

## Imagining nice and nasty events in childhood or adulthood: Recent positive events show the most imagination inflation

Stefanie J. Sharman<sup>a,\*</sup>, Amanda J. Barnier<sup>b,2</sup>

<sup>a</sup> School of Psychology, University of New South Wales, Sydney, NSW 2052, Australia

<sup>b</sup> Macquarie Centre for Cognitive Science, Macquarie University, Sydney, Australia

### ARTICLE INFO

#### Article history:

Received 16 July 2007

Received in revised form 29 May 2008

Accepted 10 June 2008

Available online 18 July 2008

#### PsycINFO classification:

2343

#### Keywords:

Imagination inflation

False memories

Source monitoring

### ABSTRACT

We explored whether event recency and valence affect people's susceptibility to imagination inflation. Using a three-stage procedure, subjects imagined positive and negative events happening in their distant or recent past. First, subjects rated how confident they were that they had experienced particular positive and negative events in childhood or adulthood using a Life Events Inventory (LEI). Two weeks later, they imagined two positive and two negative events from the LEI. Finally, they rated their confidence on the LEI a second time. For positive events, subjects showed more imagination inflation for adulthood than childhood events. For negative events, they showed no difference in imagination inflation for adulthood and childhood events. We discuss factors that may influence source confusions for memories of the past and highlight directions for future research.

© 2008 Elsevier B.V. All rights reserved.

### 1. Introduction

People who imagine false childhood events often become more confident that they had experienced those events; an effect known as imagination inflation (Garry, Manning, Loftus, & Sherman, 1996; Sharman, Garry, & Hunt, 2005). There are three steps in the imagination inflation procedure. First, subjects rate how confident they are that certain childhood events happened using a Life Events Inventory (LEI). Second, they imagine some of the events from the LEI but not others. Third, subjects rate their confidence about all the events on the LEI a second time. In one such study, subjects who imagined false childhood events (such as getting a skin sample taken by a school nurse) were four times more likely to remember experiencing the event than those who read about the event (Mazzoni & Memon, 2003).

Imagination inflation occurs when people experience source confusions and attribute imagined events to genuine experiences (Garry et al., 1996; Sharman et al., 2005). According to the Source Monitoring Framework (SMF), people use the qualitative details of their memories to judge whether they genuinely experienced

remembered events or internally generated them (Johnson, Hashtroudi, & Lindsay, 1993; Mitchell & Johnson, 2000). Typically, people judge memories that contain many sensory and perceptual details and that feel very familiar to be memories of externally generated, genuinely experienced events. They judge memories that contain few of these details and feelings to be memories of internally generated, not experienced events. In imagination inflation, people become more confident that they experienced the internally generated events because the act of imagining presumably enhances the sensory and perceptual details associated with that experience.

The imagination inflation procedure was originally designed to investigate whether merely imagining false events, such as traumatic childhood experiences, creates beliefs that these events were genuine. Thus, research has focused on, and imagination inflation has been demonstrated with, a range of (mildly) negative childhood events, which attempt to balance forensic relevance with experimental ethics (e.g., going to the emergency room late at night; Garry et al., 1996). Research has not yet considered whether people are more, less or equally susceptible to imagination inflation for (1) distant, childhood and more recent, adulthood events, and (2) positive and negative events. Some researchers have measured imagination inflation for events adults experienced recently (e.g., flipping a coin two weeks ago; Goff & Roediger, 1998) and some researchers have included a few (mildly) positive events in their experiments (e.g., winning a stuffed animal at a carnival game; Garry et al., 1996). However, these events have varied

\* Corresponding author. Tel.: +61 2 9385 3047; fax: +61 2 9385 3641.

E-mail address: [s.sharman@unsw.edu.au](mailto:s.sharman@unsw.edu.au) (S.J. Sharman).

<sup>1</sup> She was supported by a Vice Chancellor's Postdoctoral Fellowship at the University of New South Wales.

<sup>2</sup> She was supported by Australian Research Council (ARC) Queen Elizabeth II Fellowship and an ARC Australian Research Fellowship.

enormously in terms of recency and valence. In this experiment, we took the first steps in exploring whether imagination inflation differs for positive and negative interpersonal events in subjects' distant or recent past.

In terms of event recency, imagination inflation has been found for both childhood (distant) and adulthood (recent) events, but there has been no direct comparison. There are three possible outcomes of this comparison: childhood events might show more inflation than adulthood events, adulthood events might show more inflation than childhood events, or both types of events might show equal levels of inflation. By considering four factors from the misinformation, source monitoring, and imagination inflation literatures, we can evaluate these predictions for which events will show most inflation: (1) discrepancy detection, (2) attributing the act of imagination, (3) memory qualities, and (4) feature importation. The first factor is discrepancy detection. The "Discrepancy Detection Principle" (Tousignant, Hall, & Loftus, 1986) suggests that people are more likely to accept misinformation if their memories for the original event have been weakened by the passage of time, which makes individuals less likely to detect discrepancies between the misinformation and the genuine event (Loftus, 2005). On the surface, this principle suggests that our subjects who remember and imagine childhood events might be less likely to detect discrepancies than subjects who remember and imagine adulthood events, because of the longer time elapsed between the act of imagination and the events of childhood. Thus, these subjects should show more imagination inflation. However, the discrepancy relevant to imagination inflation is not between the time of the original events (in childhood or adulthood) and the time of generating events during the imagination exercise. Rather, the discrepancy is between the time of remembering these events when completing the first LEI and the time of generating events during the imagination exercise. Since this time frame is relatively short and the same for subjects who imagine childhood or adulthood events, there is no reason to expect that one group would be less likely to detect discrepancies than the other. Therefore, discrepancy detection predicts no difference in imagination inflation between childhood and adulthood events.

The second factor, related to discrepancy detection, is attributing the act of imagination. Garry et al. (1996) illustrated this attribution in the following way. Consider a group of people who imagine winning the lottery. Although they may imagine this event vividly, few would misattribute it to genuine experience. Instead – given ample evidence that they are not millionaires – they would correctly attribute to their imaginations. In imagination inflation experiments, for plausible events, people may incorrectly misattribute their imaginings to the past, overlooking the impact of the imagination exercise. In contrast, for more implausible events, the recent imagination exercise might be a more salient explanation such that people are far less likely to attribute those events to genuine experience. Although this explanation makes no clear predictions about inflation for childhood vs. adulthood events, it leads us to consider the role of plausibility in case distant vs. recent events are inherently more or less plausible.

The third factor, memory qualities, allows us to make a direct prediction about imagination inflation for childhood and adulthood events. Research shows that memories of distant, childhood events contain fewer memory qualities (sights, sounds, etc.) than memories of recent, adulthood events because the memories of childhood events have faded over time (Johnson, Foley, Suengas, & Raye, 1988; Sporer & Sharman, 2006). In fact, memories of childhood events contain qualities similar to imagined events. Johnson et al. (1988) asked subjects to remember and imagine childhood or adulthood events and rate their memory qualities. For childhood events, remembered events were rated differently from imagined events on only 3 qualities. For adulthood events, remembered

events were rated differently from imagined events on 20 of the 38 qualities. Therefore, our subjects who imagine childhood events should generate imaginings with similar qualities to their genuine childhood memories. Subjects who imagine adulthood events should generate imaginings with fewer qualitative details than their genuine adulthood memories. Thus, genuine memories and imagining of childhood events should be more easily confused, and childhood events should show more imagination inflation than adulthood events. Of course, differences in memory qualities may underlie imagination inflation for both types of events, but findings on memory quality point to more inflation for childhood events.

The fourth factor, feature importation, also allows us to make a direct – albeit opposite – prediction about imagination inflation for childhood and adulthood events. When people imagine events, they base their imaginings on their past experiences, which can make their imaginings of recently experienced events particularly vivid and detailed (Lyle & Johnson, 2006; see also Henkel & Franklin, 1998). For example, subjects who imagined objects (e.g., lollipop) similar to those that they had actually seen (e.g., magnifying glass), reported that the imagined objects had similar shapes, colours, or locations to the seen objects. In other words, subjects imported features from the seen objects into their imaginations (this phenomenon has also been called "content borrowing"; see Lampinen, Meier, Arnal, & Leding, 2005). This importation increased subjects' qualitative ratings, which suggests that their memories of the imagined objects were similar to their memories of the seen objects. In our experiment, subjects who imagine childhood events may find it difficult to import features (e.g., qualitative details) from their genuine distant experiences because their memories are faded and vague. However, subjects who imagine adulthood events may find it easier to import features from their genuine recent experiences because their memories are clear and accessible. Consequently, subjects' imaginings of adulthood events may contain particularly clear and vivid details, which may make them more likely to be confused with genuine adulthood memories. Thus, adulthood events should show more imagination inflation than childhood events. Again, differences in feature importation may underlie imagination inflation for both types of event, but findings on feature importation point to more inflation for adulthood events.

Although we can make predictions about the impact of event recency on imagination inflation, we are particularly interested in how event recency and valence may interact. No imagination inflation studies have compared positive and negative events. However, we know from the veridical memory literature that positive autobiographical memories typically contain more sensory and temporal memory qualities than negative autobiographical memories (Destun & Kuiper, 1999; Schaefer & Philippot, 2005). For instance, subjects' positive memories contained more sounds, tastes, smells, and information about the day, season, and year in which the events took place than their negative memories. Similarly, valence can influence the qualities of imagined autobiographical events. In one study, subjects described two genuine and two imagined events before rating their characteristics (Destun & Kuiper, 1999). Both genuine and imagined positive events contained more sensory and temporal qualities than genuine and imagined negative events, respectively. This may occur because people tend to elaborate on positive rather than negative events, because these events are more consistent with their self-enhancement goals and positive views of themselves (e.g., Baumeister, 1998; D'Argembeau & Van der Linden, 2004). Destun and Kuiper also found that, on average, imagined positive events contained more qualities than genuine negative events, which could increase the difficulty of people's source monitoring judgments, especially when making judgments about both real and imagined, positive and negative memories, as in our experiment. Based on this literature, we expect

that imagination will boost the qualities of positive events more so than negative events such that imaginings of positive events will be more easily confused with memories of positive events, leading to more imagination inflation for positive than for negative events. The most interesting question, however, will be whether and how valence interacts with event recency to affect imagination inflation.

## 2. Method

### 2.1. Subjects and design

Seventy-eight undergraduate psychology students (53 females), from the University of New South Wales, (age:  $M = 21.83$  years,  $SD = 8.11$  years, range = 17–59 years) participated in return for course credit. We used a 2 (event recency: childhood, adulthood)  $\times$  (2) (event valence: positive, negative)  $\times$  (2) (imagined: yes, no) mixed design.

### 2.2. Materials and procedure

Subjects took part in two sessions two weeks apart.

**Session 1.** Subjects were told that the experiment was about their perceptions of interpersonal experiences. Half completed a childhood Life Events Inventory (LEI; Garry et al., 1996) and rated whether events happened to them before the age of 10 on a scale from 1 (definitely did not happen) to 8 (definitely did happen). They also rated their memory for each event from 1 (no memory of event) to 8 (clear and complete memory). The other half completed an adulthood LEI and rated whether the same events happened to them within the last three years and their memories of those events. Both LEIs consisted of 20 positive events (e.g., you gave someone a gift for no special reason) and 20 negative events (e.g., you tried to sabotage someone else's success).<sup>3</sup>

**Session 2.** Subjects returned to describe some of their interpersonal experiences in more detail. Prior to Session 2, the experimenter chose 12 events for each subject using his or her pretest LEI ratings. Four true events were chosen from the events subjects had rated as 7 or 8 (or gave the next highest ratings) for both confidence and memory, two of these events were positive and two were negative. Eight false events were chosen from the events subjects had rated as 4 or lower for both confidence and memory; four events were positive and four were negative. If more than four true and eight false events were available for selection, the target events were randomly selected. The false events were divided into two groups: imagined events and not imagined (control) events.

Subjects were told that they would be using a guided retrieval technique to help them remember events that they had rated in Session 1. Subjects were told that to enhance their recall of these events, they should (1) reinstate the setting where the events occurred and (2) focus on the different sensory attributes (e.g., sights, sounds, smells) of their memories. For events that subjects did not remember in Session 2 (the four false events), they were instructed to imagine how the events might have happened. Specifically, they were told:

When I ask you to describe each of the events, I'll ask you to begin by thinking about the setting you were in when the event took place. Really cast yourself back, imagine that you're there, and pretend that it's all happening again. Look around yourself and tell me what you see. As you're casting your mind back, I'll ask you to think about as much detail as you can. Think about

sights, sounds, smells and time of day. Describe every detail that comes to mind, even if it seems irrelevant. If you can't remember all of an object, person, or event, then describe the fragments as they come to you. If you do not remember an event happening, I would like you to think about a setting in which the event might have occurred. I would like you to describe what you imagine.

Subjects gave written descriptions of eight events (four true and four false), which were presented in a random order. For each event, subjects received an answer sheet consisting of the event name at the top of the page and space to briefly describe the event. At the top of the page, they were instructed to "write down what you can remember about the following event. If you can't remember anything or are unsure whether it happened, please imagine the event and write down how it might have happened." They answered eight questions about each event, which were designed to draw their attention to perceptual details (sights, sounds, people) and apperceptual details (thoughts and feelings). They were given a maximum of 5 min to describe and answer questions about each event. After imagining and describing the eight events, subjects completed the childhood or adulthood LEI a second time.

## 3. Results

All subjects expressed surprise at finding out the true nature of the experiment; they had believed that they were participating in an investigation of their abilities to imagine childhood or adulthood events.

### 3.1. Imagination inflation

**Pretest confidence ratings.** Before determining whether subjects showed imagination inflation, we examined whether there were any pretest differences in their confidence ratings for imagined and not imagined events (see Table 1). There were no pretest differences in confidence ratings between imagined and not imagined false events,  $F(1, 76) = 0.28, p > .05$ , or childhood and adulthood events,  $F(1, 76) = 1.59, p > .05$ . There was, however, a pretest difference in confidence ratings between positive and negative events: subjects were more confident that they had not experienced the negative events ( $M = 1.64, SD = 0.89$ ) than the positive events ( $M = 1.97, SD = 0.96$ ),  $F(1, 76) = 12.23, p < .01, \eta_p^2 = .14$ . This difference was only about a third of a point on the 8-point scale and should not affect our interpretation of the imagination inflation

**Table 1**

Mean pretest and posttest confidence and memory ratings for imagined and not imagined false events

	Pretest		Posttest	
	Imagined	Not imagined	Imagined	Not imagined
<i>Confidence ratings</i>				
Childhood				
Positive	2.02 (1.04)	1.97 (0.97)	5.54 (2.03)	4.19 (1.76)
Negative	1.86 (1.10)	1.82 (1.04)	5.50 (2.10)	3.73 (1.67)
Adulthood				
Positive	1.98 (1.06)	1.88 (1.13)	6.37 (1.88)	3.63 (1.84)
Negative	1.40 (0.65)	1.47 (0.67)	4.67 (2.27)	3.05 (1.79)
<i>Memory ratings</i>				
Childhood				
Positive	1.32 (0.49)	1.36 (0.57)	4.22 (1.95)	2.86 (1.64)
Negative	1.31 (0.67)	1.28 (0.54)	4.40 (2.09)	2.41 (1.45)
Adulthood				
Positive	1.69 (0.99)	1.53 (0.77)	5.56 (1.96)	2.77 (1.74)
Negative	1.19 (0.49)	1.33 (0.67)	3.86 (2.28)	2.23 (1.51)

Note. Standard deviations are shown in parentheses.

<sup>3</sup> A pilot sample ( $n = 20$ ) rated the positive events as more positive/less negative ( $M = 6.94, SD = 0.52$ , where 1 = very negative and 7 = very positive) than negative events ( $M = 2.34, SD = 0.67$ ),  $t(19) = 22.48, p < .01$ .

results. The most important finding is that the pretest ratings for all false events were at or below 2 on the scale, which indicates that subjects were fairly confident that they had not experienced the false events at pretest.

**Inflation.** Before examining whether event recency and valence influenced people's susceptibility to imagination inflation, we first determined whether subjects showed imagination inflation. To avoid many of the problems associated with analyzing imagination inflation data (e.g., non-normal distributions because events rated 1–4 are selected; see Garry, Sharman, Wade, Hunt, & Smith, 2001), we used two steps to calculate inflation scores for each subject for each event. First, we subtracted subjects' pretest confidence ratings from their posttest confidence ratings to calculate their change scores. Second, we subtracted subjects' change scores for not imagined control events from their change scores for imagined events to calculate their imagination inflation scores. Inflation scores of zero indicate that subjects did not show imagination inflation; that is, their confidence ratings for the imagined events did not increase over and above changes in their confidence ratings for the not imagined events. Positive inflation scores demonstrate imagination inflation. Negative inflation scores indicate that subjects' confidence ratings for the imagined events decreased more than the changes in their confidence ratings for the not imagined events. Subjects' mean confidence inflation scores were normally distributed with no significant skewness or kurtosis ( $S = 0.47$ ,  $SE = 0.27$ ,  $p > .05$ ;  $K = 0.28$ ,  $SE = 0.54$ ,  $p > .05$ ; see Tabachnik & Fidell, 2001).

Subjects who imagined childhood events showed imagination inflation; that is, their confidence inflation scores were significantly greater than zero ( $M = 1.51$ ,  $SD = 1.64$ ),  $t(38) = 5.76$ ,  $p < .01$ , Cohen's  $d = 1.30$  (Cohen, 1988). Subjects who imagined adulthood events also showed imagination inflation ( $M = 2.17$ ,  $SD = 1.76$ ),  $t(38) = 7.71$ ,  $p < .01$ ,  $d = 1.74$ . There was no difference in imagination inflation for childhood and adulthood events,  $t(76) = 1.70$ ,  $p > .05$ .

Fig. 1a shows subjects' imagination inflation for positive and negative events imagined in childhood or adulthood. For positive events, subjects who imagined adulthood events showed more imagination inflation than those who imagined childhood events. For negative events, subjects who imagined adulthood events showed similar amounts of imagination inflation to subjects who imagined childhood events. A repeated measures ANOVA revealed that this interaction between recency and valence was significant,  $F(1,76) = 4.95$ ,  $p < .05$ ,  $\eta_p^2 = .06$ . Follow-up  $t$ -tests showed that for positive events, subjects who imagined adulthood events showed more imagination inflation than those who imagined childhood events,  $t(76) = 3.02$ ,  $p < .01$ ,  $d = 0.68$ . For negative events, there was no significant difference in imagination inflation between subjects who imagined childhood events and those who imagined adulthood events,  $t(76) = 0.07$ ,  $p > .05$ . Neither the main effect for recency nor valence was significant,  $F(1,76) = 2.89$ ,  $p > .05$  and  $F(1,76) = 0.68$ ,  $p > .05$ , respectively.

### 3.2. Memory inflation

The lower half of Table 1 shows subjects' mean pretest and posttest memory ratings for the imagined and not imagined events. As for imagination inflation scores, there were no pretest differences in memory ratings between imagined and not imagined events,  $F(1,76) = 0.01$ ,  $p > .05$ , or childhood and adulthood events,  $F(1,76) = 0.91$ ,  $p > .05$ , but there was a pretest difference in memory ratings between negative and positive events: subjects gave lower memory ratings to negative events ( $M = 1.28$ ,  $SD = 0.58$ ) than positive events ( $M = 1.47$ ,  $SD = 0.65$ ),  $F(1,76) = 9.99$ ,  $p < .01$ ,  $\eta_p^2 = .12$ . Again, this difference was only 0.2 of a point on the 8-point scale, and should not affect our interpretation of the results. All pretest ratings were below 2 on the

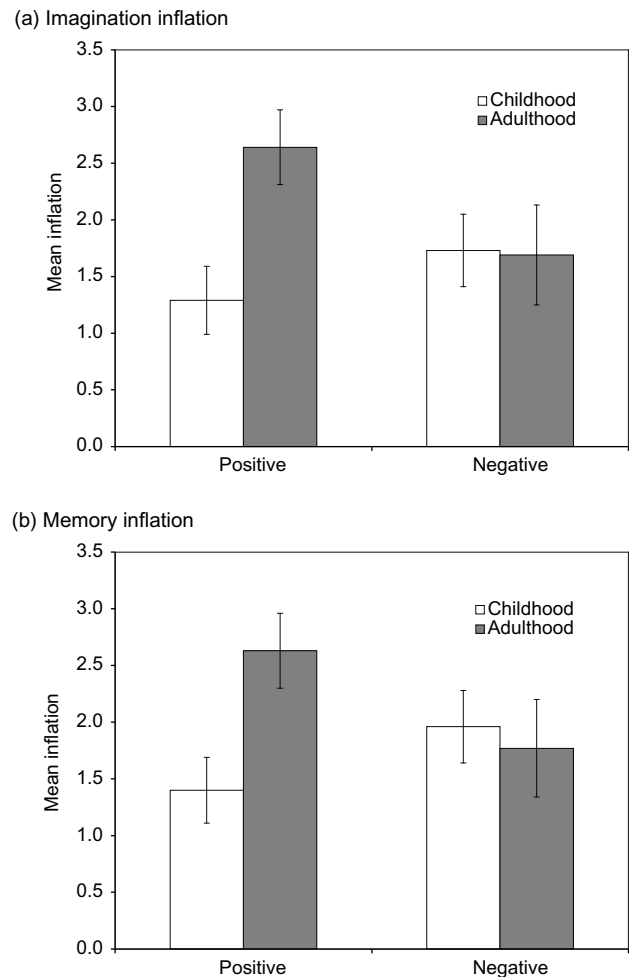


Fig. 1. Imagination and memory inflation for positive and negative childhood and adulthood events.

scale, which indicates that subjects had little or no memory of the false events at pretest.

We calculated subjects' memory inflation scores in the same way as their imagination inflation scores using their pretest and posttest memory ratings. Subjects' mean memory inflation scores were normally distributed with no significant skewness or kurtosis ( $S = 0.42$ ,  $SE = 0.27$ ,  $p > .05$ ;  $K = -0.38$ ,  $SE = 0.54$ ,  $p > .05$ ). Consistent with the imagination inflation effects, subjects who imagined childhood events showed memory inflation; that is, their memory inflation scores were significantly greater than zero ( $M = 1.68$ ,  $SD = 1.51$ ),  $t(38) = 6.94$ ,  $p < .01$ ,  $d = 1.57$ . Subjects who imagined adulthood events also showed memory inflation ( $M = 2.20$ ,  $SD = 1.78$ ),  $t(38) = 7.70$ ,  $p < .01$ ,  $d = 1.75$ . There was no difference in memory inflation for childhood and adulthood events,  $t(76) = 1.39$ ,  $p > .05$ .

Event recency and valence affected subjects' memory inflation in the same way as imagination inflation (see Fig. 1b). A repeated measures ANOVA revealed a significant interaction between recency and valence,  $F(1,76) = 5.27$ ,  $p < .05$ ,  $\eta_p^2 = .07$ . Follow-up  $t$ -tests showed that for positive events, subjects who imagined adulthood events rated their memories as clearer and more complete than those who imagined childhood events,  $t(76) = 2.81$ ,  $p < .01$ ,  $d = 0.64$ . For negative events, there was no significant difference in memory inflation between subjects who imagined childhood events and those who imagined adulthood events,  $t(76) = 0.36$ ,  $p > .05$ . Neither the main effect for recency nor valence

was significant,  $F(1,76) = 2.89$ ,  $p > .05$  and  $F(1,76) = 0.68$ ,  $p > .05$ , respectively.

### 3.3. Plausibility

We considered whether event plausibility could account for our pattern of results. We recruited a new posthoc sample who had not participated in the experiment ( $n = 30$ ) and asked them to rate the plausibility of the LEI events from 1 (very implausible) to 8 (very plausible). Half the subjects rated childhood events and half rated adulthood events. Fig. 2 shows subjects' mean plausibility ratings. A repeated measures ANOVA revealed a significant interaction between recency and valence,  $F(1, 28) = 4.91$ ,  $p < .05$ ,  $\eta_p^2 = .15$ . Follow-up  $t$ -tests showed that for positive events, there was no difference in plausibility ratings for childhood and adulthood events,  $F(1, 29) = 0.72$ ,  $p > .05$ . For negative events, childhood events were rated as more plausible than adulthood events,  $F(1, 29) = 13.00$ ,  $p < .01$ ,  $\eta_p^2 = .32$ . The main effects for recency and valence were also significant: childhood events were rated as more plausible than adulthood events,  $F(1, 28) = 8.33$ ,  $p < .01$ ,  $\eta_p^2 = .23$ , and positive events were rated as more plausible than negative events,  $F(1, 28) = 61.89$ ,  $p < .01$ ,  $\eta_p^2 = .69$ . Overall, plausibility ratings showed a different pattern than did imagination and memory inflation, which suggests that event plausibility cannot account for our findings.

## 4. Discussion

Event recency and valence influenced people's susceptibility to imagination inflation. Subjects showed the most inflation for positive adulthood events and less, but still significant, inflation for negative adulthood events and positive and negative childhood events. We found imagination inflation as indexed by subjects' confidence ratings as well as by their memory ratings; subjects rated their memories of the imagined events as clearer and more complete than their memories of the not imagined events. Thus, this research extends the types of events that show imagination inflation to positive and negative interpersonal events and extends the types of ratings that can be used to measure changes in subjects' beliefs and memories (see also Mazzoni & Memon, 2003).

Positive adulthood events showed the most imagination inflation overall: subjects' mean confidence ratings for these

events jumped from around 2 on the 8-point scale at pretest to over 6 at posttest. Subjects went from being fairly confident at pretest that they had not experienced the events to being fairly confident at posttest that they had experienced the events after merely imagining them. Imagination caused subjects' confidence ratings to cross the scale mid-point, suggesting that subjects believed the imagined events were genuine experiences (see Smeets, Merckelbach, Horselenberg, & Jelicic, 2005, for a discussion of the distinction between confidence, belief, and memory). Future research may further examine the extent to which this brief imagination exercise affects people's beliefs and memories of past events and – possibly an even more convincing demonstration of false beliefs and memories – affects people's behaviours.

Overall, childhood and adulthood events showed similar levels of inflation. Subjects confused (relatively weak) imagined childhood events with genuine childhood memories and they confused (relatively strong) imagined adulthood events with genuine adulthood memories at similar rates. It is possible that even though they showed similar levels of inflation, there were different mechanisms underlying this inflation. Both types of inflation occurred because subjects confused the qualitative details of the imagined events with the qualitative details of their genuine memories. However, for childhood events this inflation was most likely due to the confusion between the weak details of imagined events with the weak details of genuine events that had faded over time. For adulthood events, this inflation was most likely due to the confusion between strong details of imagined events that were generated using feature importation with the strong details of recently experienced genuine events. It is highly likely that the mechanisms driving imagination inflation for childhood and adulthood events overlap to some extent; future research could investigate the separate and combined pathways driving imagination inflation for recent and distant events.

We found that positive adulthood events showed the most imagination inflation. Why? Perhaps these events were the most plausible and consequently the least likely to be attributed to the imagination exercise. We tested this explanation with a separate group of subjects who rated the positive events as equally plausible in childhood and adulthood and rated the negative events as more plausible in childhood than adulthood. This pattern was opposite to our imagination inflation findings and suggests that plausibility played little or no role in our results. Another possible explanation is subjects' certainty about whether they experienced the false events. In Session 1, subjects were more confident that they had not experienced negative events – in either childhood or adulthood – than positive events. Since they were initially more confident that they had not experienced the negative events, perhaps they were less susceptible to imagination inflation for these events. But if this was the case, we would have seen more imagination inflation for positive than negative events overall, and not just positive adulthood events. A third possibility is that because we relied on subjects' memories to determine whether imagined events were true or false, some events were misclassified. That is, we classified events that subjects remembered when they completed the first LEI as true, experienced events, and we classified events that they could not remember as false, not experienced events. Perhaps subjects initially failed to remember events that they had in fact experienced, and imagining them simply prompted genuine recall. This explanation seems unlikely, since the greatest inflation was for events probably least likely to be overlooked (recent events), but it does highlight a methodological choice. Consistent with previous research in this paradigm, we chose to rely on subjects' memories to classify true and false events rather than using novel staged events to increase ecological validity.

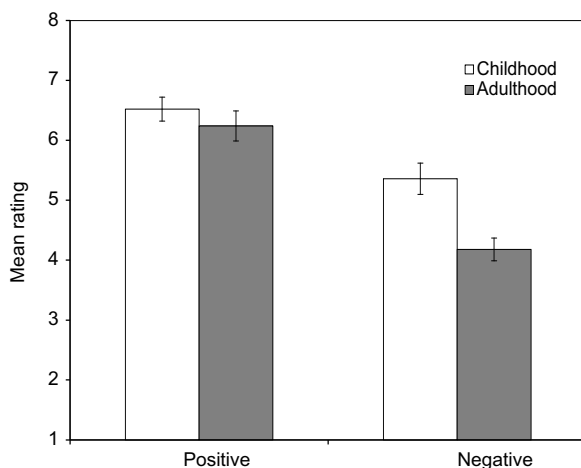


Fig. 2. Mean plausibility ratings for positive and negative childhood and adulthood events.

A final, more tentative explanation is that subjects showed the most imagination inflation for recent positive events because these events contributed most to their self-image. Perhaps subjects were more motivated to create “memories” of events that happened recently and that showed them in a positive light. This possibility is consistent with D’Argembeau and van der Linden’s (2004) report that recent positive events (from the past year) contributed more to people’s self-images than distant positive or negative events (from the past 5–10 years) or recent negative events. It is also consistent with source monitoring research showing that people are motivated to remember that the option that they chose was the best option (Henkel & Mather, 2007). Finally, it is consistent with an emerging and influential theoretical view that autobiographical remembering is motivated. For instance, Conway, 2005 (see also Conway & Pleydell-Pearce, 2000) argued that within a Self-Memory System, executive control processes facilitate memories that support the desired sense of self, and inhibit memories that undermine this sense of self. Research within this framework suggests that we are particularly motivated to remember events illustrating how we have improved over time and thus are more likely to remember positive, recent autobiographical events than positive (or negative) distant events (Baumeister, 1998; Walker, Skowronski, & Thompson, 2003; Wilson & Ross, 2001, 2003). Recent research with confabulating amnesic patients suggests that false, as well as genuine, memories can be self-enhancing (Fotopoulou, Conway, & Solms, 2007; Fotopoulou et al., 2008). These patients – who generate multiple false memories on a daily basis without any intention to deceive – created false memories that made past experiences considerably more pleasant and more self-serving. These findings suggest that, even in more extreme cases, people’s motivation to see themselves positively can influence what they falsely recall.

Our findings are suggestive, but do not test the role of motivation in the creation of false memories. Based on our first steps, more work is needed to index the ways in which individuals’ specific self-goals and motivations influence source errors. If goals and motivations are important influences, it might help to explain why people develop false beliefs and false memories of bizarre and unpleasant events. A common argument against the creation of false memories for traumatic events is that people would not generate memorial representations of such truly awful experiences (as opposed to repressing and later recalling those experiences; e.g., Freyd, 1994, 2001). This argument seems consistent with our current results: subjects showed less imagination inflation for negative childhood and adulthood events than positive adulthood events. However, if, in a different context, people were motivated to recall negative childhood events rather than positive adulthood events, then the pattern of results may be quite different. Indeed, in situations such as therapy where people’s goals may be to explain their current problems (see Bowers & Farvolden, 1996), people may be more motivated to recall the unpleasant experiences that contributed to those problems rather than any associated pleasant experiences. Such speculation requires measured empirical testing.

Our results, although modest, have both theoretical and practical implications. Theoretically, they suggest that the type of events people imagine – and possibly in conjunction with the context in which the events are imagined – contribute to whether they are later falsely believed and remembered. Practically, they suggest that people’s motivations in particular contexts may contribute to their false beliefs and false memories. However, future research is needed to test this explanation and to quantify the relative contributions of cognitive and social factors to the development of false beliefs and memories.

## References

- Baumeister, R. F. (1998). The self (4th ed.). In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 1, pp. 680–740). NY: McGraw-Hill.
- Bowers, K. S., & Farvolden, P. (1996). Revisiting a century-old Freudian slip – from suggestion disavowed to the truth repressed. *Psychological Bulletin*, *119*, 355–380.
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). NJ: Lawrence Erlbaum.
- Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language*, *53*, 594–628.
- Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, *107*, 261–288.
- D’Argembeau, A., & Van der Linden, M. (2004). Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: influence of valence and temporal distance. *Consciousness and Cognition*, *13*, 844–858.
- Destun, L. M., & Kuiper, N. A. (1999). Phenomenal characteristics associated with real and imagined events: The effects of event valence and absorption. *Applied Cognitive Psychology*, *13*, 175–186.
- Freyd, J. J. (1994). Betrayal-trauma: Traumatic amnesia as an adaptive response to childhood abuse. *Ethics & Behaviour*, *4*, 307–329.
- Freyd, J. J. (2001). Memory and dimensions of trauma: Terror may be “all-too-well remembered” and betrayal buried. In J. R. Conte (Ed.), *Critical issues in child sexual abuse: Historical, legal, and psychological perspectives* (pp. 139–173). CA: Sage.
- Fotopoulou, A., Conway, M. A., Tyrer, S., Birchall, D., Griffiths, P., & Solms, M. (2008). Is the content of confabulation positive? An experimental study. *Cortex*, *44*, 764–772.
- Fotopoulou, A., Conway, M. A., & Solms, M. (2007). Confabulation: Motivated reality monitoring. *Neuropsychologia*, *45*, 2180–2190.
- Garry, M., Manning, C. G., Loftus, E. F., & Sherman, S. J. (1996). Imagination inflation: Imagining a childhood event inflates confidence that it occurred. *Psychonomic Bulletin & Review*, *3*, 208–214.
- Garry, M., Sharman, S. J., Wade, K. A., Hunt, M. J., & Smith, P. J. (2001). Imagination inflation is a fact, not an artifact. *Memory & Cognition*, *29*, 719–729.
- Goff, L. M., & Roediger, H. L. (1998). Imagination inflation for action events: Repeated imaginings leads to illusory recollections. *Memory & Cognition*, *26*, 20–33.
- Henkel, L. A., & Franklin, N. (1998). Reality monitoring of physically similar and conceptually related objects. *Memory & Cognition*, *26*, 659–673.
- Henkel, L. A., & Mather, M. (2007). Memory attributions for choices: How beliefs shape our memories. *Journal of Memory and Language*, *57*, 163–176.
- Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General*, *117*, 371–376.
- Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin*, *114*, 3–28.
- Lampinen, J. M., Meier, C. R., Arnal, J. D., & Leding, J. K. (2005). Compelling untruths: Content borrowing and vivid false memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *31*, 954–963.
- Loftus, E. F. (2005). Planting misinformation in the human mind: A 30-year investigation of the malleability of memory. *Learning & Memory*, *12*, 361–366.
- Lyle, K. B., & Johnson, M. K. (2006). Importing perceived features into false memories. *Memory*, *14*, 197–213.
- Mazzoni, G., & Memon, A. (2003). Imagination can create false autobiographical memories. *Psychological Science*, *14*, 186–188.
- Mitchell, K. J., & Johnson, M. K. (2000). Source monitoring: Attributing mental experiences. In E. Tulving & F. I. M. Craik (Eds.), *The Oxford handbook of memory*. NY: Oxford University Press. p. 179–195.
- Schaefer, A., & Philippot, P. (2005). Selective effects on the phenomenal characteristics of autobiographical memories. *Memory*, *13*, 148–160.
- Sharman, S. J., Garry, M., & Hunt, M. (2005). Using source cues and familiarity cues to resist imagination inflation. *Acta Psychologica*, *120*, 227–242.
- Smeets, T., Merckelbach, H., Horselenberg, R., & Jelicic, M. (2005). Trying to recollect past events: Confidence, beliefs, and memories. *Clinical Psychology Review*, *25*, 917–934.
- Sporer, S. L., & Sharman, S. J. (2006). Should I believe this? Reality monitoring of accounts of self-experienced and invented recent and distant autobiographical events. *Applied Cognitive Psychology*, *20*, 837–854.
- Tabachnik, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). NY: Harper & Row.
- Tousignant, J. P., Hall, D., & Loftus, E. F. (1986). Discrepancy detection and vulnerability to misleading post-event information. *Memory & Cognition*, *14*, 329–338.
- Walker, W. R., Skowronski, J. J., & Thompson, C. P. (2003). Life is pleasant – and memory helps to keep it that way. *Review of General Psychology*, *7*, 203–210.
- Wilson, A. E., & Ross, M. (2001). From chump to champ: People’s appraisals of their earlier and present selves. *Journal of Personality and Social Psychology*, *80*, 572–584.
- Wilson, A. E., & Ross, M. (2003). The identity function of autobiographical memory: Time is on our side. *Memory*, *11*, 137–149.