., event versus self-image), as this would have required us to merge the data. However, as each pair of experiments used corresponding tasks, and since all subjects were recruited from the same pool, and none of them participated in more than one of the four experiments, it was possible to reanalyze the data in the present meta-analysis with the specific aim of testing the effect of domain (see Staugaard & Berntsen, 2014 for a similar procedure). In addition, this reanalysis helped us to corroborate that, despite our results showing consistent replications across experiments, similar tasks across each set of experiments (Experiments 1 and 2; and Experiments 3 and 4) indeed targeted different forms future thoughts (events vs. self-images).

Method

The data of all 388 participants from Experiments 1 and 2 were included in one database to examine the effect of domain of the future cognition (episodic or semantic) on frequency of the future cognitions generated. Similarly, the data of all 394 participants from Experiments 3 and 4 were merged in a single database to analyze the effect of domain on distance from present of the future cognitions.

Results

In the meta-analyses of the previous results, we conducted a 2 (domain: episodic vs. semantic) × 2 (target: self vs. acquaintance) × 3 (valence: positive, neutral vs. negative) mixed ANOVA with frequency of future cognitions generated on Experiments 1 and 2 as the dependent variable. Another 2 (domain: episodic vs. semantic) × 2 (target: self vs. acquaintance) × 2 (valence: positive vs. negative) mixed ANOVA was conducted on distance from present of the future cognitions generated by participants in Experiments 3 and 4. As we were running additional analyses on the same data, we made a Bonferroni correction and adjusted the alpha-level to $\alpha = 0.01$ to reduce the risk of type-1 error.

Domain and frequency of future cognitions

The results showed that there was a significant effect of domain, $F\,(1,386) = 8.48$, $p = 0.004$, $\eta_p^2 = 0.21$, and a significant interaction between domain and the valence of the future cognitions, $F\,(1,386) = 35.74$, $p < 0.001$, $\eta_p^2 = 0.085$. The effect of domain indicated that participants overall generated significantly more self-images than events. As for the interaction between domain and valence, inspection of the estimated marginal means revealed that participants generated significantly more positive self-images than positive events, but significantly more neutral and negative events than neutral and negative self-images (all $ps = < 0.001$). The interaction between domain and target was not significant under the new alpha value, $F\,(1,386) = 6.26$, $p = 0.013$, $\eta_p^2 = 0.016$. Also, the three-way interaction between domain, target, and valence of the future cognition was not significant, $F\,(1,386) = 3.54$, $p = 0.061$, $\eta_p^2 = 0.009$. The absence of a significant three-way interaction shows that the interaction between target and valence replicated across cognitive domains, that is, events and self-images.

Domain and distance from present of future cognitions

The results of this analysis revealed that there was a significant effect of domain, $F\,(1,390) = 33.75$, $p < 0.001$, $\eta_p^2 = 0.080$, on distance from present, indicating that participants assessed events and self-images to occur at different points in the future. Inspections of the estimated marginal means showed that participants projected events to occur significantly closer to the present compared to self-images, which they estimated to happen further into the future. There were no significant interactions between domain and either the valence or the target of the future cognitions, nor a significant three-way interaction, all $ps > 0.212$.

Discussion

The results of our meta-analysis showed that although similar effects were found across domains (episodic and semantic) in Experiments 1 and 2, and in Experiments 3 and 4 correspondingly, each experiment clearly targeted a different instance of future thought. Specifically, the results of our meta-analysis on Experiments 1 and 2 demonstrated that participants generated overall more future self-images than events. Correspondingly, the meta-analyses of the data of Experiments 3 and 4 showed that participants assessed future self-images to occur farther into the future compared to future events, which they judged to happen closer to the present. The effect of the domain (episodic and semantic), on both the frequency of the future cognitions generated and their distance from present, in turn, underscores the robustness of results from Experiments 1 through 4 by emphasizing their generalizability across cognitive domains.

General discussion

Self-enhancement biases are well-established (e.g., Alicke & Sedikides, 2009; Ebner, Freund, & Baltes, 2006; Sedikides & Gregg, 2008) and may lead to biased recall of past events and their temporal distance from the self (Ross & Wilson, 2002; Wilson & Ross, 2001). Similar biases have been found in the future thinking literature and in both the semantic and the episodic domains. However, the lack of direct comparison with similar tasks across domains, as well as conflicting findings using the self versus other manipulation put into question whether these findings truly signify self-enhancement, and whether self-enhancement also represents a similar underlying motivational mechanism in both domains of future thinking. In a systematic analysis of the positivity bias in future thinking, we examined and extended the self-enhancement effect found in the recall of past events to imagined events and self-images in the future, using equivalent tasks in both the episodic and the semantic domains. A meta-analysis of Experiments 1–4 documented clear differences between the semantic versus episodic tasks, underscoring the robustness and replicability of the findings. More specifically, the results across the four experiments provided solid evidence supporting the claim that the positivity bias in future thinking serves a self-enhancement function (Ross & Wilson, 2002; Wilson et al., 2012; Wilson & Ross, 2001). Our findings also suggested that self-enhancement is likely a shared aspect of many forms of future thinking.

The results of Experiments 1 and 2 showed that emotional valence influenced the frequency of future cognitions when the agent of these was one's own self but less so, when the agent was an acquaintance. The two experiments showed that when participants freely generated future events and self-images, they showed an overwhelming preference for nominating positive events and self-images over neutral or negative ones. These results are in line with previous findings on episodic (e.g., D'Argembeau & Van Der Linden, 2004b) and future self-images research (e.g., Rathbone et al., 2011). Here, we extended these results for future events and future self-images generated for an acquaintance. We showed that when participants generated events and self-images for an acquaintance, they also nominated more positive over neutral or negative instances. However, while more positive events and self-images were produced for both self and an acquaintance, this preference for positive cognitions was significantly more marked for self than for the acquaintance.

Experiments 3 and 4 demonstrated that the emotional valence of future thoughts also influenced their judged distance from present, and that this perceived distance was sensitive to the target of the future cognition (whether self or an acquaintance). In line with previous research on episodic future thinking (e.g., Wilson et al., 2012), the results of Experiment 3 demonstrated that individuals forecasted their positive events to occur closer to their present, but they assessed their negative events to occur further into their future. We demonstrated that this pattern, however, was not found for future events nominated for an acquaintance; participants judged events to occur close to the acquaintance's present regardless of the events being negative or positive. Experiment 4 extended these results to the domain of future self-images. The results of this experiment demonstrated that, similar to events, subjects estimated their positive self-images to emerge closer to their present, and relegated their negative self-images to emerge further into their future. This, however, was true only for future self-images about the self. It was not true for future self-images that participants forecasted for an acquaintance; both positive and negative self-images were assessed to emerge equally close to the acquaintance's present.

Altogether, this series of experiments demonstrated that the mental construction of the future is highly sensitive to the emotional valence (whether positive or negative) as well as to the target (self or others) of the future cognitions. The results also showed that the manipulation of the type of domain (episodic or semantic) yield barely any difference in these results, although the two domains differed between themselves. Accordingly, our findings suggest that the positivity bias found in both the episodic future thinking and the semantic future thinking domains likely have a similar underlying mechanism. It is likely that the positivity bias is a common feature shared by different mental representations of the future, from episodic forms of thought to those including more semanticized forms, such as self-images.

Despite results showing similarities between the episodic (events) and the semantic (self-images) domains of future

thinking, important differences were also found. For example, the meta-analysis with the data of the four experiments showed that the number of self-images generated was significantly higher than the number of events. Further, compared with events, self-images were judged to emerge significantly later in the future. These differences are in line with research suggesting that episodic thinking demands more cognitive effort by virtue of its richer phenomenological characteristics and its connections to contextual details at the present (e.g., D'Argembeau & Mathy, 2011; D'Argembeau & Van Der Linden, 2004a; Trope & Liberman, 2003). In contrast, semanticized forms—such as self-images—depend on knowledge that is more abstract, less detailed, less context dependent, and less cognitive demanding (e.g., Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002; Rubin, 2014). The finding that self-images were generated more easily than events agrees with self-images representing more schematic forms of knowledge, which, therefore, is more easily accessible (e.g., cultural life scripts; Berntsen & Rubin, 2004; Zaragoza-Scherman, Salgado, Shao, & Berntsen, 2017). In turn, the finding that self-images were judged to emerge significantly later in the future than the imagined events is in line with prior work showing that, mental representations of temporally distant occurrences are more abstract (thus, more schema-driven) than occurrences imagined closer in time (Trope & Liberman, 2003). Overall, these results support the idea that, while both domains of future thinking are affected similarly by the emotional valence and the target of the future cognitions, they still represent different instances of thought (see Levine et al., 2002; Prebble et al., 2013; Szpunar et al., 2014 for related discussions). The fact that our key results replicated across these two domains underscore the robustness and replicability of the findings.

The results of the four experiments replicated the shortening of future perspective reported in research using open-ended tasks in both episodic (e.g., Rasmussen & Berntsen, 2013) and self-images research (e.g., Salgado & Berntsen, 2018). We extended these findings and demonstrated that this shortening in future perspective is also present when thinking about the future of others, and that it interacts systematically with the valence of the cognition.

Although the present findings are interpreted to support a self-enhancement mechanism, it is important to note that a future furnished with a higher number of positive occurrences closer to the present also is likely to serve motivational functions other than self-enhancement. It is likely that the mental construction of the future represents a narrow, but realistic, timespan to pursue endeavors while having higher expectations of success (see Oyserman, Bybee, Terry, & Hart-Johnson, 2004; Rasmussen & Berntsen, 2013), although naively (Sharot, 2011a, b; Stefan & David, 2013). This short and positive perspective of the future could be beneficial as it may help subjects to envision tangible goals, which are likely nurtured from concerns at present, and also profit more from on-line adjustment behavior than goals in distant time. If this proposition is correct, psychological disorders characterized either by a diminished sense of self (e.g., schizophrenia) or by a negative vision of the future (e.g., anxiety disorders) might show reverse patterns (see Di Simplicio, Holmes, & Rathbone, 2015). In these cases, negative future instances might be posited closer to the present and promote avoidance rather than approach. This should be explored in future research.

One possible limitation of this series of experiments is the fact that all data was collected on-line using subjects from the pools of Amazon's Mechanical Turk. However, various studies using this platform have already demonstrated that the quality of the responses is as trustworthy as the data collected via more conventional means (Berntsen, Rubin, & Salgado, 2015; Buhrmester, Talaifar, & Gosling, 2018; Grysman, 2014; Grysman, Prabhakar, Anglin, & Hudson, 2015). Research has also shown that subjects on this platform are highly motivated and engaged (see Mason & Suri, 2012 for a review). Finally, the validity of our results is supported by the fact that we replicated previous and well-established findings in the literatures addressing semantic and episodic future thinking. A second issue with using subjects from Mechanical Turk is the fact that the entire pool is mostly composed of Americans (Stewart et al., 2015). Future research should address whether our findings hold in samples from different cultures.

Conclusion

The present series of experiments provided the first systematic analyses of the positivity bias found in episodic future thinking (events) and the semantic domain (self-images). We did so by using two equivalent tasks assessing two different measures of the positivity bias (frequency vs. distance from present), and by contrasting each measure with regards to the agent of the future thought (self vs. an acquaintance). Taken together, our results suggested that the positivity bias serves a self-enhancement function by two means. First, it does so by means of anticipating higher frequencies of positive future experience and, second, by means of depicting future positive cognitions closer to present while pushing negative ones into the distant future. Importantly, these mechanisms were true only for thoughts in which the agent was the participant's own self, not another person. Finally, we demonstrated that these forms of self-enhancement are present regardless of the domain of the future cognition (whether semantic or episodic).

Our findings have relevant implications for research in other areas of psychology, such as areas working with a range of disorders (e.g., depression, anxiety disorders)

in which the sense of self is diminished or threatened by thoughts of negative future scenarios. Future research should examine whether the patterns established here with healthy individuals will differ in such disorders. Beyond psychology, our findings have relevance for disciplines dealing with models of decision making or planning, where motivation, goal pursuit, approach, action taking, and collaboration (self-other) dynamics play a central role, such as in marketing, consumption and political behavior.

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Author contributions All authors contributed to the study design. SS performed the data analysis and interpretation under the supervision of DB. SS drafted the manuscript, and DB provided critical revisions. All authors approved the final version of the manuscript for submission.

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