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**To cite this article:** Daniel L. Schacter, Ciara M. Greene & Gillian Murphy (2023): Bias and constructive processes in a self-memory system, *Memory*, DOI: [10.1080/09658211.2023.2232568](https://doi.org/10.1080/09658211.2023.2232568)

**To link to this article:** <https://doi.org/10.1080/09658211.2023.2232568>



Published online: 06 Jul 2023.



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DISCUSSION



## Bias and constructive processes in a self-memory system

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### ABSTRACT

Martin Conway's influential theorising about the self-memory system (Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, 107(2), 261–288) illuminated how the “working self” influences the construction of autobiographical memories. Moreover, his constructive view of self and memory is compatible with the occurrence of various kinds of errors and distortions in remembering. Here we consider one of the “seven sins” of memory (Schacter, D. L. (2021). *The seven sins of memory updated edition: How the mind forgets and remembers*. Houghton Mifflin Harcourt) that we believe is most closely related to the operation of Conway's self-memory system: bias, which refers to the role of current knowledge, beliefs, and feelings in shaping and sometimes distorting memories for past experiences and attitudes. More specifically, we discuss recent research on three forms of bias – consistency, self-enhancing, and positivity biases – that illuminate their role in influencing how people remember the past and also imagine the future. We consider both theoretical and applied aspects of these biases and, consistent with Conway's perspective, argue that despite sometimes contributing to inaccuracies, bias also serves adaptive functions.

### ARTICLE HISTORY

Received 22 May 2023  
Accepted 28 June 2023

### KEYWORDS

Self-memory system; consistency bias; self-enhancing bias; positivity bias; autobiographical memory

Among Martin Conway's many empirical and theoretical contributions to memory research, his thinking about the role of the self in the construction of autobiographical memories may rank as his most impactful. According to Google Scholar, Conway's two seminal papers on the self-memory system have been cited more than 8200 times combined, with over 5400 citations to Conway and Pleydell-Pearce (2000) and over 2800 citations to Conway (2005). Both of these major integrative efforts delineated how a “working self” interacts with various levels of autobiographical knowledge to produce the temporary constructions that we call memories.

Conway elaborated on the implications of his ideas about self and memory construction for a variety of issues, including developmental, clinical, and neuropsychological aspects of memory (for an update, see Conway et al., 2019). Here we focus on a prominent feature of memory that Conway also considered in his theorising about the self-memory system, one that we believe has important theoretical and applied implications: errors and distortions in memory that can result from the contribution of the “working self” to memory construction. We approach this issue from the perspective of the “seven sins” of memory (Schacter, 2001, 2021). Although Conway's self-memory system has potential implications for each one of the seven sins, here we focus on the

memory sin that we believe is most closely connected to the operation of the self: bias. Within the seven sins framework, bias is one of four “sins of commission” (the others are *misattribution*, *suggestibility*, and *persistence*), and it refers to the ways in which current knowledge, beliefs, and feelings can skew or distort memory for past experiences and attitudes. Schacter (2001, 2021) distinguished among several different forms of such retrospective bias, and here we will discuss three manifestations of the phenomenon: consistency bias, self-enhancing bias, and positivity bias. *Consistency bias* occurs when individuals' views of themselves lead them to reconstruct or even create the past in a manner that aligns with their current perspective; *self-enhancing bias* reflects how people use memory to distort past experiences and shape possible future experiences in order to boost current self-assessments; and the closely related *positivity bias* refers to tendencies to remember past experiences and imagine future experiences in an overly rosy or positive manner. Schacter (1999, 2001) reviewed early work on these biases, and Adler and Pansky (2020) provided a comprehensive review of recent work on positivity bias. Our treatment will focus on recent research that we think illustrates the constructive view of self and memory outlined in Conway's (2005; Conway & Pleydell-Pearce, 2000) major statements on this topic. One important conceptual link

between the “seven sins” perspective on the various forms of bias and Conway and colleagues’ view (Conway, 2005; Marsh et al., 2019) is that both emphasise the adaptive functions of retrospective and prospective bias in promoting psychological well-being (for related perspectives, see Taylor & Schneider, 1989; Walker & Skowronski, 2009; Wilson & Ross, 2003).

### Consistency bias and the self-memory system

As outlined by Conway et al. (2004b), the process of coherence influences our memories to make our recollections more consistent with our current goals, self-images and self-beliefs. Conway (2005) argued that memory and central aspects of the self form a coherent system in which one’s beliefs and knowledge about the self are supported and confirmed by specific experiences. Conway noted that it has long been observed that memories may be altered, distorted or even fabricated to support current conceptions of the self (e.g., Bartlett, 1932; Freud, 1899; Loftus, 1993), and considerable research in cognitive psychology and social psychology has provided evidence for a role of consistency bias in this process (e.g., Goethals & Reckman, 1973; Karney & Coombs, 2000; Ross, 1989; Ross & Wilson, 2000). In this section, we will discuss recent evidence for the consistency bias, particularly in the context of political memories.

Recent research assessing false memories for fake news has illustrated the relationship between one’s sense of self and memories of the past. Frenda et al. (2013) presented participants with doctored photographs of US politicians like Barack Obama and George W. Bush engaged in fictitious scandals (such as George W. Bush vacationing with a baseball celebrity during the Hurricane Katrina emergency). They found that conservatives were more likely to falsely “remember” a Democrat scandal and liberals were more likely to falsely “remember” a Republican scandal. This suggests that alignment between one’s own political beliefs might bias source-attributions and increase the likelihood of forming a false memory of an event that never occurred.

In recent years, this effect has been demonstrated in a wide variety of contexts, without the use of doctored media. Murphy et al. (2019) examined this ideological congruency effect in false memories during a real-world political campaign – the Irish abortion referendum in 2018. They found that, in the week before the polls opened, voters were significantly more likely to form false memories for a scandal that reflected poorly on the opposing side than they were for an identical story that reflected poorly on their own side. Similarly, in the aftermath of Brexit, Greene et al. (2021) found that those who voted Leave were much more likely to form false memories for fake news stories that reflected poorly on Remain voters, and vice-versa. Calvillo et al. (2022) examined memories for true and false events related to the January 6th 2021 Capitol Riot in the United States. They also found clear

partisan effects on memory, where participants were more likely to remember both true and false events when the event favoured their political party.

Alignment between our beliefs and how we construct memories of the past has also been demonstrated in contexts that go beyond party politics. Greene et al. (2022) examined the role of pre-existing vaccine attitudes in participants’ tendency to form false memories for fake news stories that were either pro or anti-vaccine in nature. The pro-vaccine condition included headlines such as, “New study finds risk of lung cancer to be significantly reduced after two shots of COVID-19 vaccine” while the anti-vaccine headlines included, “The mRNA technology in the COVID-19 vaccine affects cell mutation and decreases your bone density”. They found that pre-existing opinions had a significant effect on susceptibility to these fake stories, with participants being more likely to report false memories for stories that aligned with their beliefs. Further work has tested whether the strength of one’s opinions affects this ideological congruency effect in a linear manner. Murphy et al. (2021) measured attitudes towards feminism, scoring participants from strongly pro-feminism to strongly anti-feminism. Participants then saw a mix of true and fake news stories that reflected well or poorly on feminists as a group (e.g., a positive story about a national feminist group supporting vulnerable people during the COVID-19 pandemic, a negative story about a national feminist group fundraising to support frontline COVID-19 workers but then using the money for a “wellness retreat” for their own members). Once again, the findings demonstrated the role of ideological congruency in false memories for fake news stories, finding that the more supportive a participant was towards feminism, the more likely they were to report a memory for a false event that positively reflected on feminists and the less likely they were to report a memory for a false event that negatively reflected on feminists.

In understanding these fake news studies, where individuals preferentially construct memories for information that is consistent with their political identity, we might consider Conway’s (2005) aforementioned concept of the *working self*. Conway argued that the working self maintains an updated set of active goals and may actively edit memories in order to maintain coherence. Social identity is critical to the development of the self; Conway et al. (2004a) argue that the working self relies on a “life story schema”, which is constructed within the individual’s particular culture. This schema draws on social norms and conventions to generate predictions and templates for the individual’s identity and behaviour. Ensuring coherence thus requires maintenance of that social identity, and memory biases will act to retrieve information that is consistent with that identity while suppressing information that is inconsistent. An example of this is the case of national identity: Delaney et al. (2023) reported that German participants were more likely to form false

memories for fake news stories that reflected positive stereotypes about their own nationality or negative stereotypes about another nationality (though note that this pattern was not observed for a separate sample of Irish participants). Further evidence of the importance of social identity is provided in the study of Brexit-related fake news described above (Greene et al., 2021), which also reported that participants who were first exposed to a threat to their social identity (in the form of a fabricated news broadcast that denigrated either Leave or Remain voters) were more likely to form ideologically congruent false memories. This finding has yet to be replicated, but it indicates that the working self may work that much harder to maintain internal consistency of memories when coherence is threatened.

Conway's model of the self-memory system encompasses a tension between the two goals of correspondence and coherence. Autobiographical memory is dominated by the need to maintain a coherent sense of self; thus, our memories are biased in line with our previous experiences. In tandem with this bias, memory must also accurately correspond to events in the real world and provide a veridical record of past goals and our attempts to achieve them. To resolve this contradiction, Conway et al. (2004a) introduced the concept of adaptive coherence, whereby, for any given experience, we recall just enough detail to maximise survival and fitness while still maintaining a sense of self. The relative contribution of correspondence and coherence to any given memory will vary as a function of the goal being pursued; as Conway (2005) notes, certain experiences will require the retention of a detailed record, while for others the gist of the event will be sufficient.

A striking illustration of this feature can be observed in studies showing that memories of emotions have more in common with the individual's current emotional state than the actual emotion experienced at the time. Levine (1997) first observed this phenomenon in a study surrounding Ross Perot's withdrawal from the 1992 US presidential race. Participants noted their emotional reactions at the time, and then again four months later, when they were also asked to recall how they had responded the first time. Their recollections were systematically biased in the direction of their current appraisals, where for example, supporters who remained loyal to Perot at follow-up underestimated how sad and angry they were at the time. More recently, Levine et al. (2021) applied Conway's model of goal-directed memory to other political contexts. They reported the results of two studies, one investigating American participants' recollections of the 2016 US presidential election, and another investigating Irish participants' recollections of the 2018 referendum on abortion in Ireland. Participants were asked to report how they felt immediately after hearing the outcome of the contest, and then, several months later, to recall their earlier feelings. In both cases, the participants' current feelings about the event in question were

a stronger predictor of their recalled emotional response than their actual reported feelings at the time. This outcome meant that, for example, a participant who felt angry about the outcome of the abortion referendum when asked to reflect on it six months later might overestimate how angry they had been in the immediate aftermath of the vote. Levine et al. (2009) note that this memory bias for emotional information promotes goal-directed behaviour – in line with the coherence motivation of the working self – and helps individuals cope with challenging situations by altering their memories and perceptions to match their current emotional state. Interestingly, there was no association between accuracy in memories for facts and feelings, further supporting the notion that memory reconstruction may prioritise either coherence or correspondence in the service of specific goals.

The research described in this section demonstrates that the requirement to maintain a coherent sense of self directly affects the way we interact with the world around us and process information. As the threat of misinformation and disinformation becomes a significant focus of cognitive psychology research (Lewandowsky et al., 2017) and evidence about the role of misinformation in shaping our memories and behaviour continues to emerge (Greene & Murphy, 2021), the seminal work of Martin Conway has important theoretical and applied implications. While we may understand vulnerability to misinformation in terms of digital literacy (Brashier & Schacter, 2020), cognitive ability (Greene & Murphy, 2020) or situational factors like exposure frequency (Fazio, 2020), we must not forget the role of the self. As we strive to maintain coherence in our self-image, we are prone to significant consistency biases in how we recollect the past, making us particularly vulnerable to misinformation that chimes with our existing views of ourselves and the world we live in. This manifestation of bias also has implications for forensic settings. Research has shown that false memories may be more likely where the material being recalled has some self-relevance (Wang et al., 2019, 2022), suggesting that eyewitness reports related to the self might be particularly likely to contain inaccuracies. However, these findings are limited to certain paradigms such as memory for word lists and so further research is needed to clarify the role of the self in ecologically valid eyewitness experiments, given the weak associations between performance across memory tasks (Murphy et al., *in press*; Patihis et al., 2018).

### Self-enhancing bias and the self-memory system

The link between consistency bias and maintenance of a coherent self-image is closely related to *self-enhancing bias*, the tendency to recall past experiences in a manner favourable to the present self. Consistent with Conway's self-memory system, within the seven sins framework the existence of this bias "reflects the important role that

“the self” plays in organising and regulating mental life” (Schacter, 2001, p. 150). The operation of self-enhancing biases in memory is captured in well-known recollective distortions that inflate an individual’s evaluation of their current self, including deprecating a past self in order to boost one’s current self-image (Wilson & Ross, 2003), preferentially generating memories that reflect what people are led to believe are desirable personality traits (Sanitioso et al., 1990), and recalling more anxiety about an upcoming exam (Keuler & Safer, 1998) or blood donation (Breckler, 1994) than one had actually experienced in order to increase one’s sense of accomplishment or bravery.

Martin Conway contributed to research on self-enhancing bias in several studies of brain-damaged patients with memory disorders who confabulated about their past experiences. In an early study, Conway and Tacchi (1996) described a case of *motivated confabulation*, in which a head-injured patient’s confabulations were biased to portray her in a self-serving, unrealistically positive light. In a later case of what Conway and colleagues called self-enhancing confabulation, Fotopoulou et al. (2007) described a patient who began confabulating after experiencing an anterior communication artery aneurysm. Strikingly, the patient’s confabulations about past events contained more positive self-representations than did his veridical memories, reflecting a strong link between memory construction and self-enhancing bias. Noting the existence of self-enhancing bias in this and other clinical cases of confabulation, Fotopoulou et al. (2008) attempted to characterise the role of encoding processes in this phenomenon by examining story recall in confabulating amnesic patients, non-confabulating amnesics, and healthy controls. They manipulated whether participants encoded stories containing positive, negative, or neutral plots with reference to themselves (by imagining that they were the protagonist in the story) or with reference to another person who they imagined as the protagonist. Fotopoulou et al. (2008) documented a self-enhancing bias in the confabulating amnesics for negative information in the self-referential encoding condition only, such that patients recalled this negative information in a manner that portrayed them in an overly positive manner. More generally, they argued that confabulating patients’ deficits in control and regulation of memory allowed motivational factors to play an outsized role in memory retrieval such that “the self-enhancing content of confabulation could be explained as a neurogenic exaggeration of normal self-serving memory distortion” (2008, p. 1438).

More recent research on self-enhancing bias has explored implications of this memory distortion in novel domains. Carlson et al. (2020) documented a self-enhancing memory bias related to moral cognition, specifically, motivated misremembering of previous selfish decisions. In their experiments, people made a series of decisions as part of a dictator game involving how to divide money between themselves and an anonymous partner.

After completing some brief filler tasks, participants were given a surprise memory test in which they were instructed to recall what percentage of the money they had given to their partner; accurate recall was incentivized by providing additional funds if participants’ responses were within 10% of how much they had actually transferred (on average) to their partner. Across several lab and online experiments, Carlson et al. documented that participants recalled being significantly more generous to their partner than they actually were, and that this self-enhancing memory bias was particularly pronounced in participants who had allocated money in a stingy manner during the game and also violated their own personal standards of what they deemed to be a fair allocation of the funds. By contrast, participants whose allocations did not violate their personal standards of fairness did not exhibit a self-enhancing memory bias. In line with Conway’s concept of coherence (Conway, 2005; Conway et al., 2004b), these findings nicely illustrate how an egocentric memory bias can serve to maintain a coherent sense of self: by misremembering how generously they had behaved when distributing funds, participants whose behaviour violated their personal standards of fairness were, in effect, “potentially warding off threats to their moral self-image (Carlson et al., 2020, p. 1).”

In an earlier and conceptually related developmental study, Tasimi and Johnson (2015) examined recall of giving or taking stickers in children aged 5–8 years, under conditions in which they could give another child a sticker that had been provided to them, or take the sticker from the other child; the participants also observed other children giving or taking stickers from another child. Children generally recalled their own giving and taking relatively accurately, but they misremembered *other* children as having taken stickers more often than they actually had. Tasimi and Johnson (2015, p. 531) suggested that “children’s memory in this situation may reflect a self-serving bias, suggesting that other children take more than they themselves would.”

Related evidence on the developmental emergence of self-enhancing bias comes from a study of 8 – to 10-year-olds by Rowell and Jaswal (2021). They utilised a self-reference memory paradigm, which in many earlier studies of young adults had been shown to produce increases in item recognition following an encoding task in which participants make judgments about information in relation to themselves versus another person (for a meta-analysis, see Symons & Johnson, 1997); a similar self-reference advantage has been documented for source memory (Rosa & Gutchess, 2011). Rowell and Jaswal (2021) compared memory for “nice” action phrases (e.g., be kind to someone) and “mean” action phrases (e.g., hurt someone’s feelings) when they were encoded with respect to the self or another person. Children’s source memory for whether they had encoded an item with respect to themselves was higher for nice than mean items, whereas self-referential memory for mean

items was lower than for mean items encoded about others. Together, these findings point toward the operation of a self-enhancing bias in 8 – to 10-year-olds. Extending Conway and Pleydell-Pearce's (2000) incorporation of various kinds of developmental evidence into their initial conception of the self-memory system, these recent findings suggest that self-enhancing biases may be a relatively early feature of the system.

Another early source of evidence for the self-memory system came from research linking personality and memory (see, for example, Conway & Pleydell-Pearce, 2000, p. 267). With respect to self-enhancing bias, a number of studies have shown that individuals scoring high on the personality characteristic of trait narcissistic grandiosity, who maintain unrealistically positive self-assessments (Krizan & Herlache, 2018), display exaggerated self-enhancing biases (for review, see Jones, 2018). For example, using a variant of the aforementioned self-reference memory paradigm, Jones and Brunell (2014) found that following self-referent encoding, but not following encoding with reference to another person, higher narcissism was associated with enhanced recall of positive "agentic" traits (traits about the self; e.g., clever, attractive, ambitious) and not positive "communal" traits (traits describing how one interacts with others; e.g., kind, generous, sympathetic; cf., Gebauer et al., 2012; Raskin & Terry, 1988). These results demonstrate that narcissism leads to a self-enhancing bias for content that is selectively positive about the self. Moreover, Jones and Brunell distinguished these effects associated with narcissism from those associated with the related but distinct personality characteristic of self-esteem, which was associated with enhanced recall of positive communal traits. In a more recent study, Jones et al. (2017) extended this general pattern of results to autobiographical memory, finding a selective association between narcissism and more detailed and faster retrieval of positive-agentic but not positive-communal autobiographical memories. Notably, Jones et al. (2017) developed some of their hypotheses based on Conway and Pleydell-Pearce's (2000) self-memory system.

In a recent extension of this line of research, Finch et al. (2023) examined whether self-enhancing memory biases associated with narcissistic grandiosity extend to imagined future experiences. Numerous studies have documented striking cognitive and neural similarities when people remember past experiences and imagine or simulate possible future experiences (for reviews, see Benoit & Schacter, 2015; Schacter et al., 2012; Szpunar, 2010). According to the constructive episodic simulation hypothesis (Schacter & Addis, 2007, 2020), these similarities reflect the important role played by constructive episodic retrieval processes in generating simulations of future experiences based on recombined elements of past experiences. Noting some of these similarities, Conway et al. (2016) postulated the existence of what they termed a remembering-imagining system and proposed that it is "part of the goal

system, cf. Conway and Pleydell-Pearce (2000) and maintains access to memories of recent events that themselves support plausible imaginings of near-future events (p.260)." Thus, based on both the constructive episodic simulation hypothesis (Schacter & Addis, 2007, 2020) and Conway et al.'s (2016) remembering-imagining system – an important component of the self-memory system – one would expect that some of the same self-enhancing biases that are evident when individuals high in narcissistic grandiosity recall past experiences should be observed when they imagine future experiences.

In two experiments, Finch et al. (2023) provided evidence that supports these hypotheses. Young adult participants were instructed to either remember a specific past experience or imagine a specific future experience in which they had exhibited, or would exhibit, either a positive trait (e.g., *skilled*) or a negative trait (e.g., *inadequate*). Participants described the event in detail, and completed several seven-point Likert-type scales regarding event characteristics including how difficult the event was to remember or imagine, the vividness of the event, and for future experiences, how plausible it was that the event could take place in their futures and how frequently they had thought about the imagined event. Narcissism was assessed using the short form of the Five-Factor Narcissism Inventory (Sherman et al., 2015), with a specific focus on grandiose narcissism, which is indicated by high scores on items that assess such traits as exhibitionism, authoritativeness, grandiose fantasies, manipulativeness, entitlement, acclaim seeking, and several others.

In both experiments, participants scoring higher in grandiose narcissism remembered past events and imagined future events in which they exhibited positive traits more easily and with greater vividness than events in which they exhibited negative traits, compared with those scoring lower in grandiose narcissism. Moreover, those scoring higher in grandiose narcissism also rated future events in which they exhibited positive traits as more likely to occur than events in which they exhibited negative traits relative to people scoring lower in grandiose narcissism. By contrast, these patterns were not observed on measures of the amount of objective detail that participants provided about past or future events. Overall, the finding that grandiose narcissism produced similar patterns for remembered past events and imagined future events extends previous observations of self-enhancing memory bias to the domain of future event simulation, and thus supports both the constructive episodic simulation hypothesis (Schacter & Addis, 2007, 2020) and the notion of the remembering-imagining system suggested by Conway et al. (2016).

### Positivity bias and the self-memory system

Positivity biases have been documented repeatedly in studies of memory and future thinking (for detailed

review and discussion, see Adler & Pansky, 2020; Sharot, 2011; Taylor, 1989). Positivity biases are closely related to self-enhancing biases because they often serve to maintain or inflate a positive view of the self. However, not all positivity biases are specifically related to self-enhancement, so it is perhaps most appropriate to consider self-enhancing biases as a subset of positivity biases. Although the literature on positivity biases is too vast to cover here, we will focus on several recent studies that have examined the operation of positivity bias during memory and future simulation, including work from Conway and colleagues.

One line of research has examined the possible role of retrieval-induced forgetting (RIF; Anderson et al., 1994) in contributing to positivity biases. RIF is a well-established phenomenon in which successful retrieval of an item or event results in reduced accessibility of related but non-retrieved information, which is thought to reflect the operation of inhibitory processes during retrieval (e.g., Anderson & Hulbert, 2021; Anderson & Spellman, 1995; for an alternative perspective, see Jonker et al., 2013). In an initial study of a possible link between RIF and positivity bias in autobiographical memory, Storm and Jobe (2012) tested participants in two separate experimental paradigms. The first was a standard RIF paradigm in which participants encoded category-exemplar pairs (e.g., fruit-orange, fruit-banana, metal-silver, metal-aluminum) and were later given retrieval practice on some of the studied categories by providing, for half the exemplars, the category name with the first two letters (e.g., fruit-or), followed by a final cued recall test for all exemplars and categories. Replicating many previous studies, Storm and Jobe documented significant RIF: final recall was lower for studied but nonpracticed exemplars from practiced categories than for exemplars from nonpracticed categories. In a separate autobiographical recall task, participants were given neutral word cues (e.g., pool, medicine) and either attempted to retrieve “memories that made them ‘happy, proud, pleased, or gratified’” or “memories that made them ‘sad, embarrassed, depressed, or hurt’”. On this task, there was evidence of a positivity bias: participants recalled more positive than negative memories. Most important, the two phenomena were linked: participants who exhibited greater RIF recalled significantly fewer negative memories and numerically more positive memories compared with participants who exhibited less RIF. A similar pattern of results was observed when the autobiographical memory task required participants to retrieve memories from specific time periods. Storm and Jobe argued, from the perspective of an inhibition account of RIF, that the link to reduced recall of negative autobiographical memories occurred because negative autobiographical memories are more likely than positive ones to be the target of inhibitory processes that reduce their accessibility, reflecting the influence of positivity bias. Using similar procedures, Giebel et al. (2016) extended this relationship to future event simulation, finding that participants who exhibited greater RIF

imagined fewer negative future events than those who exhibited less RIF. However, they did not observe a significant relationship between RIF and the number of positive future events that participants were able to imagine.

In a more recent extension of this line of work, Conway and colleagues (Marsh et al., 2019) modified some of the procedures used in the preceding studies and investigated both autobiographical memory and future event simulation within the same paradigm and participants. All participants were given a series of neutral word cues. In one block, they were instructed to recall an associated autobiographical memory and, in another block, they were instructed to imagine an associated future event. Unlike in the Storm and Jobe (2012) and Giebel et al. (2016) studies, participants were not guided to generate a positive or negative event; they freely recalled or imagined an event and then rated its valence. According to Marsh et al. (2019, p. 510), “free recall and future episodic simulation is a greater reflection of natural everyday memory retrieval and future simulation, giving an indication of whether these findings are relevant outside of the laboratory.” Marsh et al. found evidence of correlated positivity biases in both the memory and future simulation conditions, with a somewhat greater positivity bias in the future condition. Increased RIF was significantly correlated with retrieval of more positive autobiographical memories, and a similar numerical but nonsignificant trend was observed for imagined future events (further, the difference between the two correlations was not significant). Consistent with an adaptive perspective on the functions of bias, greater positivity bias in future simulations was associated with lower levels of self-reported depression and anxiety, and a similar relationship was observed between depression and positivity bias in autobiographical memories.

Taken together, the foregoing studies build on previous findings by furnishing evidence for positivity bias in both autobiographical memory and future event simulation, and linking these processes to RIF, albeit with stronger evidence for memory than for future simulation. In a related study, Szpunar et al. (2012) evaluated the operation of positivity bias in memories for simulations of positive, negative, and neutral future events. This line of research took inspiration from two key sources. First, Ingvar (1985) theorised about the functional importance of “memories for the future” – remembering our thoughts and plans for future behaviours can make them more efficient – yet few data exist concerning the properties of memory for future event simulations. Second, research on one of the most robust positive memory biases, known as the *fading affect bias* (Walker et al., 2003; Walker & Skowronski, 2009), shows that in many situations, negative emotions fade more quickly over time than positive emotions. Szpunar et al. (2012) asked whether a form of this bias would be evident in what people remember over time from positive, neutral, and negative future event simulations.

In the Szpunar et al. experiments, participants were instructed to imagine either a positive, negative, or neutral future event involving a familiar person, place, and object (participants generated these stimuli in a separate session a week before the experimental session). For example, a participant might be asked to generate a positive, negative, or neutral simulation involving Mark, Best Buy, and a cigarette. They were told that the future event should be plausible and could take place within the next five years. After either a 10-minute or 1-day delay, participants were given a cued recall test in which two of the three simulation details were provided (e.g., Mark-Best Buy) and they tried to recall the missing third detail. The key result in two experiments took the form of an interaction between emotion and delay: details from positive and negative simulations were equally well remembered after a 10-minute delay, but details from negative simulations were remembered more poorly than those from positive simulations after a 1-day delay. Szpunar et al. hypothesised that the affect associated with an episodic future simulation could serve to link together components of that simulation, so that faster fading of negative than positive affect over time – the fading affect bias – would produce worse memory for details of negative than positive simulations. Such a process would result in people “remembering a rosy future”, which in accord with an adaptive perspective on the fading affect bias (Walker & Skowronski, 2009) and positivity biases more generally, could contribute to psychological well-being. Further research is needed to better understand the relation between positivity bias and forgetting over time (the sin of transience in the seven sins framework; Schacter, 2001, 2021).

Examining another aspect of interactions among episodic memory, future simulation, and affective biases, Devitt and Schacter (2018) asked how simulating a positive or negative future event changes memory for that event after it has taken place. In an initial experiment, participants were provided with brief descriptions of event scenarios (e.g., going to a play) and were asked to simulate that event happening in the next year, with the event either going well (positive simulation) or going poorly (negative simulation). After a 15-minute break, participants were instructed to imagine that it was a year later, and that they would now find out how the simulated events had played out. They were presented with narratives corresponding to the positive and negative simulation conditions, and they rated the emotional valence and other characteristics of the narratives. Finally, after either a 15-minute or 24-hour delay, participants were given an old/new recognition test for details in the narratives, along with new details that had not appeared in a previous narrative. The critical finding was that, across test delays, positive simulations produced a liberal response bias on the recognition test for positive details and a conservative response bias for negative details; negative simulations,

by contrast, had no detectable influence. A second experiment replicated this finding for future simulation, and also showed that the same liberal bias for positive details occurred after participants initially simulated an event from the past year either going well or poorly. Moreover, ratings made after the recognition test showed that narratives were rated retrospectively as more positive when they were preceded by positive simulations than by negative simulations. Together, the findings suggest that positive episodic simulations can influence how an event is remembered after it occurs, creating a liberal bias for remembering positive information that can result in the creation of an overly favourable view of the past. Along with the findings from Szpunar et al. (2012) and the previously discussed studies linking RIF with positive biases, the evidence highlights the ways in which interactions between episodic memory and simulation work together to create positive bias that support both a “rosy future” and a “rosy past”.

These findings align well with the aforementioned adaptive perspectives on positivity biases that emphasise their role in contributing to psychological well-being. A recent study by Chang and Overall (2022) provides compelling evidence on this point. In the first of two studies, Chang and Overall had a large sample ( $N = 308$ ) of undergraduates keep diaries for seven weeks, and each week recorded their current level of stress as well as memories of their level of stress the previous week. Participants also completed a questionnaire assessing their depressive symptoms during the past week. Most relevant to the present concerns, Chang and Overall found that low levels of depressive symptoms predicted a positivity bias – remembering the previous week as involving less stress than what was recorded at the time – whereas somewhat higher levels of depressive symptoms predicted unbiased recall of the prior week’s stress and the highest levels of depressive symptoms predicted a negativity bias, i.e., recalling the previous week as being more stressful than what was initially reported. In a second study, Chang and Overall reported a similar pattern of results in couples’ memories for a discussion about conflicts in their relationship, such that lower levels of depressive symptoms were associated with a positive bias in recall of stress levels during the conflict discussion and higher levels of depressive symptoms were associated with either no recall bias or negative recall bias. Together, these studies provide evidence supporting a link between positive memory bias and psychological well-being, and are consistent with a large literature linking depression with a *probability bias* to view negative events as more likely than positive events (e.g., Booth et al., 2023).

### Concluding comments

The research reviewed in this paper demonstrates the continued influence of Martin Conway’s self-memory system



on our understanding of cognitive bias. Importantly, Conway's influence ensures that bias is not just understood as a negative by-product of cognition, but as a fundamental part of a functional and adaptive memory system. The biases outlined here – consistency, self-enhancement and positivity – may result in memories that are less than perfectly accurate, but the resulting distortions serve a function (cf., Howe, 2011; Schacter et al., 2011; for a recent review of adaptive memory distortions, see Sanders & Schacter, *in press*). Specifically, these biases contribute to the maintenance of a coherent and psychologically healthy self that is robust to the vicissitudes of a constantly shifting world. In 1988, Alan Baddeley challenged memory researchers to take a functional approach to human memory, asking “*but what the hell is it for?*” (Baddeley, 1988). This call has been reissued and revisited numerous times since then (e.g., Baddeley, 2022; Bluck, 2009; Schacter et al., 2011). Here we argue that one of Conway's most significant contributions has been not just to explain what memory *is*, but to help uncover what memory is *for*. This perspective helps to move us away from approaches that assess simple accuracy without considering context and function. We call on other researchers to continue Conway's important work in this regard, considering human memory from a functional perspective and considering how some “errors” of memory can reflect useful and important processes that might ultimately benefit us in many complex and intersecting ways.

## Acknowledgements

We thank Sarah Kalinowski for helpful comments on the manuscript.

## Data availability statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

DLS was supported by National Institute on Aging [grant no R01 AG008441]. CMG and GM were supported by the Health Research Board of Ireland COV19-2020-030 .

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