The characteristics of memories we would save and memories we would erase

By

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Abstract

Autobiographical memory contains an incomplete yet dynamic and largely adaptive record of a person's life experiences. Across three experiments we considered the extent to which people have a desire to intervene in the ordinary processes of remembering and forgetting by asking them how likely they would be to "save" or "erase" a memory of their choosing. We then asked people to rate those memories on functions, emotions, and other characteristics. We found that people do have memories they say they would save or erase if they could. The memories people would save were highly positive memories that served self and belonging functions. Half of these memories were of typical cultural milestones whereas the other half were of more idiosyncratic events. The memories people would erase were highly negative memories that served directive functions. These memories mostly concerned idiosyncratic events. When comparing save and erase memories to people's most positive and negative memories, we found no difference between save and most positive memories. In contrast, erase memories differed from most negative memories by being more associated with shame and less with social and belonging functions. We discuss our findings in terms of our theoretical understanding of the characteristics of adaptive and maladaptive memories.

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Autobiographical memories constitute an important resource that people can use to create coherent stories of their identity and behavior across time (Conway & Pleydell-Pearce, 2000; Habermas & Bluck, 2000; Prebble, Addis, & Tippett, 2013). These stories may reflect well on the rememberer's character, and maintain adaptive behavior and self-understanding, or these stories may reflect poorly on the rememberer's character, and maintain maladaptive behavior and self-understanding. Yet for such an important task, the resource of autobiographical memory is unreliable, undergoing unconscious editing: cherished memories deteriorate, disturbing memories persist, and both kinds of remembering are malleable. But these reconstructive processes of autobiographical memory are also open to conscious editing: People can preserve the ability to bring some memories to mind—to “save” them—and avoid recalling other memories—to “erase” them. Do people, then, have memories they actually desire to save or erase? And if so, what stories of identity and behavior are they choosing to keep in their save memories, and which are they choosing to forget in their erase memories? These are the questions we address in the three experiments reported here.

“Saving” Memories

Desire to “save?” Although lay people tend to believe that memories are stored permanently in the brain, they also believe that access to those memories is not always preserved (Lynn, Evans, Laurence, & Lilienfeld, 2015). For example, people say that they would use a memento, such as a souvenir magnet, if they wanted to be able to recall a particularly special event (Zauberman, Ratner, & Kim, 2009). But a memento does not guarantee the availability, let alone fidelity, of that memory. Into

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that breach has stepped a “neurotechnology” company, which claims to provide this very service: to record “thoughts and memories for future playback” (Cuthbertson, 2014). But would people want to use such a service? To the extent that people have a desire to preserve the ability to bring to mind certain memories we expect that they would save a memory if they could.

Why “save” a memory? Regardless of whether people seek out “memory-saving” cues or technologies, we do not know much about why they might want to save those memories. It stands to reason that those memories are important, but in what way?

Valence and function. One possibility is that people might want to save memories that serve an adaptive function (Bluck, 2017). People recall autobiographical memories for different reasons, including supporting a sense of self (the “self” function) or belonging (the “belonging” function), guiding behavior (the “directive” function), bonding with others (the “social” function), and regulating emotion (the “emotion regulation” function; Bluck, Alea, Habermas, & Rubin, 2005; Janssen, 2017; Rusting & DeHart, 2000; Walker, Skowronski, Gibbons, Vogl, & Ritchie, 2009; Webster, 1993). Memory function is not, however, synonymous with memory adaptiveness (Bluck et al., 2005; Harris, Rasmussen, & Berntsen, 2014). The extent to which a memory is adaptive depends on whether the function it serves is association with positive, real-world, outcomes (Bruce, 1985).

There is evidence that some kinds of memories are more often associated with adaptive outcomes than others. At minimum, positive memories are associated with real world, positive, outcomes because people feel good when they recall those

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memories (Bryant, Smart, & King, 2005; Joorman & Siemer, 2004). But positive memories can do more than just make people feel good. Studies show that positive, rather than negative, memories tend to serve self, social, and belonging functions (McLean & Lilgendahl, 2008; Rasmussen & Berntsen, 2009, 2013). These particular combinations of valence and functions seem to be adaptive. For example, younger adults who think of highly positive memories to develop their sense of self, and older adults who share highly positive memories to bond with others, score higher on measures of wellbeing (McLean & Lilgendahl, 2008). People in intimate relationships who think about a positive experience of being with their partner report greater feelings of warmth towards their partner (Alea & Bluck, 2007). Of course, positive memories may also come to serve adaptive directive functions—for instance, in the form of career defining moments such as when meeting an inspiring person motivates a person to pursue a certain career path (Pillemer, 2003). But there is less empirical evidence demonstrating adaptiveness in relation to the directive function of positive memories. Therefore, to the extent that people want to remember adaptive memories we might expect people would save highly positive memories that serve self, social, or belonging functions.

Characteristics of “save” memories. One way positive memories serving self, social, or belonging functions might be associated with adaptive outcomes is by creating positive self-evaluations—representing people well to themselves and to others. There is some evidence that these memories are already kept close: When people recall events in which they felt proud of themselves they feel a greater sense of reliving, a greater belief that the event really happened, more sensory details, more

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coherence, they talk and think about the event more, and judge it more important than the events in which they felt shame (D'Argembeau & Van der Linden, 2008).

Therefore, to the extent that people want to save self-enhancing memories we would expect those memories to be associated with pride, a greater sense of reliving and belief, more sensory details and coherence, greater voluntary rehearsal and importance than the memories they would rather forget.

Assuming people do not go to the effort of recalling every self-enhancing positive memory, which memories might people prioritize to save?

Type of event. Arguably, the positive memories that most adaptively serve self, social, and belonging functions are the memories that people include in their personal life story. Experimentally, life stories are elicited by asking people to describe up to seven of the most central events of their lives (a “self” function) to a new friend in whom they have complete trust (a “social” function; see also Rubin, Berntsen, & Hutson, 2009). Overall, events in people’s life stories tend to be positive, and represent similar events—although the extent of similarity differs according to culture. In one study, 70% of the events in Danish undergraduates’ life stories were of culturally valued and expected milestones, such as falling in love, getting your first job, or having children. For American undergraduates, however, only 46% of the events in their life stories overlapped with cultural milestones (Rubin et al., 2009). In both samples, these milestones form a widely shared *cultural life script*, a series of normative (mostly positive) transition events that people in a certain culture would expect to happen in a newborn infant’s life from that same culture (Berntsen & Bohn, 2009; Berntsen & Rubin, 2004; Berntsen, Rubin, & Siegler, 2011; Zaragoza Sherman,

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Salgado, Shao, & Berntsen, 2015). Furthermore, cultural life script events are overrepresented when people are asked to describe their most positive memory, representing between 63.0%-92.4% of nominated memories (Berntsen et al., 2011; Zaragoza Sherman et al., 2015). Yet there are also other events that people commonly mention when recounting their personal life stories that do not feature on their cultural life script such as having an epiphany, moving house, playing a sport, or an instrument. These events are called “unique life story events” (Umanath & Berntsen, 2013). Therefore, to the extent that people want to save their positive memories that most adaptively serve self, social, or belonging functions, we would expect those memories to be a part of their life story and thus correspond with cultural life script events, or unique life story events.

“Erasing” memories

Desire to “erase?” It stands to reason that just as there are certain memories people would like to hold on to, there are other memories people would like to banish. Indeed, one symptom of various psychopathologies associated with trauma is that people avoid reminders that might bring the traumatic memories to mind (American Psychiatric Association, 2013). Yet when asked if they would take a drug as a preventative measure against hypothetical intrusive recollections of an assault, most people report they would not (Newman, Berkowitz, Nelson, Garry, & Loftus, 2011). On the other hand, it is possible that those same people, when asked about their own quite real memories, may still have a candidate memory they would consider erasing.

Why “erase” a memory?

Valence and function. If people wanted to erase a certain memory, it stands to

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reason they would nominate a memory that was, in some way, associated with negative, real-world, outcomes. We might think of these memories as serving significant maladaptive functions (Bluck, 2017; Harris et al., 2014; Pillemer, 2001, 2003). There is some evidence that some kinds of memories are associated with more maladaptive outcomes than others. For example, people who think of traumatic memories to guide their behavior (a “directive” function) and as central to their identity (a “self” function) score highly on measures of post-traumatic-stress-disorder (PTSD; Berntsen & Rubin, 2006, 2007). Yet in other cases, people can associate negative—even traumatic—memories with positive psychological change: for example, a greater appreciation of life, or increased emotional resilience (Tedeschi & Calhoun, 2004). Moreover, memories of failure may come to serve adaptive directive functions by, for instance, motivating future success (Pillemer, 2003). Therefore it may not be the combination of negative affect and self or direction functions alone that determines the extent to which the memory is maladaptive. Erase memories, therefore, may represent a negative memory with specific functions and characteristics.

Characteristics of “erase” memories. One way that negative memories serving self or directive functions might be associated with maladaptive outcomes is that negative memories support negative self-evaluations. Memories associated with negative self-evaluations have the potential to invoke negative self-conscious emotions such as shame, embarrassment, social anxiety, and guilt (Leary, 2007). There is some evidence to say that people already try to distance themselves from memories associated with negative self-evaluations: people recall their “shame”

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memories with less of a sense of reliving, less belief that the event really happened, fewer sensory details, less coherence, they talk and think about the event less, and judge it less important than their memories associated with pride (D'Argembeau & Van der Linden, 2008, although see Bohn & Berntsen, 2007; Rasmussen & Berntsen, 2009 for similar differences between emotionally positive and negative memories). Therefore, to the extent that people want to erase memories associated with negative self-evaluations we would expect that those memories would be associated with shame, have less of a sense of reliving and belief, fewer sensory details, less coherence, importance, and voluntary rehearsal than the memories they want to save.

Assuming people, in general, would rather be able to remember most of the events that have happened to them, even most of the negative events, which memories might be worth erasing?

Type of event. Unlike save memories, it may not be the case that people's candidate erase memory is part of their life story. In fact, such a memory would more easily be forgotten if it did not form a part of a person's life story. But regardless of whether or not people would include their erase memory in their life story, we would not expect erase memories to correspond to events on the cultural life script. There are three reasons we would not expect people to choose a cultural life script event to erase: First, there are very few negative events on cultural life scripts, and most of them involve the death of important others, which may potentially be very important to remember (Berntsen & Rubin, 2004; Zaragoza Sherman et al., 2015). Take, for example, patient H. M. —whose amnesia was so severe we could consider every new experience he had to be immediately erased: he was reported to have carried a piece

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of paper on his person, reminding him that his father was dead (Ditrich, 2016).

Second, when people are asked to describe their most negative memory, only 32.1-50.4% of nominated memories correspond to cultural life script events (Zaragoza Sherman et al., 2015). Although this research has been carried out with non-American samples, there is no reason to think that Americans would be any more likely to nominate a cultural life script memory as their most negative memory. Finally, a third possible reason that cultural life script events do not register as people's most negative memory is because those are likely to be talked about with others, and when negative memories are shared, their affective intensity is reduced (the Fading Affect Bias; Walker et al., 2009). Taken together, we do not expect that people will choose cultural life script events to erase.

Instead, we would expect erase memories to be about events that deviate from cultural expectations (for example, a romantic partner's infidelity). Events that deviate from cultural expectations have the potential to engender negative self-conscious emotions, because these emotions are associated with a perception of rejection by others (Leary, 2007). Furthermore events that deviate from the cultural life script might challenge people's sense of themselves and how they should behave in the world, therefore these memories are likely to serve self or directive functions (Berntsen & Rubin, 2006, 2007). Taken together, to the extent that people want to erase their most problematic negative memories that serve self or directive functions, we would not expect those memories to correspond to the cultural life script.

Overview

Across three experiments, we asked people to describe one memory they

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would save or one memory they would erase. Subjects rated that memory on several memory characteristics. We expected that save memories would have characteristics associated with adaptive memories, and thus be highly positive, and serve self, social, or belonging functions. We also expected that save memories would correspond to events on the cultural life script as frequently as highly positive memories, although be more associated with pride. By contrast, we expected that erase memories would have characteristics associated with maladaptive memories, and thus be highly negative and serve self or directive functions. Furthermore, we expected that erase memories would be less likely to correspond to events on the cultural life script than other highly negative memories, and be more associated with shame. Compared to their save counterparts, we also expected erase memories to have less of a sense of reliving and belief, fewer sensory details, less coherence, importance, and voluntary rehearsal. We present the method and results for Experiments 1 and 2 together, because Experiment 2 is a replication of Experiment 1.

Experiments 1 & 2

Method

Subjects. For both experiments we recruited subjects from the United States and Canada via Amazon's Mechanical Turk (Mturk; www.mturk.com/mturk). Subjects received USD \$0.25. Studies run through Mechanical Turk attract diverse subjects and tend to produce results similar to studies run in the laboratory (Buhrmester, Kwang, & Gosling, 2011; Germine et al., 2012; Mason & Suri, 2012). We aimed for a final sample size of 150 subjects per cell (that is, 300 subjects total). In anticipation of having to exclude data from subjects who did not complete the

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survey or did not follow instructions, we predetermined to collect data from 350 subjects. Because Mturk does not communicate directly with Qualtrics, our data collection software, we collected data from 356 people in Experiment 1, and 374 people in Experiment 2.

Procedure. Subjects were told we were investigating people's preferences for different types of experiences. Before subjects began the experiment, we asked them to complete the experiment under strict conditions. We asked them to complete the experiment in one session, in an environment free from distraction, and to refrain from doing anything else on their computer while doing the experiment. There were five phases in the experiment.

In the first phase, subjects read a press release of technology that would allow them to either save a memory or erase a memory. The save subjects read a press release adapted from neurotechnology company Millennium Magnetic Technologies (Cuthbertson, 2014). Specifically, subjects read that a company had developed a "patented technology [that] can record detailed brain patterns and correlate them with thoughts and emotions for future interpretation. These recordings can then be "played back" either on a screen or by reliving them in the mind itself" (for the full text, see the Supplemental Materials). The description was 187 words with a Flesch-Kincaid grade level of 13, suggesting it was at a reading level suitable for people in their first year of university (Kincaid, Fishburne, Rogers, & Chissom, 1975).

Erase subjects read an entirely fictional press release that paralleled the style of the save press release. Specifically subjects read that a company had developed "a technology to switch off a specific memory by beaming light through the eyes and

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into the brain, using a fiber optic cable... the end result is that the memory and only that specific memory is gone” (for the full text, see the Supplemental Materials). The press release was 188 words, and also suitable for people in their first year of university (Kincaid et al., 1975).

To assess the extent to which people thought the save and erase technologies were similarly plausible, we had earlier gathered data from 100 undergraduate psychology students who read both press releases (counterbalanced for order) and rated the releases for their plausibility (1 = *not at all plausible*, 5 = *very plausible*) and how easy it was to imagine the way the technology works (1 = *not at all easy*, 5 = *very easy*). These subjects rated both technologies similarly; subjects judged the technologies as moderately plausible (Save $M=3.05$, 95% CI [2.88, 3.22]; Erase $M=2.91$, 95% CI [2.71, 3.12]) and moderately easy to imagine (Save $M=3.22$, 95% CI [3.02, 3.42]; Erase $M=3.42$, 95% CI [3.23, 3.61]). In line with findings from social psychology, subjects who found the technology easier to imagine also rated it as more plausible (Save $r = .3$, 95% CI [.12, .47]; Erase $r = .23$, 95% CI [.03, .40]; Sherman, Cialdini, Schwartzman & Reynolds, 1985).

In the experiment proper, we asked subjects in both conditions to “imagine you could use this service. What one memory would you choose to save [erase]?” We also specified that the memory should be a “single event that you personally experienced.” We defined single event as “an event that took place at a specific time and day and which took no longer than 24 hours” (Williams et al., 1996).

In the second phase, subjects in both conditions described the memory they had selected to save or erase in “a few brief sentences.” In the third phase of

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Experiment 1 subjects rated the phenomenological and memorial characteristics of their nominated memory using 55 items drawn from published research. A total of 29 items were drawn from the Autobiographical Memory Questionnaire (AMQ; Rubin, Schrauf & Greenberg, 2003) which contains a series of 7-point Likert-type scale items measuring the extent to which sensory details, emotions, a sense of reliving, and belief are associated with recalling a particular memory. The remaining items dealing with discrete emotions, memory functions, and the age of the memory were drawn from previous research (Rasmussen & Berntsen, 2009; Talarico, Labar & Rubin, 2004). For the purposes of our planned analyses, we created sum variables that relate to “sense of reliving,” “sensory vividness,” and “voluntary rehearsal” by grouping together conceptually related characteristics and calculating the average rating for those groupings. The particular items used for each sum variable appear in Table 1. Cronbach’s alpha was acceptable and consistent for both sum variables across both experiments for sense of reliving and sensory vividness, but not voluntary rehearsal (**Experiments 1** Sense of reliving $\alpha = .74$, Sensory vividness $\alpha = .80$, Voluntary rehearsal $\alpha = .55$; **Experiment 2** Sense of reliving $\alpha = .74$, Sensory vividness $\alpha = .80$, Voluntary rehearsal $\alpha = .50$). We therefore treated the two voluntary rehearsal items separately in all subsequent analyses.

In the third phase of Experiment 2, we made some minor changes to the characteristics subjects rated. We omitted 19 phenomenological and memorial characteristic ratings used in Experiment 1 so that we could add another scale and reduce overall experiment length. The omitted items included the discrete emotions associated with the memory, and any items that conceptually overlapped with another

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item. For example, “How often have you thought about the event” was omitted in favor of “Since it happened, I have thought about the event.” The scale we added was the 7-item version of the Centrality of Events Scale (Berntsen & Rubin, 2006). The Centrality of Events Scale measures the degree to which people consider the event a turning point, central to their identity, and a reference point for new experiences they have. Cronbach’s alpha was acceptable for the Centrality of Events Scale ($\alpha = .90$). Thus, subjects in Experiment 2 rated a total of 48 phenomenological and memorial characteristics (see Table 1 for full list of items and anchors).

In the fourth phase of both experiments, subjects in each condition rated on a 7-point Likert-type scale “If you could actually save [erase] this memory, how likely would you be to do that?” (1 = *not at all likely*, 7 = *extremely likely*). Finally, we asked subjects if they had complied with our requests to complete the experiment under the conditions we specified at the start. To encourage honesty, we promised to pay them regardless of their answers. At the end of the study, subjects were debriefed.

Scoring of Correspondence with the Cultural Life Script and Unique Life Story Events. First, we analyzed subjects’ descriptions of their save or erase memory, and classified them according to their place (if any) on the US version of the cultural life script (events in leftmost column Table 4; Rubin et al., 2009). Two highly trained judges classified the memory descriptions in Experiments 1 and 2, one judge was blind to the purpose of the study and the manipulations. For Experiment 1 judges classified all memories independently, and agreed on 92.8% of classifications. For Experiment 2 judges classified 20% of subjects’ memories independently, and 89.0% of classifications. One judge classified the remaining memories alone. All disputes

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were resolved by discussion.

Table 1.

All Memory Characteristics Rated for Experiments 1, 2, and 3.

Order by Experiment			Variable	Characteristic Items and Anchors
1	2	3		
				When you think about this event, how does it make you feel? Click on the number for each of the scales below that best describes your feelings about this event.
1			Calm	(1 = <i>Not at all calm</i> , 7 = <i>Extremely calm</i>)
2			Afraid	(1 = <i>Not at all afraid</i> , 7 = <i>Extremely afraid</i>)
3			Motivated	(1 = <i>Not at all motivated</i> , 7 = <i>Extremely motivated</i>)
4			Nervous	(1 = <i>Not at all nervous</i> , 7 = <i>Extremely nervous</i>)
5			Relaxed	(1 = <i>Not at all relaxed</i> , 7 = <i>Extremely relaxed</i>)
6			Angry	(1 = <i>Not at all angry</i> , 7 = <i>Extremely angry</i>)
7			Satisfied	(1 = <i>Not at all satisfied</i> , 7 = <i>Extremely satisfied</i>)
8			Frustrated	(1 = <i>Not at all frustrated</i> , 7 = <i>Extremely frustrated</i>)
9			Happy	(1 = <i>Not at all happy</i> , 7 = <i>Extremely happy</i>)
10			Confused	(1 = <i>Not at all confused</i> , 7 = <i>Extremely confused</i>)
11			Confident	(1 = <i>Not at all confident</i> , 7 = <i>Extremely confident</i>)
12			Shameful	(1 = <i>Not at all shameful</i> , 7 = <i>Extremely shameful</i>)
13			Proud	(1 = <i>Not at all proud</i> , 7 = <i>Extremely proud</i>)
Sensory vividness sum variable				
14	1		Vivid	How vivid and clear is your memory for this event? (1 = <i>Not at all vivid and clear</i> , 7 = <i>Completely vivid and clear</i>)
24	11		Hear	As I remember the event, I can <i>hear</i> it in my mind (1 = <i>Not at all</i> , 7 = <i>As clearly as if it was happening right now</i>)
25	12		See	As I remember the event, I can <i>see</i> it is my mind (1 = <i>Not at all</i> , 7 = <i>As clearly as if it was happening right now</i>)
29	15		Setting	As I remember the event, I can recall the <i>setting</i> where it occurred (1 = <i>Not at all</i> , 7 = <i>As clearly as if it was happening right now</i>)
30	16		Spatial layout	As I remember the event, I know its <i>spatial layout</i> (1 = <i>Not at all</i> , 7 = <i>As clearly as if it was happening right now</i>)
Sense of reliving sum variable				
23	10		Reliving	As I remember the event, I feel as though I am <i>reliving</i> it (1 = <i>Not at all</i> , 7 = <i>As clearly as if it was happening right now</i>)
34	20		Back in time	As I remember the event, I feel that I travel back to the time it happened (1 = <i>Not at all</i> , 7 = <i>Completely</i>)
Voluntary rehearsal sum variable				
37	23	15	Thought	Since it happened, I have <i>thought</i> about this event (1 = <i>Not at all</i> , 7 = <i>As often as any event in my life</i>)
38	24	16	Talked	Since it happened, I have <i>talked</i> about this event (1 = <i>Not at all</i> , 7 = <i>As often as any event in my life</i>)

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Table 1 Cont.

All Memory Characteristics Rated for Experiments 1, 2, and 3.

Order by Experiment			Variable	Characteristic Items and Anchors
1	2	3		
Other memory characteristics				
15	2		Stressful	E1 How stressful was this event? (1 = <i>Not at all stressful</i> , 7 = <i>completely stressful</i>) E2 How stressful is your memory for this event? (1 = <i>Not at all stressful</i> , 7 = <i>completely stressful</i>)
16	3		Pleasant	How pleasant is your memory for this event? (1 = <i>Not at all pleasant</i> , 7 = <i>Extremely pleasant</i>)
17	4		Confidence	How confident are you that this event occurred? (1 = <i>Not at all confident</i> , 7 = <i>Completely confident</i>) To what degree does your memory for this event contain the following details?
18	5		Visual	Visual (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
19	6		Auditory	Auditory (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
20	7		Olfactory	Olfactory (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
21	8		Tactile	Tactile (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
22	9		Gustatory	Gustatory (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
26	13		People talking	As I remember the event, I or other people are <i>talking</i> (1 = <i>Not at all</i> , 7 = <i>As clearly as if it was happening right now</i>)
27	14		Emotion then	As I remember the event, I can feel the <i>emotion</i> I felt then (1 = <i>Not at all</i> , 7 = <i>As clearly as if it was happening right now</i>)
28			Emotion now	Compared to how I felt at the time of the event, the <i>emotion</i> I feel about it now is (1 = <i>Completely different</i> , 7 = <i>Identically the same</i>)
31	17		Remember/ know	Sometimes people know something happened to them without being able to actually <i>remember</i> it. As I think about the event I can actually remember it rather than just knowing that it happened (1 = <i>Not at all</i> , 7 = <i>As much as any memory</i>)
32	18		In words	As I remember the event, it comes to me in <i>words</i> (1 = <i>Not at all</i> , 7 = <i>As much as any memory</i>)
33	19		Coherence	As I remember the event, my memory comes in words or pictures as a <i>coherent</i> story or episode and not as an isolated fact, observation or scene (1 = <i>Not at all</i> , 7 = <i>As much as any memory</i>)
35	21		Importance	This memory is <i>significant</i> for my life because it imparts an important message for me or represents a critical juncture or turning point (1 = <i>Not at all</i> , 7 = <i>As much as any memory</i>)
36	22		Belief	I believe that event in my memory <i>really</i> occurred in the way I remember it and that I have not imagined or fabricated anything that did not occur (1 = <i>100% imaginary</i> , 7 = <i>100% real</i>)
39	25		Own eyes	As I remember the event I see it out of my own eyes rather than those of an outside observer (1 = <i>Not at all</i> , 7 = <i>Completely</i>)
40	26		Specific	This memory is based on details <i>specific</i> to my life, not on general knowledge that I would expect most people to have (1 = <i>Not at all</i> , 7 = <i>Completely</i>)
41			Thought2	How often have you thought about this event? (1 = <i>Not at all</i> , 7 = <i>As much as any memory</i>)
42			Talked2	How often have you talked about this event? (1 = <i>Not at all</i> , 7 = <i>As much as any memory</i>)
43	27		Involuntary	The memory of this event has come to me out of the blue, without my trying to think about it (1 = <i>Not at all</i> , 7 = <i>More than for any event in my life</i>)
56		5	Valence	The feelings I experience as I recall the event are (-3 = <i>Extremely negative</i> , 3 = <i>Extremely positive</i>)
57	41	6	Intensity	The feelings I experience as I recall the event are intense (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)

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Table 1 Cont.

All Memory Characteristics Rated for Experiments 1, 2, and 3.

Order by Experiment			Variable	Characteristic Items and Anchors
1	2	3		
	39		Negative	The feelings I experience as I recall the event are extremely negative (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
	40		Positive	The feelings I experience as I recall the event are extremely positive (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
44	29	18	Age of memory	How old were you when this event took place? Please give your age at the time estimated in years: type in the number, e.g. 7
45	30		Days	If your answer to question 1 is your current age, how many days ago did the event happen? (Please type in a number e.g. 52) ¹
46	31	1	Directive	E1 & E2 This memory guides my thinking and behaviour (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>) E3 This memory guides my present and future thinking and behaviour (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>) ¹
47	32	2	Self	This memory tells me something about my identity (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
48	33	3	Social	I have often shared this memory with other people (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
49	34	4	Belonging	This memory gives me a sense of belonging with other people (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
50	35		Physical reaction	This memory triggered a physical reaction—for instance, palpitations, feeling restlessness, tension, fear, laughter (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
51	36		Action	This memory triggered an action—for instance, deciding to do the dishes, buying a special present for another, listening to a certain song from my collection (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
52	37		Specific day	The memory deals with (<i>A concrete event that occurred on a specific day OR A mixture of similar events that happened on more than one day</i>)
53			Mood	This memory affected my mood (-3 = <i>Extremely negatively</i> , 3 = <i>Extremely positively</i>)
54	38		Consequences	The event had consequences (1 = <i>Not at all</i> , 7 = <i>To a very high degree</i>)
55		17	Involuntary ²	The event has previously popped up in my mind by itself—that is, without my deliberately thinking about it (1 = <i>Almost never</i> , 7 = <i>Extremely often</i>)

¹Note: We adapted this item for Experiment 3 so it most closely matched the Danish translation

Second, we analyzed the save and erase memories that did not correspond with events on the cultural life script and classified them according to their correspondence with unique life story events. Umanath and Berntsen (2013) identified 11 events common life story events that are never mentioned in cultural life script tasks (events in the leftmost column of Table 5). For both Experiments 1 and 2, two judges

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classified 20% of non-CLS memories using the common life-story event coding scheme. Their agreement was 77.2%, and all disagreements were resolved by discussion. One judge classified the remaining memories alone.

Results

The purpose of these experiments was to first establish the extent to which people have memories they would like to save or erase, and second, to ask why people might want to save or erase those particular memories.

Before addressing these questions, we first identified subjects who did not complete the survey (Experiment 1 $n = 48$, 14.0%; Experiment 2 $n=57$, 15.2%), and subjects who did not provide a description of a memory to save or erase (Experiment 1 $n = 13$, 4.0%; Experiment 2 $n=34$, 9.0%). We excluded the data from these subjects. We then evaluated the dataset for subject compliance. We found that 17.4% of subjects in Experiment 1 ($n=51$) and 23.7% of subjects in Experiment 2 ($n = 69$) failed at least one of our compliance check questions. These failure rates are typical of those in research investigating “attention check” failures among Mechanical Turk subjects, which range from 10-39% (Downs, Holbrook, Sheng, & Cranor, 2010; Goodman, Cryder, & Cheema, 2013; Kapelner & Chandler, 2010). Including subjects who failed our compliance checks did not change the overall patterns of results, so we retained them in our analyses (see Table S1 for the percentage of subjects who failed each compliance question). The remaining sample for Experiment 1 comprised 295

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subjects ($M_{age} = 35.42$, $SD_{age} = 12.61$ ¹) and for Experiment 2 comprised 291 subjects ($M_{age} = 37.05$, $SD_{age} = 12.52$). Table S2 shows the means, standard deviations and 95% confidence intervals for all variables measured in Experiments 1 and 2.

Desire to “save?” Desire to “erase?” We first set out to determine if people did indeed have memories they would save or erase. They did. In both Experiments 1 and 2, when people were asked how likely they were to actually to save or erase their nominated memory, the modal response was 7 (*extremely likely*). Nevertheless, people were more willing to use hypothetical technology to save their memories than they were to erase their memories (**Experiment 1** Save $M=5.97$, 95% CI [5.74, 6.20], Erase $M = 4.81$, 95% CI [4.44, 5.18]; $M_{diff}=1.13$, 95% CI [0.70, 1.56]; **Experiment 2** Save $M = 6.22$, 95% CI [5.99, 6.44], Erase $M = 5.37$, 95% CI [5.05, 5.69]; $M_{diff}=0.85$, 95% CI [0.45, 1.24]). Therefore, these results suggest that people did have a desire to save or erase at least one memory, although their desire to erase a memory was not as strong as the desire to save a memory.

Why “save” a memory? Why “erase” a memory? Recall we hypothesized that people want to save memories with adaptive outcomes, and erase memories with maladaptive outcomes. As a proxy for adaptiveness we examined the extent to which save and erase memories were associated with characteristics that have been associated with adaptive and maladaptive memories—namely particular combinations of memory function and valence, memorial characteristics, and type of event.

¹ Three subjects committed an apparent typo when entering the year they were born (entering, for example, 1860 instead of 1960). We excluded these subjects from our earlier descriptive statistics about age. One of these three subjects did not finish the survey. The data from the remaining two subjects were retained for all analyses that did not include age.

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Valence and function. To what extent were valence and functions of save and erase memories similar to the valence and function of adaptive and maladaptive memories? Were save memories positive and erase memories negative? They were. More specifically, people rated save memories as very positive, and erase memories as very negative (**Experiment 1** Save $M_{valence} = 2.26$, 95% CI [2.08, 2.45]; Erase $M_{valence} = -2.09$, 95% CI [-2.28, -1.89]; $M_{diff} = 4.35$, 95% CI [4.08, 4.62]; **Experiment 2** Save $M_{positive} = 6.23$ 95% CI [6.01, 6.45]; Erase $M_{positive} = 1.93$, 95% CI [1.67, 2.19]; $M_{diff} = 4.03$, 95% CI [3.96, 4.64]; Save $M_{negative} = 1.83$, 95% CI [1.57, 2.09]; Erase $M_{negative} = 5.90$, 95% CI [5.68, 6.11]; $M_{diff} = 4.06$, 95% CI [3.73, 4.39]²).

To analyze the extent to which save and erase memories were differentiated by memory function we entered subjects' ratings on self, social, directive, and social belonging items into a stepwise logistic regression, predicting whether these ratings belonged to save or erase memories. The final model for Experiment 1 included ratings on self, directive, and belonging functions. The final model for Experiment 2 included ratings on all functions. We found that save memories tended to serve self and belonging functions and erase memories tended to serve directive functions.

For both Experiments 1 and 2 the regression model was statistically significant (**Experiment 1** $\chi^2 = 128.00$, $p < .01$; **Experiment 2** $\chi^2 = 123.36$, $p < .01$). The results appear in Table 2. The leftmost column displays the memory function variables included in the model. In the fourth and fifth columns we display our measure of

² Note that for Experiment 2 we adapted the emotional valence Likert-type scale with symmetrical anchors (-3 very negative, 3 very positive) from Experiment 1 into two separate items: "The feelings I experience are extremely negative" (1 = *not at all*, 7 = *to a very high degree*), "The feeling I experience are extremely positive" (1 = *not at all*, 7 = *to a very high degree*).

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effect size, the Odds Ratio (OR), and the 95% confidence interval around the OR.

ORs greater than 1 indicate that ratings on that memory function were associated more with erase memories than save memories. We found that memories rated highly on self and belonging functions were more likely to be save memories (**Experiment 1** Self OR = 0.75, 95% CI [0.60, 0.93]; Belonging OR = 0.48, 95% CI [0.40, 0.58]; **Experiment 2** Self OR = 0.69, 95% CI [0.55, 0.86]; Belonging OR = 0.45, 95% CI [0.37, 0.56]). Memories rated highly on the directive function were more likely to be erase memories (**Experiment 1** OR = 1.77, 95% CI [1.41, 2.22]; **Experiment 2** OR = 1.77, 95% CI [1.41, 2.21]).

Table 2.

Logistic Regression Model Using Memory Function Ratings to Predict “Save” or “Erase” Classification for Experiment 1 and 2

Memory function	Experiment 1				Experiment 2			
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI</i>
<i>Intercept</i>	1.31	0.40			1.39	0.50		
Belonging	-0.73	0.09	0.48	[0.40, 0.58]	0.57	0.11	0.45	[0.37, 0.56]
Self	-0.29	0.11	0.75	[0.60, 0.93]	-0.37	0.11	0.69	[0.55, 0.86]
Directive	0.57	0.12	1.77	[1.41, 2.22]	0.18	0.10	1.77	[1.41, 2.21]
Social					-0.79	0.11	1.20	[0.99, 1.45]

Note. ORs greater than 1 indicate that ratings on that memory function were associated more with “erase” memories than “save” memories.

The finding that people chose memories to save that were both highly positive and served self and belonging functions supports our hypothesis that people would save memories that are adaptive. The finding that people chose memories to erase that were both highly negative, and served directive functions supports our hypothesis that people would erase memories that are maladaptive. The only prediction that was not

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confirmed was the prediction that save memories would serve social functions more so than erase memories. Although there is a numerical difference between the mean social function of save and erase memories (**Experiment 1** $M_{save} = 4.33$, 95% CI [4.02, 4.64], $M_{erase} = 3.09$, 95% CI [2.77, 3.41], $M_{diff} = 1.24$, 95% CI [0.80, 1.68]; **Experiment 2** $M_{save} = 4.59$, 95% CI [4.26, 4.93], $M_{erase} = 3.84$, 95% CI [3.40, 4.18], $M_{diff} = 0.76$, 95% CI [0.28, 1.24]) this difference did not account for significantly more variance in a model which already included ratings on self, belonging, and directive functions. Therefore, in the present experiments, save memories are particularly set apart by the way that they give people a sense of their own identity, and their belonging with others, while erase memories are particularly marked by the way they guide people's behavior.

Characteristics of “save” and “erase” memories. Of course, the extent to which a memory serves an adaptive or maladaptive function depends on exactly what the memory tells rememberers about their identity, how to behave, and where they belong. We therefore hypothesized that one of the ways in which save memories might serve adaptive self functions may be because those memories lead to positive self-evaluations, whereas erase memories might serve maladaptive directive functions because those memories lead to negative self-evaluations. To test this hypothesis we examined the extent to which save and erase memories displayed characteristics associated with memories of positive and negative self-evaluations.

Did people's erase memories have less sensory details, less of a sense of reliving, coherence, belief, importance, and were less often thought about than save memories? They did not. We entered ratings for sensory details, sense of reliving,

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coherence, belief, importance, and the extent to which the memory was thought or talked about into a stepwise logistic regression predicting whether the memory belonged to the save or erase group. To represent sensory vividness and a sense of reliving we used the sum variables noted in the method. For all other variables we used the memory characteristics item with the corresponding keyword. The final model in Experiment 1 included the sensory vividness sum variable, importance, and talking about the memory ($\chi^2 = 32.34, p < .01$). However the goodness of fit test suggested that the model did not fit the data well ($\chi^2 = 278.09, p < .01$). The final model in Experiment 2, included the sensory vividness sum variable and talking about the memory ($\chi^2 = 26.25, p < .01$), did fit the data well ($\chi^2 = 106.48, p < .29$), and the results appear in Table 3. The leftmost column displays the memory characteristics included in the model. In the fourth and fifth columns we display our measure of effect size, the Odds Ratio (OR), and the 95% confidence interval around the OR. ORs greater than 1 indicate that ratings on that memory characteristics were associated more with erase memories than save memories. We found that, in line with our expectations, memories that were talked about often were more likely to be save memories (OR = 0.77, 95% CI [0.68, 0.88]). But, contrary to our expectations, memories rated high on sensory vividness were more likely to be erase memories (OR = 1.70, 95% CI [1.31, 2.22]). We interpret these findings with caution because they were not replicated in both experiments, and in the case of the finding for sensory details the numerical difference in means was very small.

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Table 3.

Logistic Regression Model Using Memory Characteristics to Predict “Save” or “Erase” Classification for Experiments 1 and 2

Memory characteristics	Experiment 1				Experiment 2			
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI</i>
<i>Intercept</i>	-0.54	0.68			-1.80	0.76		
Sensory details	0.48	0.14	1.62	[1.23, 2.11]	0.53	0.13	1.70	[1.31, 2.22]
Talked	-0.27	0.07	0.76	[0.67, 0.87]	-0.26	0.07	0.77	[0.68, 0.88]
Significant	-0.20	0.08	0.82	[0.70, 0.96]				

Note. ORs greater than 1 indicate that ratings on that memory function were associated more with “erase” memories than “save” memories.

Type of event. Although our results so far tell us about the valence, function, and characteristics of save and erase memories, they do not tell us about the content of the memories. Recall that we predicted if people were to prioritize memories to save, they would choose their most adaptive memory—and that memory would most likely be from their personal life story, and thus most likely correspond to cultural life script events or unique life story events. Our data suggest that these event types accounted for only a slight majority of save memories. As the second and fourth columns of Table 4 show, 42.1% of people’s save memories in Experiments 1 and 50.9% of people’s save memories in Experiment 2 described events that are on the cultural life script. Of those cultural life script memories, most were of falling in love (**Experiment 1** 15.1%; **Experiment 2** 11.2%) getting married (**Experiment 1** 9.2%; **Experiment 2** 9.1%) and having children (**Experiment 1** 9.2%; **Experiment 2** 19.6%).

The second and fourth columns of Table 5 show a further 13.2% in Experiment 1 and 10.5% in Experiment 2 of save memories corresponded to unique

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life story events. Taken together, across both the cultural life script and unique life story event coding schemes, 44.7% of save memories in Experiment 1, and 38.5% of save memories in Experiment 2 remained unexplained. Although we cannot conclude that these unexplained save memories would not have formed part of our subjects' life stories, we can conclude that the events they depict are unusually idiosyncratic given previous research demonstrating that 63.0-92.4% of people's most positive memories tend to be about cultural life script events (Berntsen et al., 2011; Zaragoza Sherman et al., 2015).

Less surprising, on the other hand, were our findings about the idiosyncrasy of erase memories. As the third and fifth columns of Table 4 show, we found that only 19.9% of erase memories in Experiment 1 and 22.6% of erase memories in Experiment 2 described events that corresponded to the cultural life script. These percentages are somewhat lower than previous findings with non-American showing that 32.1%-50.38% of people's most negative memories tend to be about cultural life script events (Zaragoza Sherman et al., 2015). The third and fifth columns of Table 5 show a further 2.1% of erase memories in Experiment 1 and 0.7% of erase memories in Experiment 2 corresponded to unique life story events (Umanath & Berntsen, 2013). A total of 78.0% of erase memories in Experiment 1 and 76.7% of erase memories in Experiment 2 remain unexplained. Although these findings suggests that erase memories are idiosyncratic, it is not necessarily the case that erase memories are unusually idiosyncratic because the correspondence of Americans' most negative memories to cultural life script events could be lower than for other countries. Therefore, we conclude that these erase memories are of events that deviate both from

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the kinds of events that are culturally anticipated, and commonly included in personal

Table 4.

Percentage of “Save” and “Erase” Memories Corresponding to Cultural Life Script Events in Experiment 1 and 2

Cultural life script event	Experiment 1		Experiment 2	
	Save	Erase	Save	Erase
Marriage	9.2%	0.0%	9.1%	2.1%
Having children	9.2%	0.0%	19.6%	0.0%
College	1.3%	2.1%	2.8%	0.0%
Begin school	0.0%	0.0%	0.0%	0.0%
High school	0.0%	3.5%	0.7%	1.4%
First job	0.7%	0.0%	0.0%	0.0%
Begin talking	0.0%	0.0%	0.0%	0.0%
Begin walking	0.0%	0.0%	0.0%	0.0%
Own death	0.0%	0.0%	0.0%	0.0%
Go to school	0.0%	0.0%	0.7%	2.1%
Parent’s death	1.3%	3.5%	0.0%	4.8%
Other’s death	0.0%	9.9%	0.7%	11.6%
Retirement	0.0%	0.0%	0.0%	0.0%
Own birth	1.3%	0.0%	0.7%	0.0%
Fall in love	15.1%	0.7%	11.2%	0.7%
Begin driving	0.7%	0.0%	0.0%	0.0%
Grandchildren	1.3%	0.0%	2.1%	0.0%
Settle on career	0.0%	0.0%	0.0%	0.0%
Puberty	0.0%	0.0%	0.0%	0.0%
First sex	0.0%	0.0%	1.4%	0.0%
Leave home	0.0%	0.0%	0.0%	0.0%
Begin daycare	0.0%	0.0%	0.0%	0.0%
Empty nest	0.0%	0.0%	0.0%	0.0%
First kiss	2.0%	0.0%	2.1%	0.0%
Total	42.1%	19.9%	50.9%	22.6%

Note: All totals are calculated from unrounded percentages

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life stories.

Centrality of events. Given that both people's save and erase memories tended to deviate from events anticipated by the cultural life script we wondered how central these events were to people's life stories. Thus, in Experiment 2, we asked subjects to complete the Centrality of Events Scale for their nominated memory, and compared their ratings according to whether the memory was a save or erase memory, and whether it corresponded to an event on the cultural life script (CLS). We found that the extent to which people viewed their nominated memory as central to their lives depended on both whether that memory corresponded to the cultural life script and whether they wanted to save or erase that memory. People rated save memories as

Table 5.

Percentage of "Save" and "Erase" Memories Corresponding to Unique Life Story Events in Experiment 1 and 2

Unique life story event	Experiment 1		Experiment 2	
	Save	Erase	Save	Erase
Moving	0.0%	0.0%	0.0%	0.0%
Major achievement	0.0%	0.0%	0.7%	0.0%
Playing a sport	2.6%	0.7%	2.1%	0.7%
Playing an instrument	0.0%	0.0%	0.0%	0.0%
Bar/Bat Mitzvah	0.0%	0.0%	0.0%	0.0%
Meeting current significant other	0.0%	0.7%	0.0%	0.0%
Long-term relationship	3.3%	0.0%	0.7%	0.0%
Living in another country	0.7%	0.0%	0.7%	0.0%
Parents (re)marry	0.0%	0.0%	0.0%	0.0%
Vacation	6.6%	0.0%	5.6%	0.0%
Having an epiphany/realization	0.0%	0.7%	0.7%	0.0%
Total	13.2%	2.1%	10.5%	0.7%

Note: All totals are calculated from unrounded percentages

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more central to their lives than erase memories, and cultural life script memories as more central than non-cultural life script memories (Condition $F(1, 279) = 5.50, p = .02$; On CLS $F(1, 279) = 7.82, p < .01$). The finding that people viewed the memories that corresponded to the cultural life script as more central to their lives than non-cultural life script memories is consistent with previous research showing that cultural life script correspondence predicts event centrality (Berntsen et al., 2011). There was also a non-significant interaction trending in a direction that would suggest that people rate cultural life script memories as more central to their lives only when those memories were save memories ($F(1, 279) = 3.76, p = .05$). However, it is important to note that subjects self selected into the “cultural life script” and “non-cultural life script” groups and therefore the number of subjects in each group is also uneven (Save CLS $n = 84$; Save Non-CLS $n = 61$; Erase CLS $n = 45$; Erase Non-CLS $n = 101$). Hence, these results should be interpreted with caution.

Discussion

In Experiments 1 and 2 we found that save memories were associated with characteristics of adaptive memories, such as positive valence, and self and belonging functions. A large portion of subjects also opted to save a memory that did not correspond with the US cultural life script. We also found that erase memories were associated with characteristics of maladaptive memories, such as negative valence, directive functions, and had a low degree of overlap with the cultural life script. Overall, these results are consistent with previous findings on differences between highly positive and highly negative memories, although they suggest that save and erase memories may be more idiosyncratic relative to other highly positive and

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negative memories.

Surprisingly, erase memories did not show the expected patterns of memory characteristic fading typically associated with memories of negative self-evaluations, or with negative memories in general (Berntsen, 2002; Bohn & Berntsen, 2007; D'Argembeau, Comblain, & Van der Linden, 2003; D'Argembeau & Van der Linden, 2008; Walker, Skowronski, & Thompson, 2003). Based on this literature, we had expected that erase memories would be rated lower on sensory details, a sense of reliving, coherence, belief, importance, talking about the memory, and thinking about the memory. However, in Experiment 1 we found that people's ratings on these memory characteristics did not differ according to the save and erase classification, and in Experiment 2 we found that memories higher in sensory details were likely to be erase memories. On the other hand, in Experiment 2 we also found that and memories that were more often talked about were likely to be save memories, which is consistent with earlier work. Nevertheless, although we noticed the lack of consistency with previous literature on these variables, the effects are small and do not replicate across the two experiments. We follow up on the extent to which erase memories are associated with negative self-evaluations at all in Experiment 3.

Experiment 3

The findings from Experiment 1 and 2 suggest that save and erase memories are functionally similar to highly positive and highly negative memories, albeit perhaps more idiosyncratic, as indicated by lower correspondence with the cultural life script. However, it is possible that these findings reflect a general lower correspondence for Americans' highly emotional memories to cultural life script events. But it is also

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possible that these findings simply reflect the main dimension (i.e., valence) on which save and erase memories differ, rather than being defining features of save and erase memories themselves. To parse out the characteristics of save and erase that are particular to those categories we therefore asked subjects in Experiment 3 to describe either a save *and* erase memory, or a highly positive *and* a highly negative memory. We then compared the characteristics of highly positive memories to save memories, and the characteristics of highly negative memories to erase memories. We included both an American and a non-American sample consisting of Danish undergraduates.

On the one hand, the memories that people would save and erase may be indistinguishable in terms of valence, function, and event type from highly positive and negative memories. In this case, we might conclude that highly positive memories tend to be adaptive, and highly negative memories tend to be maladaptive, and that save and erase memories merely reflect this standard pattern. Furthermore these results would suggest that our findings regarding low cultural life script overlap in Experiments 1 and 2 are an artifact of our coding practices, which could have been stricter than in previous work, or due to the American sample.

On the other hand, save and erase memories may stand out from other highly positive and negative memories, by being more idiosyncratic. In this case, we might conclude that memories that correspond to cultural life script events are not necessarily a person's most adaptive or maladaptive memories. Instead, cultural life script events represent a more normative or idealized version of life in a given culture in which especially maladaptive memories may be less present (e.g., Berntsen & Rubin, 2004; Zaragoza Sherman, Salgado, Shao, & Berntsen, 2017).

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Additionally, there is reason to expect that erase memories may also stand out from other highly negative memories in terms of memory function. Memories that people would like to erase are likely to be memories associated with shame or embarrassment. Memories of shame can share characteristics with traumatic memories (Matos & Pinto-Gouveia, 2010). For instance, when traumatic memories become central to people's identity and life stories, people tend to score highly on measures of posttraumatic stress disorder and depression (Berntsen & Rubin, 2006, 2007). In a similar way, research suggests that the more central shame memories become in people's lives, the more people experience symptoms of psychopathology, such as depression, anxiety, and posttraumatic stress disorder—even when controlling for feelings of fear and sadness (Matos, Pinto-Gouveia, & Duarte, 2012; Robinaugh & McNally, 2010). Moreover, the emotion of shame is associated with feelings of social isolation (e.g., Leary, 2007; Matos et al., 2012), and thus memories that elicit shame are likely to also be associated with feelings of social isolation. Finally, it is very likely that memories of experiences that people are ashamed about will also be the memories that they are highly unlikely to share with others. We would not then expect shame memories to serve belonging or social functions. Therefore, the more erase memories are central and associated with shame compared to highly negative memories, the less we expect erase memories will to serve a belonging or social function.

Hence, for Experiment 3, we expected save and erase memories to stand out from other types of highly positive and negative memories by being more idiosyncratic as indicated by their correspondence with the cultural life script.

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Moreover, we expected erase memories to stand out from other highly negative memories in the extent to which people associate them with shame, lack of belonging or sharing, as well as centrality to identity and life story.

Method

Subjects. We ran Experiment 3 with two samples. The first sample was recruited from the United States and Canada via Amazon's Mechanical Turk (Mturk). Subjects received USD \$0.8 upon completion of the study. We aimed for a final sample size of 75 subjects per cell (that is, 300 subjects total). In anticipation of having to exclude data from subjects who did not complete the survey or do not follow instructions we predetermined to collect data from 400 subjects. Because Mturk does not communicate directly with Qualtrics, our data collection software, we actually collected data from 415 people.

The second sample was recruited from a Psychology research methods class at Aarhus University, Denmark, as part of a teaching exercise. The students in the class were instructed to distribute the link to the survey on social media in order to increase the sample size as well as the male to female ratio. Apart from minor details such as the specific wording of items as well as language (the English version had been translated to Danish), the questionnaire was identical to the MTurk questionnaire and accessible to the participants via a link to Qualtrics. We collected data from 270 people.

Procedure. As with Experiments 1 and 2, we told subjects we were investigating people's preferences for different types of experiences. All subjects completed the experiment online. Before subjects began the experiment, we asked

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them to complete the experiment under strict conditions. We asked them to complete the experiment in one session, in an environment free from distraction, and to refrain from doing anything else on their computer while doing the study.

Experiment 3 followed the same procedure as Experiments 1 and 2, except as noted. Over the course of the experiment, we asked subjects to nominate and rate the characteristics of two memories: either one memory they would save and then one memory they would erase, or their most positive memory and then their most negative memory. We counterbalanced the order subjects selected and rated the two memories. To prompt subjects for their most positive and negative memories we told them “some events may stand out as your most positive (negative) memories. Now imagine that you have to choose between these memories. Which one is your most positive (negative) memory?” For both the save and erase memory prompts we replaced the press releases we had used in Experiments 1 and 2 with straightforward hypothetical scenarios. Our previous research had revealed that these press releases were only moderately plausible, and we wanted to keep the length of the memory prompts for Experiment 3 as similar across the four conditions as possible. To prompt subjects for a memory they would save we told them to “suppose that you could permanently save one specific memory. If you saved that memory you would save whatever information you currently have about that event, and be able to re-experience it whenever you wanted to.” To prompt subjects for a memory they would erase we told them to “suppose that you could permanently erase one specific memory. If you erased that memory you would not be able to re-experience it again.” The full texts for all memory prompts are detailed in the Supplemental Materials.

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In the third phase of Experiment 3, subjects rated their nominated memory on 25 of the phenomenological and memorial characteristics from Experiment 2. We reduced the total number of unique items subjects rated for each memory because we were now asking subjects to rate two memories over the course of the experiment. The omitted 12 items measured the sensory details, sense of reliving, and other metacognitive judgments associated with the memory, which showed inconsistent results in Experiments 1 and 2. Thus, in Experiment 3, subjects rated their memories on 25 characteristics. These characteristics included measures of memory function, discrete emotions, valence, rehearsal, and the Centrality of Events Scale (see Table 1 for the full list of items and anchors). Cronbach's alpha was acceptable for the Centrality of Events Scale (American sample $\alpha = .90$; Danish sample $\alpha = .87$).

In the fourth phase, subjects categorized their memory according to its place, if any, in their cultural life script and a secondary content coding scheme (Berntsen & Rubin, 2004; Rubin et al., 2009; Schlagman, Schultz, & Kvavilashvili, 2006). If subjects were describing a memory prompted by the erase or most negative instructions then we also asked them to categorize their memory according to the Traumatic Life Events Questionnaire (Kubany et al., 2000). We found that sometimes subjects miscategorized their memories (for example, categorizing "divorce" as "getting married" in the cultural life script) so we do not report these data, but instead coded the memories according to the cultural life script as in Experiments 1 and 2.

Only subjects in the save/erase condition completed the fifth phase of the experiment. These subjects rated on a 7 point Likert-type scale "If you could actually

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save [erase] this memory, how likely would you be to do that?" (1 = *not at all likely*, 7 = *extremely likely*).

Subjects then repeated phases one to five in response to the second memory prompt. For example, if subjects had first described a memory they would save they would now describe one they would erase and vice versa. Similarly, if subjects had first described their most positive memory, they now described their most negative memory, and vice versa.

Finally, we asked all subjects completing the experiment via Mechanical Turk (that is, American subjects) if they had complied with our instructions to complete the experiment under the conditions we specified at the start. As with the first two experiments, we promised to pay them regardless of their answers. We did not ask these questions of the Danish students because we thought doing so could be construed as being at odds with our assurances that their answers would not affect their grades in the class they were taking while participating in the experiment. At the end of the study, all subjects were debriefed.

Scoring of Correspondence with the Cultural Life Script. For the USA sample, two judges analyzed subjects' descriptions of their nominated memories, and classified them according to their place (if any) on the US version of the cultural life script (events in the leftmost column of Table 8a; Rubin et al., 2009). One judge was blind to the hypothesis and predictions of the study. Judges classified 20% of subjects' memories independently, and agreed on 90.2% of classifications, resolving disputes by discussion.

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For the Danish sample, two judges analyzed subjects' descriptions of their nominated memories, and classified them according to their place (if any) on the Danish version of the cultural life script (events in the leftmost column of Table 8b; Rubin et al., 2009). One judge was blind to the purposes and hypotheses of the study. Judges agreed on 92.0% of classifications, and resolved disputes by discussion.

Results and Discussion

The purpose of this experiment was to parse out the characteristics of save and erase memories that are particular to those categories, rather than simply properties of highly positive and negative memories.

Before addressing these questions, we first identified subjects who did not complete the survey, (American $n = 112$, 27.0%; Danish $n = 91$, 66.3%) and subjects who did not provide a description of a memory to save or erase, (American $n = 9$, 0.02%; Danish $n = 3$, 0.01%). We excluded the data from these subjects. We then evaluated the Mechanical Turk dataset for subject compliance. We found that 22.4% of American subjects ($n = 66$) failed at least one of our compliance checks. Including subjects who failed our compliance checks did not change the overall patterns of results, so we retained the data in our analyses (see Table S1 for the percentage of subjects who failed each compliance question). The remaining American sample comprised 294 subjects ($M_{age} = 38.44$, $SD_{age} = 12.69$) and the remaining Danish sample comprised 176 subjects ($M_{age} = 24.60$, $SD_{age} = 5.13$). Table S3 shows the means, standard deviations and 95% confidence intervals for all variables measured in Experiment 3.

“Save” and “erase” memories as special categories. To determine the extent

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to which save and erase memories are special categories of highly positive or highly negative memories we now compare the characteristics of save to highly positive memories, and the characteristics of erase memories to highly negative memories.

Valence and function. To what extent were save memories as positive as people's most positive memories, and erase memories as negative as people's most negative memories? We found that, regardless of sample nationality, save memories were indeed as positive as people's most positive memories, and erase memories were as negative as people's most negative memories. We ran a mixed-measures 2 (sample: American, Danish) x 2 (memory instructions: save and erase, most positive and most negative) factorial ANOVA, with valence as the repeated measure, and memory instructions as a between-subjects factor. We found that people's most positive or save memories were rated as very positive, and their most negative or erase memories were rated as very negative ($F(1,466) = 4223.71, p < .01; M_{diff} = 4.40, 95\% \text{ CI } [4.22, 4.59]$). The effect of valence was not different according to memory instruction or sample nationality (memory instruction $F(1,466) = 1.57, p = .39$; sample $F(1,466) = 1.92, p = .34$). Thus, people's save memories are as positive as their most positive memories, and their erase memories are as negative as their most negative memories.

To analyze the extent to which save and erase memories serve different functions from most positive and most negative memories, we entered subjects' ratings on self, social, directive, and social belonging items into two stepwise logistic regressions, predicting whether these ratings belonged to a save or most positive memory, and erase or most negative memory. We analyzed the data from each sample separately and the results appear in Table 6a (save vs. most positive) and 6b (erase vs.

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most negative).

The save versus most positive memory model included ratings on the directive and self functions for the American sample only ($\chi^2 = 14.03, p < .01$). Memories rated highly on the directive function were more likely to be most positive memories compared to save memories (OR = 1.37, 95% CI [1.14, 1.63]). We did not replicate this finding in the Danish sample, and it is also unsupported by previous research on highly positive memories. For the Danish sample no combination of function variables predicted save or most positive category membership. Taken together, we cannot conclude that save memories serve any particular functions more so than other highly positive memories.

Table 6a.

Logistic Regression Model using Memory Function Ratings to Predict Memory Classification—Save versus Most Positive

Memory function	USA			
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95%CI</i>
Intercept	-0.76	0.43		
Self	-0.15	0.10	0.86	[0.71, 1.04]
Directive	0.31	0.09	1.37	[1.14, 1.63]

Note. ORs greater than 1 indicate that ratings on that memory function were associated more with most positive memories than “save” memories.

The erase versus most negative memory model included ratings on the social function for the American sample ($\chi^2 = 4.86, p = .03$). Memories that were rated highly on social functions were more likely to be most negative memories than erase memories (OR = 2.12, 95% CI [1.08, 4.17]). For the Danish sample the model included ratings on the social and belonging functions ($\chi^2 = 22.58, p < .01$).

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Memories that were rated highly on belonging functions were more likely to be most negative memories than erase memories (OR = 16.20, 95% CI [3.14, 83.55]). Taken together, these findings suggest that erase memories are less likely to be shared with others (for Americans), or to give people a sense of belonging with others (for Danes) compared to other highly negative memories.

Table 6b.

Logistic Regression Model using Memory Function Ratings to Predict Memory Classification—Erase versus Most negative

Memory function	USA				Denmark			
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95%CI</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95%CI</i>
Intercept	-0.50	0.24			-1.28	0.37		
Belonging					0.46	0.14	2.51	[0.74, 8.50]
Social	0.13	0.06	2.12	[1.08, 4.17]	0.15	0.10	16.20	[3.14, 83.55]

Note. ORs greater than 1 indicate that ratings on that memory function were associated more with most negative memories than “erase” memories.

Self-evaluation. One reason that an erase memory may not be shared with others, or give people a sense of belonging, is because that memory elicits shame. To test this hypothesis we compared erase memories to most negative memories in terms of the extent to which people felt shame when recalling those memories, while controlling for other negative emotions. We entered subjects’ ratings on how much sadness, shame, anger, and fear they felt when recalling the memory into a stepwise logistic regression, predicting whether these ratings belonged to an erase or most negative memory. We analyzed the data from each sample separately and the results appear in Table 7. The final model for the American sample included ratings on shame and sadness ($\chi^2 = 11.04, p < .01$). Memories that were rated highly on shame were more likely to be erase memories than most negative memories (OR = 1.18, 95% CI

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[1.06, 1.31]). For the Danish sample the model included ratings on shame, anger, and sadness ($\chi^2 = 18.79, p < .01$). But the goodness of fit test indicated that this model did not fit the data very well ($\chi^2 = 153.88, p < .01$). We therefore also ran a 2 (memory instruction: erase, most negative) x 2 (sample: American, Danish) factorial ANOVA with shame as the dependent variable. We found that people had more shame when recalling their erase memories compared to their most negative memories ($F(1,466) = 20.44, p < .01; M_{diff} = 0.92, 95\% \text{ CI } [0.52, 1.32]$). These findings suggest that erase memories tend to involve higher degrees of shame than other highly negative memories.

Table 7.

Logistic Regression Model using Negative Emotion Ratings to Predict Memory Classification—Erase versus Most Negative

Memory function	USA				Denmark			
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95%CI</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95%CI</i>
Intercept	-0.05	0.44			0.17	0.52		
Shame	-0.17	0.05	0.85	[0.76, 0.94]	-0.25	0.07	0.78	[0.67, 0.90]
Sadness	0.11	0.07	1.11	[0.96, 1.28]	0.26	0.10	1.29	[1.05, 1.59]
Anger					-0.16	0.09	0.85	[0.72, 1.01]

Note. ORs greater than 1 indicate that ratings on that memory function were associated more with most negative memories than “erase” memories.

We also compared save memories to most positive memories in terms of the extent to which people felt pride when recalling those memories. We entered subjects' ratings on how happy, proud, content, and peaceful the memory makes them feel into a stepwise logistic regression, predicting whether these ratings belonged to a save or most positive memory. We analyzed the data from each sample separately. We found that none of the positive emotion ratings were predictive of whether the memory was

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a save or most positive memory. Therefore, we cannot conclude that save memories are particularly associated with positive self-evaluation more so than any other highly positive memory.

Centrality of Events Scale. One of the ways we hypothesized that erase memories might become particularly problematic was if they were not only associated with shame, but also viewed as more central memories compared to other negative memories. To test this hypothesis we ran a mixed-measures 2 (sample: American, Danish) x 2 (memory instructions: save and erase, most positive and most negative) factorial ANOVA, with event centrality as the repeated measure, and memory instructions as a between-subjects factor. We found that, overall, people considered their most positive or save memories as more central to their lives than their most negative or erase memories ($F(1,466) = 84.72$, $p < .01$; $M_{diff} = 0.62$, 95% CI [0.50, 0.75]). Thus, overall, people's high point memories were more central than their low point memories, but erase memories were not necessarily more central than people's most negative memories.

Type of event. Finally, to gauge whether or not the save and erase memories were unusual in how often they corresponded to cultural life script events we compared them with the events people nominated as their most positive or most negative memory. We analyzed each sample separately, according to the American and Danish cultural life scripts respectively (see Table 8a and 8b).

Previous research on Americans' and Danes' most positive memories found that 68% and 91.6% respectively corresponded to cultural life script events (Berntsen et al., 2011; Zaragoza Sherman et al., 2015). In Experiments 1 and 2 we found that

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42.1%-50.9% of Americans' save memories corresponded to cultural life script events. As the second and third columns of Table 8a and 8b show, the percentages of save and most positive memories corresponding to the cultural life script in Experiment 3 were similar, but both were considerably lower than the previous estimates of cultural life script correspondence of most positive memories. For Americans, cultural life script events accounted for 37.3% of save memories, and 46.9% of people's most positive memories ($\chi^2 = 2.73, p = .10$). For Danes, cultural life script events accounted for 53.5% of save memories, and 64.4% of people's most positive memories ($\chi^2 = 2.19, p = .14$).

Previous research on Danes' most negative memories found that 50.38% corresponded to cultural life script events, but no studies have coded Americans' most negative memories for cultural life script correspondence (Zaragoza Sherman et al., 2015). In Experiments 1 and 2 we found that 19.9% and 22.6% of Americans' erase memories corresponded to cultural life script events. As the fourth and fifth columns of Table 8a and 8b show, the percentage of erase and most negative memories corresponding to the cultural life script were different. For Americans, cultural life script events accounted for 14.0% of erase memories, and 33.6% of people's most negative memories ($\chi^2 = 14.63, p < .01$). For Danes, cultural life script events accounted for 22.1% of erase memories, and 44.4% of people's most negative memories ($\chi^2 = 10.03, p < .01$).

Taken together, these results suggest that across cultures, the memories people would erase are more idiosyncratic than other highly negative memories, whereas the memories that people would save are similar to other highly positive memories in

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terms of cultural life script correspondence. We did find that the proportion of most positive and negative memories corresponding to the cultural life script was numerically smaller than previous estimates. This discrepancy may be due to sampling error, or stricter criteria for coding cultural life script events compared to previous research. We also found that the correspondence with the cultural life script was numerically smaller in the American sample as compared with the Danish sample, which may reflect heterogeneity of the US culture relative to the homogeneity of the Danish culture (Rubin et al., 2009).

High points vs. low points. Given the similarities of valence and centrality between save memories and most positive memories, and erase memories and most negative memories, we collapsed these categories into “high points” and “low points.” We then ran our analyses again to see if we would replicate the function and event type results of Experiments 1 and 2. The full analyses appear in the Supplemental Materials. We found that regardless of sample nationality, memories of high points tended to serve more self and belonging functions, and memories of low points tended to serve more directive functions. Similarly, we found that a large portion of high point memories (USA = 58.0%, Denmark = 40.9%), and the majority of low point memories (USA = 76.1%, Denmark = 66.5%), were not accounted for by the cultural life script. Therefore, by collapsing memory categories into high points and low points we replicate the findings for save and erase memories in Experiments 1 and 2 as well as previous work comparing memories of high points and low points (or highly positive and highly negative memories) on the directive, self, and social functions (e.g., McLean & Lilgendahl, 2008; Rasmussen & Berntsen, 2009).

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Table 8a.

Percentage of Memories Corresponding to Cultural Life Script Events for Americans in Experiment 3

Cultural life script event	Save	Most positive	Erase	Most negative
Marriage	10.0%	8.4%	0.0%	0.0%
Having children	14.0%	20.3%	0.0%	0.7%
College	2.0%	4.2%	0.0%	0.0%
Begin school	0.0%	0.0%	0.0%	0.0%
High school	0.7%	2.1%	0.0%	0.0%
First job	0.0%	0.7%	0.0%	0.0%
Begin talking	0.0%	0.0%	0.0%	0.0%
Begin walking	0.0%	0.0%	0.0%	0.0%
Own death	0.0%	0.0%	0.0%	0.0%
Go to school	0.0%	0.0%	0.0%	0.0%
Parent's death	0.0%	0.0%	4.0%	12.6%
Other's death	0.7%	0.0%	9.3%	20.3%
Retirement	0.0%	0.0%	0.0%	0.0%
Own birth	0.0%	0.0%	0.0%	0.0%
Fall in love	6.7%	7.7%	0.0%	0.0%
Begin driving	0.7%	0.7%	0.0%	0.0%
Grandchildren	0.7%	1.4%	0.0%	0.0%
Settle on career	0.0%	0.0%	0.0%	0.0%
Puberty	0.0%	0.0%	0.0%	0.0%
First sex	0.7%	0.7%	0.7%	0.0%
Leave home	0.0%	0.7%	0.0%	0.0%
Begin daycare	0.0%	0.0%	0.0%	0.0%
Empty nest	0.0%	0.0%	0.0%	0.0%
First kiss	1.3%	0.0%	0.0%	0.0%
Total	37.3%	46.9%	14.0%	33.6%

Note: All totals are calculated from unrounded percentages

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Table 8b.

Percentage of Memories Corresponding to Cultural Life Script Events for Danes in Experiment 3

Cultural life script event	Save	Most positive	Erase	Most negative
Having children	2.3%	2.2%	1.2%	0.0%
Marriage	3.5%	3.3%	0.0%	0.0%
Begin school	0.0%	0.0%	0.0%	0.0%
College	5.8%	15.6%	0.0%	0.0%
Fall in love	24.4%	15.6%	0.0%	0.0%
Other's death	1.2%	0.0%	3.5%	22.2%
Retirement	0.0%	0.0%	0.0%	0.0%
Leave home	1.2%	0.0%	0.0%	0.0%
Parents' death	2.3%	0.0%	3.5%	11.1%
First job	1.2%	0.0%	0.0%	0.0%
Begin daycare	0.0%	0.0%	0.0%	0.0%
Own death	0.0%	0.0%	0.0%	0.0%
Divorce	0.0%	0.0%	0.0%	2.2%
Siblings	0.0%	1.1%	0.0%	0.0%
First friend	0.0%	0.0%	0.0%	0.0%
Go to school	0.0%	3.3%	1.2%	0.0%
Puberty	0.0%	0.0%	0.0%	0.0%
Grandchildren	0.0%	0.0%	0.0%	0.0%
Long trip	4.7%	10.0%	1.2%	0.0%
Begin walking	0.0%	0.0%	0.0%	0.0%
Serious disease	0.0%	1.1%	7.0%	8.9%
Major achievement	0.0%	4.4%	0.0%	0.0%
Settle on career	0.0%	0.0%	1.2%	0.0%
First sexual experience	0.0%	0.0%	0.0%	0.0%
Partner's death	0.0%	0.0%	1.2%	0.0%
Begin talking	0.0%	0.0%	0.0%	0.0%

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Table 8b Cont.

Percentage of Memories Corresponding to Cultural Life Script Events for Danes in Experiment 3

Cultural life script event	Save	Most positive	Erase	Most negative
Confirmation	2.3%	0.0%	1.2%	0.0%
Enter adulthood	0.0%	0.0%	0.0%	0.0%
Having peers	3.5%	5.6%	1.2%	0.0%
Empty nest	0.0%	0.0%	0.0%	0.0%
First rejection	0.0%	0.0%	0.0%	0.0%
The “right” job	0.0%	2.2%	0.0%	0.0%
First contact	0.0%	0.0%	0.0%	0.0%
Baptism	1.2%	0.0%	0.0%	0.0%
Earn first money	0.0%	0.0%	0.0%	0.0%
Total	53.5%	64.4%	22.1%	44.4%

Note: All totals are calculated from unrounded percentages

Overall, our results suggest that the memories that people would save if they could are mostly indistinguishable from their most positive memories in terms of their valence, function, positive self-evaluation, and centrality. Erase memories, on the other hand, are less often shared, elicit less of a sense of belonging, and are more associated with shame, and more idiosyncratic than people’s most negative memories—despite being as negatively valenced and as central as their most negative memories.

General Discussion

Across three experiments we sought to answer two questions: First, do people have memories they actually want to save or erase? And if so, why do they want to save or erase those particular memories? We found that, yes, people did have

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memories they said they would save or erase if they could. We found that people chose to save memories associated with characteristics of adaptive memories such as positive valence, a sense of their own identity, and a sense of belonging with other people. The content of around half of save memories corresponded to subjects' cultural life script, and the other half were idiosyncratic. By contrast, we found that people chose to erase memories that were associated with characteristics of maladaptive memories such as negative valence, shame, and did not give people a sense of belonging with others, or were not shared with others. Furthermore these memories were highly idiosyncratic as indicated by their low correspondence with the cultural life script.

Our findings make important contributions to three literatures: people's attitudes and beliefs towards autobiographical memories, the functions of autobiographical memories, and the cultural life script.

The first contribution of our findings is to the literature on people's attitudes and beliefs towards autobiographical memories. Our findings suggest that people do see value in having a memory preserved. But, given that there is no cost to saving the memory we cannot go so far as to say that people recognize the necessity of such a service for treasured memories that might otherwise fade. This may of course be a different case for people who suffer from special conditions such as hereditary dementia. If people know they are likely to lose their cherished memories sometime in the future, they may put different value on the memories they wish to save. The finding that people would erase a memory if they could suggests that there may be some conditions under which people would also opt to take memory dampening

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drugs. When people were asked if they would a drug as a precaution against hypothetical intrusive memories of an assault, they were not asked to imagine experiencing the intrusive memories of the assault (Newman et al., 2011). In the current research people would have already experienced any negative consequences of recalling their erase memories. Therefore, it could be that people are willing to erase only the memories for which they have first-hand experiences of the consequences. Given that “cosmetic neurology,” such as memory altering drugs, may yet be a reality (Cahill, Prins, Weber, & McGaugh, 1994; Young et al., 2016) it will be important for future research to test the conditions under which people would be willing to take such drugs.

The second contribution of our findings is to literature on the functions of autobiographical memory. Our findings replicate research showing positive memories tend to serve self, belonging, or social functions, and negative memories tend to serve directive functions: people’s save memories were positive, and served more self and belonging functions, but less directive functions compared to erase memories (McLean & Lilgendahl, 2008; Rasmussen & Berntsen, 2009, 2013). Moreover, people chose to save positive memories that served self functions, and to erase memories for which they felt shame, a negative self-evaluation, supporting the hypothesis that autobiographical memory is biased towards self-enhancing information (McLean & Lilgendahl, 2008; Rasmussen & Berntsen, 2009, 2013; Ritchie, Skowronski, Wood, Walker, Vogl, & Gibbons 2006; Wilson & Ross 2001).

Our findings also extend the autobiographical memory function literature by further characterizing adaptive and maladaptive memories. Save memories shared

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characteristics that are associated with adaptive memories and were indistinguishable from highly positive memories, suggesting people's most positive memories are also highly adaptive.

The opposite statement was not true: People's most negative memories are not necessarily highly maladaptive. Erase and most negative memories were similarly negative, but differed on the functions they tended to serve and emotions they tended to elicit. Americans were less likely to share erase memories with other people compared to their most negative memories, and Danes reported that they had less of a sense of belonging when thinking about their erase memories compared to their most negative memories. Both the social and belonging functions of autobiographical memory are associated with the building and maintaining of relationships with others. The belonging function maintains mental representations of relationships, and the social function creates connection to others through the verbal sharing of memories (Rasmussen & Habermas, 2011). Therefore, our results suggest that a feature of maladaptive memories is that these memories do not support the building and maintaining of relationships with others. Maladaptive memories may instead create a real or imagined sense of isolation from others.

One piece of evidence we have in support of the hypothesis that erase memories serve maladaptive social functions is that we also found erase memories elicited more shame than highly negative memories. Shame is characterized by a negative self-evaluation that is believed to be shared by others (Matos et al., 2012). Therefore it would make sense that when people recall a shame memory they do not feel a sense of belonging, or choose not to share that memory with others.

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To the extent that people value self-enhancement over accurate self-assessment it is adaptive that, in general, shame memories contain less intense memory characteristics than their pride counterparts (D'Argembeau & Van der Linden, 2008; Sedikides, 1993; Wilson & Ross 2001). Erase memories, on the other hand, did not show any fading of memory characteristics compared to save memories. It is possible that erase memories were not subject to the same fading that other shame memories because erase memories tend not to be shared with others. Research shows that rehearsing memories by sharing them with others has different effects on the intensity of affect in positive and negative memories. The positive affect of memories fades less when those memories are shared with others, whereas the negative affect of memories fades more (Walker et al., 2009). If the other memory characteristics of positive and negative memories show similar patterns of decreased and increased fading through social sharing, perhaps the shame memories people nominated to erase memories did not fade because people tend to share them less often with others. Therefore, highly vivid shame memories might be particularly maladaptive shame memories.

A limitation of our research is that we can only make inferences about the adaptive and maladaptive functions that save and erase memories may serve. We assessed memory functions using single item self-report scales validated in previous research on memory function (Rasmussen & Berntsen, 2009). All items were worded neutrally ("This memory tells me something about my identity") except the belonging item, which was worded in a positive direction ("This memory gives me a sense of belonging with other people"). From these answers alone we cannot conclude the

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extent to which people think those memories serve adaptive or maladaptive functions. Furthermore, we cannot verify the extent to which people's save and erase memories are actually associated with any real world positive or negative outcomes, such as PTSD symptoms, or increased wellbeing. Future research should devise items to assess and verify subjective judgments on the adaptive and maladaptive aspects of memory function.

The third contribution of our findings is to the literature on the cultural life script. We did not replicate previous findings on the percentage of most positive memories to the cultural life script. Previous estimates suggest 68% of Americans' and 91.6% of Danes' most positive memories correspond to cultural life script events (Berntsen et al., 2011; Zaragoza Sherman et al., 2015). We found that only 46.9% of Americans' and 64.4% of Danes' most positive memories corresponded to cultural life script events. The variation in correspondence of most positive memories to the cultural life script could represent sampling variation. Our own estimates for the correspondence of save memories to the cultural life script vary between 37.3% and 50.9%, and between 14.0% and 22.6% for the correspondence of erase memories. This variation suggests that larger samples may be needed for more stable estimates of cultural life script correspondence. In addition to the variation between samples, we also need to be aware of the variation in coding methodologies. It is possible that our criteria for cultural life script correspondence of an event were stricter than previous research.

We added to the cultural life script literature by estimating the percentage of Americans' most negative memories that correspond to cultural life script events, and

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estimating the percentage of save and erase memories that corresponded to cultural life script events. The third experiment was the first that we are aware of to estimate the percentage of Americans' most negative memories that correspond to cultural life script events. This estimate (33.6%) was at the lower end of previous estimates from non-American countries, in which 32.1-50.4% of people's most negative memories corresponded to cultural life script events (Zaragoza Sherman et al., 2015). But again, a larger sample may be needed to provide a more accurate estimate. The higher percentage of save memories corresponding to the cultural life script compared to erase memories suggests that people want to hold on to memories that correspond to the cultural life script. Further more we found that the memories people nominated to save were as often of cultural life script events as their most positive memories. The memories that people nominated to erase were more idiosyncratic than their most negative memories, with most negative memories corresponding to cultural life script events twice as often as erase memories. Given that cultural life script events represent culturally valued and expected events it makes sense that people would rather hold on to their memories of these events—even if they were highly negative events (Berntsen & Bohn, 2009; Berntsen & Rubin, 2004; Berntsen et al., 2011; Zaragoza Sherman et al., 2015)

The goal of these experiments was to aid our understanding of the kinds of memories that people would value saving and erasing. Lurking in the background of these questions is, of course, the ethical dilemma of whether we *should* seek to externally manipulate our remembering and forgetting (Bluck, 2017; Farah et al., 2004; Holmes, Sandberg, & Iyadurai, 2010; Westerhof, 2017). It is very difficult to

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argue that autobiographical memory is a pure recollection of one's personal past. Memories are adaptively forgotten, distorted, and remembered, without any conscious effort. Furthermore, our research suggests that the decisions people consciously make about which memories they would save or erase mimic everyday mechanisms of memory: Positive memories that give people a sense of self are chosen to save, and negative memories that are associated with shame, a negative self-evaluation, are chosen to erase. Nevertheless, the availability of erase memories for recall and rating suggests that these memories have, in fact, not been successfully forgotten through normal forgetting mechanisms. Autobiographical memory is a dynamic and flexible system—much of which remains mysterious. Wisdom, therefore, may be pursuing a greater understanding of what makes memories truly adaptive and maladaptive before attempting to permanently fix remembering and forgetting.

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Supplemental Materials

Supplemental Materials for Experiments 1 and 2

“Save” memory prompt. Recording and storing thoughts, dreams and memories for future playback is now being offered as a service by an US-based neurotechnology company called Millennium Optical Technologies (MOT), the first company to commercialize the process. Dr. Robert Ford, founder and chief science officer of MOT, says that his patented technology can record detailed brain patterns and correlate them with thoughts and emotions for future interpretation. These recordings can then be “played back” either on a screen or by reliving them in the mind itself.

The possibilities of neurotechnology first caught Ford’s attention in 2003. He read a paper that demonstrated how brain activity patterns when looking at different images could be distinguished between each other.

Ford and MOT have now developed playback technology that will make it possible for someone to revisit memories whenever they want, through a series of impulses sent to the brain. These impulses would reactivate the original neural processes.

The service is currently aimed at people wanting to preserve memories, but in the future Ford hopes that the optical technology will be advanced enough to record memories of desirable experiences as they are occurring.

“Erase” memory prompt. Erasing specific memories from the brain is a service now being offered by an US-based neurotechnology company called Millennium Optical Technologies (MOT), the first company to commercialize the process.

“The idea is that learning involves processing in the cortex, and the hippocampus reproduces this pattern of activity during remembering, allowing you to re-experience the event,” said Dr. Robert Ford, the founder and chief science officer of MOT.

Ford and his colleagues used the fact that specific nerve cells in the brain can be switched off by light. They developed a technology to switch off a specific memory by beaming light through the eyes and into the brain, using a fiber optic cable.

After isolating the exact cells responsible for that memory, Ford directs the light to those cells only— without disrupting any other cells in the hippocampus. The end result is that the specific memory, and only that specific memory, is gone.

The service is currently aimed at people wanting to erase specific memories, but in the future Ford hopes that the optical technology will be advanced enough to erase unwanted experiences as they are occurring.

Table S1.

Compliance Questions and the Percentage of Subjects From Each Experiment who Failed Them for Experiment 1, 2, and 3.

Question	Experiment 1	Experiment 2	Experiment 3
Did you maximize the size of your web browser so that it covers your entire screen?	0.6%	8.9%	5.8%
Did you complete the experiment in a single session, without stopping?	0.0%	3.1%	1.4%
Did you pause or leave the experiment to engage in other tasks, even if they were other computer tasks?	3.8%	5.5%	3.1%
Did you use your web browser's back or refresh buttons at any point during the experiment?	1.7%	3.1%	2.0%
Did you complete the experiment in an environment that is free of noise and distraction?	7.5%	8.6%	7.1%
Did you complete the experiment without anyone helping you?	3.4%	6.9%	7.8%
Did you speak with anyone at any time during the experiment?	4.1%	10.3%	5.1%
Please tell us whether you used a search engine at any point during the experiment to look anything up.	1.4%	2.1%	1.0%
Subjects who failed at least one of the above	17.4%	23.7%	33.3%

Note. The last row is not equivalent to the sum of each column because some subjects failed multiple questions.

Table S2.

Means and Standard Deviations for “Save” and “Erase” Memory Characteristic Ratings in Experiment 1 and 2

Variable	Experiment 1					Experiment 2				
	Save		Erase		95% CI mean difference	Save		Erase		95% CI mean difference
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Calm	5.10	1.70	2.30	1.22	[2.46, 3.14]					
Afraid	2.00	1.40	4.05	1.95	[-2.44, -1.66]					
Motivated	5.28	1.37	2.94	1.57	[2.01, 2.69]					
Nervous	2.60	1.77	4.85	1.81	[-2.66, -1.84]					
Relaxed	5.01	1.71	2.24	1.31	[2.42, 3.12]					
Angry	1.52	1.16	4.78	1.79	[-3.61, -2.91]					
Satisfied	5.96	1.51	1.98	1.28	[3.66, 4.30]					
Frustrated	1.86	1.46	5.21	1.68	[-3.72, -3.00]					
Happy	6.19	1.52	1.73	1.08	[4.16, 4.76]					
Confused	1.86	1.54	4.33	1.91	[-2.87, -2.07]					
Confident	5.36	1.54	2.34	1.36	[2.69, 3.36]					
Shameful	1.44	1.11	4.43	2.14	[-3.38, -2.59]					
Proud	5.39	1.81	1.95	1.26	[3.09, 3.80]					
Sensory vividness	5.47	1.13	5.72	0.97	[-0.48, 0.00]	5.57	1.01	5.95	0.92	[-0.61, -0.16]
Vivid	5.45	1.53	5.85	1.37	[-0.74, -0.07]	5.41	1.41	6.15	1.10	[-1.03, -0.44]
Hear	4.57	1.83	4.84	1.77	[-0.69, 0.14]	4.94	1.61	5.12	1.91	[-0.59, 0.24]
See	5.75	1.19	6.01	1.06	[-0.52, 0.00]	5.80	1.12	6.26	0.93	[-0.71, -0.22]
Setting	6.13	1.18	6.23	1.12	[-0.37, 0.16]	6.01	1.17	6.35	0.99	[-0.59, -0.08]
Spatial layout	5.48	1.46	5.65	1.43	[-0.51, 0.16]	5.53	1.39	5.90	1.30	[-0.69, -0.05]
Sense of reliving	5.00	1.45	5.02	1.47	[-0.35, 0.32]	5.18	1.37	5.55	1.30	[-0.68, -0.06]
Reliving	4.92	1.56	5.05	1.54	[-0.48, 0.23]	5.14	1.39	5.68	1.34	[-0.86, -0.22]
Back in time	5.08	1.69	4.99	1.76	[-0.30, 0.49]	5.12	1.62	5.43	1.62	[-0.69, 0.07]
Voluntary rehearsal	5.31	1.43	4.69	1.34	[0.30, 0.95]	5.33	0.11	5.16	0.11	[0.08, 0.70]
Thought	5.83	1.28	5.57	1.39	[-0.05, 0.57]	5.94	1.20	5.83	1.36	[-0.19, 0.41]
Talked	4.78	1.98	3.79	1.97	[0.53, 1.44]	5.24	1.73	4.45	2.06	[0.34, 1.23]

Table S2.

Means and Standard Deviations for “Save” and “Erase” Memory Characteristic Ratings in Experiment 1 and 2

Variable	Experiment 1					Experiment 2				
	Save		Erase		95% CI mean difference	Save		Erase		95% CI mean difference
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Other										
Stressful	2.36	1.77	6.19	1.20	[-4.18, -3.49]	2.60	1.82	6.13	1.24	[-3.89, -3.16]
Pleasant	6.36	1.30	1.48	1.02	[4.61, 5.15]	6.15	1.30	1.72	1.47	[4.10, 4.75]
Confidence	6.61	1.01	6.22	1.63	[0.08, 0.71]	6.71	0.72	6.59	1.07	[-0.10, 0.33]
Visual	5.87	1.22	5.92	1.27	[-0.34, 0.23]	5.83	1.13	6.11	1.14	[-0.55, -0.02]
Auditory	4.66	1.83	4.94	1.86	[-0.70, 0.15]	4.87	1.48	5.06	1.95	[-0.60, 0.21]
Olfactory	3.26	2.02	2.78	1.99	[0.02, 0.94]	3.59	1.96	2.92	2.04	[0.21, 1.14]
Tactile	4.68	2.02	3.87	2.23	[0.31, 1.30]	4.72	1.99	4.23	2.29	[-0.01, 0.99]
Gustatory	2.85	2.03	2.04	1.62	[0.39, 1.23]	2.87	1.83	2.35	1.96	[0.07, 0.96]
People talking	4.14	2.03	4.52	2.07	[-0.85, 0.09]	4.81	1.83	4.65	2.20	[-0.31, 0.63]
Emotion then	5.74	1.44	5.68	1.32	[-0.26, 0.37]	5.82	1.26	6.02	1.18	[-0.49, 0.08]
Emotion now	4.90	1.78	4.57	1.71	[-0.07, 0.73]					
Remember/ know	5.96	1.35	6.06	1.34	[-0.41, 0.21]	5.92	1.23	6.13	1.25	[-0.50, 0.08]
In words	4.17	2.04	4.01	2.01	[-0.31, 0.62]	4.55	1.83	4.48	2.02	[-0.38, 0.53]
Coherence	5.08	1.74	5.18	1.79	[-0.50, 0.31]	5.41	1.45	5.37	1.65	[-0.32, 0.41]
Importance	5.57	1.77	5.11	1.83	[0.04, 0.87]	5.65	1.53	5.66	1.62	[-0.37, 0.36]
Belief	6.22	1.17	6.34	1.03	[-0.38, 0.13]	5.98	1.24	6.24	1.26	[-0.56, 0.03]
Own eyes	5.92	1.44	5.72	1.52	[-0.14, 0.55]	5.74	1.42	5.97	1.35	[-0.55, 0.09]
Specific	6.31	1.10	6.15	1.26	[-0.11, 0.43]	6.01	1.22	6.05	1.29	[-0.33, 0.26]
Thought2	5.39	1.49	5.31	1.41	[-0.25, 0.42]					
Talked2	4.43	1.89	3.46	1.84	[0.54, 1.40]					
Involuntary	4.97	1.58	4.71	1.64	[-0.11, 0.63]	4.97	1.58	5.20	1.60	[-0.60, 0.14]
Valence	2.26	1.19	-2.09	1.16	[4.08, 4.62]					
Intensity	5.39	1.39	5.23	1.58	[-0.19, 0.50]	5.48	1.51	5.77	1.33	[-0.62, 0.04]
Negative						1.83	1.52	5.90	1.33	[-4.40, -3.73]
Positive						6.23	1.29	1.93	1.58	[3.96, 4.64]

Table S2.

Means and Standard Deviations for “Save” and “Erase” Memory Characteristic Ratings in Experiment 1 and 2

Variable	Experiment 1					Experiment 2				
	Save		Erase		95% CI mean difference	Save		Erase		95% CI mean difference
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Age of memory	22.47	9.87	23.07	11.25	[-1.83, 3.03]	23.52	10.57	23.15	12.98	[-2.37, 3.10]
Days ¹	1732	2990	1583	2626	[-798, 500]	62	89	93	119	[-92, 30]
Directive	3.82	1.84	4.06	1.80	[-0.67, 0.17]	4.50	1.88	4.82	1.73	[-0.75, 0.10]
Self	4.98	1.70	3.99	1.93	[0.57, 1.41]	5.32	1.72	4.71	1.64	[0.22, 1.01]
Social	4.33	2.01	3.09	1.82	[0.80, 1.68]	4.67	1.99	3.81	2.11	[0.38, 1.34]
Belonging	4.41	2.03	2.04	1.53	[1.96, 2.78]	4.74	1.89	2.50	1.76	[1.81, 2.67]
Physical reaction	4.41	1.94	5.07	1.70	[-1.08, -0.24]	4.88	1.86	5.15	1.77	[-0.70, 0.15]
Action	2.88	1.93	2.77	1.98	[-0.34, 0.56]	3.41	2.00	3.05	2.10	[-0.12, 0.84]
Specific day	1.82	1.36	-1.69	1.39	[3.19, 3.83]					
Mood	4.08	2.27	5.21	1.77	[-1.59, -0.66]					
Consequences	4.94	1.61	4.91	1.54	[-0.34, 0.39]	4.46	2.26	5.70	1.61	[-1.70, -0.78]
Involuntary2	4.94	1.61	4.94	1.52	[-0.37, 0.36]					
Prevalence						53.19	35.35	41.28	35.29	[3.63, 20.17]
Centrality						3.75	1.00	3.49	0.98	[0.03, 0.49]

¹The results for this question in Experiment 1 span more than 365 days because this question was erroneously programmed as forced response for all subjects. In Experiment 2, subjects only answered this question if the event occurred less than 1 year ago.

Supplemental Materials Experiment 3

General instructions (precede all memory prompts). This study examines some of the most significant memories from your life. You will be asked to generate two such memories based on specific instructions.

A memory is defined as the memory of a single event that took place within 24 hours at a specific time and place that you personally experienced.

Please answer the following questions while keeping the memory you have chosen in mind. Please keep a steady pace while you work your way through the questions. Your first impression of what is the correct answer is often the right one.

Most positive memory prompt. A human life consists of many emotional and less emotional events. Some events become highly significant to your personal life story, whereas others are forgotten. From where you are in your life right now, some events may stand out as your most positive memories.

Now imagine that you have to choose between these memories. Which one is your most positive memory?

Most negative memory prompt. A human life consists of many emotional and less emotional events. Some events become highly significant to your personal life story, whereas others are forgotten. From where you are in your life right now, some events may stand out as your most negative memories.

Now imagine that you have to choose between these memories. Which one is your most negative memory?

“Save” memory prompt. Suppose that you could permanently save one specific memory. If you saved that memory you would save whatever information you currently have about that event, and be able to re-experience it whenever you wanted to. That is, you would be able to bring to mind some aspect or aspects of what happened. You would also be able to bring to mind what

you experienced at the time of the event. In other words, the saved memory would enable you to bring back to mind visual images, feelings, and particular associations with other experiences even if you lost your memory for all other life experiences.

Now imagine you were able to use this service. What one memory would you choose to save?

“Erase” memory prompt. Suppose that you could permanently erase one specific memory. If you erased that memory you would not be able to re-experience it again. That is, you would not be able to bring to mind any aspect or aspects of what happened. You would also not be able to bring to mind what you experienced at the time of the event. In other words, the visual images, feelings, and particular associations with other experiences would be gone.

Now imagine you were able to use this service. What one memory would you choose to erase?

Table S3.
Means and Standard Deviations of Memory Characteristic Ratings in Experiment 3 according to Memory Instructions and Sample

Variable	Experiment 3 - USA										Experiment 3 - Denmark									
	Save		Most positive		95% CI mean difference	Erase		Most Negative		95% CI mean difference	Save		Most positive		95% CI mean difference	Erase		Most Negative		95% CI mean difference
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Directive	4.59	1.88	5.31	1.72	[-1.13, -0.30]	4.56	2.00	4.67	1.75	[-0.54, 0.32]	3.22	1.92	3.16	1.83	[-0.49, 0.62]	2.85	1.75	3.28	1.93	[-0.98, 0.12]
Self	5.34	1.69	5.52	1.62	[-0.56, 0.20]	4.05	1.98	4.25	1.89	[-0.65, 0.24]	4.98	1.64	4.94	1.70	[-0.47, 0.53]	3.34	1.95	3.82	1.81	[-1.05, 0.08]
Social	4.74	1.89	5.08	1.84	[-0.77, 0.09]	3.37	2.11	3.90	1.99	[-1.00, -0.06]	4.08	2.09	3.98	1.98	[-0.50, 0.71]	2.66	1.60	3.39	1.69	[-1.21, -0.24]
Belonging	4.81	1.94	4.83	1.88	[-0.45, 0.43]	2.30	1.76	2.61	1.84	[-0.72, 0.10]	4.74	2.18	4.69	2.27	[-0.61, 0.72]	1.48	0.97	2.47	1.81	[-1.42, -0.56]
Valence	2.43	1.05	2.47	1.10	[-0.29, 0.21]	-1.98	1.65	-2.08	1.44	[-0.26, 0.45]	2.12	1.71	2.34	1.19	[-0.67, 0.21]	-2.07	0.98	-2.04	1.04	[-0.33, 0.27]
Intensity	5.43	1.75	5.40	1.55	[-0.35, 0.40]	5.53	1.68	5.27	1.75	[-0.14, 0.65]	5.10	1.45	4.64	1.64	[0.00, 0.92]	4.43	1.91	4.89	1.69	[-1.00, 0.08]
Sad	2.09	1.76	1.78	1.43	[-0.07, 0.67]	5.59	1.79	5.78	1.50	[-0.57, 0.19]	1.93	1.62	1.78	1.23	[-0.28, 0.58]	5.01	1.81	5.34	1.71	[-0.86, 0.19]
Happy2	6.27	1.28	6.24	1.33	[-0.26, 0.34]	1.63	1.57	1.53	1.27	[-0.24, 0.42]	5.93	1.59	5.97	1.37	[-0.48, 0.41]	1.20	0.53	1.34	0.77	[-0.34, 0.05]
Shame	1.41	1.12	1.44	1.13	[-0.29, 0.23]	3.92	2.34	3.13	2.14	[0.27, 1.30]	1.19	0.56	1.22	0.63	[-0.21, 0.14]	3.90	2.23	2.77	2.15	[0.48, 1.78]
Pride	5.39	1.91	5.59	1.73	[-0.61, 0.22]	1.61	1.32	1.79	1.46	[-0.50, 0.14]	5.06	2.08	5.18	1.81	[-0.70, 0.46]	1.14	0.49	1.62	1.29	[-0.77, -0.19]
Anger	1.58	1.48	1.44	1.04	[-0.15, 0.43]	4.55	2.11	4.60	1.94	[-0.52, 0.41]	1.24	0.94	1.24	0.75	[-0.26, 0.25]	4.21	1.96	3.70	2.16	[-0.10, 1.12]
Content	5.91	1.47	5.73	1.59	[-0.17, 0.53]	1.85	1.60	1.77	1.32	[-0.26, 0.41]	5.47	1.88	5.56	1.58	[-0.61, 0.43]	1.13	0.43	1.40	1.03	[-0.50, -0.04]
Fearful	1.51	1.25	1.63	1.32	[-0.42, 0.17]	3.89	2.19	3.69	2.13	[-0.30, 0.69]	1.44	1.06	1.61	1.15	[-0.50, 0.16]	3.67	2.10	3.28	2.01	[-0.21, 1.01]
Peaceful	5.69	1.60	5.58	1.60	[-0.25, 0.48]	1.67	1.49	1.84	1.39	[-0.50, 0.16]	4.95	1.85	4.71	1.63	[-0.28, 0.76]	1.27	0.73	1.44	0.82	[-0.41, 0.05]
Thought	4.79	1.88	5.12	1.75	[-0.74, 0.09]	3.43	2.00	3.77	1.92	[-0.79, 0.11]	4.23	1.88	4.39	1.83	[-0.71, 0.40]	2.78	1.68	3.57	1.76	[-1.30, -0.28]
Talked	5.18	1.72	5.47	1.55	[-0.67, 0.08]	3.31	1.85	3.87	1.97	[-0.99, -0.12]	4.49	1.76	4.53	1.66	[-0.56, 0.47]	2.41	1.45	2.73	1.59	[-0.78, 0.13]
Involuntary2	4.97	1.66	5.22	1.63	[-0.62, 0.14]	4.34	1.83	4.63	1.81	[-0.70, 0.13]	4.28	1.64	3.90	1.54	[-0.10, 0.85]	4.09	1.58	4.01	1.65	[-0.40, 0.56]
Age of memory	24.62	11.17	27.08	10.56	[-4.96, 0.03]	25.09	12.70	25.26	12.83	[-3.10, 2.76]	18.74	6.44	19.91	6.54	[-3.10, 0.77]	16.84	6.01	17.30	6.46	[-2.32, 1.40]
Centrality	3.69	1.08	3.99	0.87	[-0.52, -0.07]	2.97	1.21	3.36	1.10	[-0.65, -0.12]	3.24	1.15	3.28	1.17	[-0.38, 0.31]	2.50	1.10	2.94	1.08	[-0.76, -0.11]

High point versus low point analyses.

Valence and function. Were high point memories positive and low point memories negative? They were. More specifically, regardless of nationality, people rated high point memories as very positive, and low point memories as very negative ($M_{highpoint}=2.37$, 95% CI [2.25, 2.48]; $M_{lowpoint}=-2.04$, 95% CI [-2.16, -1.91]; $M_{diff}=4.40$, 95% CI [4.24, 4.57]).

To analyze the extent to which high point and low point memories were differentiated by memory function we entered subjects' ratings on self, social, directive, and social belonging items into a stepwise logistic regression, predicting whether these ratings belonged to high point or low point memories. The final model for both the USA sample and Danish sample included ratings on self, directive, and belonging functions, so we combined the data from both sample into a single analysis (see Table S4). We found that high point memories tended to serve self and belonging functions and low point memories tended to serve directive functions. Memories rated highly on self and belonging functions were more likely to be high point memories (Self OR = 1.39, 95% CI [1.24, 1.56]; Belonging OR = 1.75, 95%CI [1.61, 1.91]). Memories rated highly on the directive function were more likely to be low point memories (OR = 0.77, 95% CI [0.69, 0.85]). Therefore, we can conclude that these results replicate our findings in Experiment 1 and 2.

Table S4.

Logistic Regression Model Using Memory Function Ratings to Predict High Point or Low Point Classification

Memory function	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>95% CI</i>
<i>Intercept</i>	-2.38	0.24		
Belonging	0.56	0.04	1.75	[1.61, 1.91]
Self	0.33	0.06	1.39	[1.24, 1.56]
Directive	-0.26	0.05	0.77	[0.69, 0.85]

Notes. ORs greater than 1 indicate that ratings on that memory function were associated more with high point memories than low point memories.

Event type. To what extent did memories of high points and low points correspond to events on the cultural life script? We analyzed each sample separately. For Americans, we found that 42.0% of their high point memories and 23.9% of their low point memories corresponded to events on their cultural life script ($X^2 = 21.91$, $p < .01$). For Danes, we found that 59.1% of their high point memories and 33.5% of their low point memories corresponded to events on their cultural life script ($X^2 = 23.40$, $p < .01$). Thus high points more often corresponded to cultural life script event than low points, but even then a large portion of high points did not correspond to cultural life script events. Therefore, we can conclude that these results replicate our findings in Experiment 1 and 2.

Centrality of events. Given that many high points and low points did not correspond to cultural life script events, we wondered about the extent to which these idiosyncratic events were central to people's lives. We ran a 2 (Memory type: high point, low point) x 2 (Cultural Life Script Correspondence: On CLS, Other) Analysis of Variance collapsed across samples. We found that high points were more central than low points ($F(1,934) = 45.0$ $p < .01$) and that cultural life script memories were more central than non cultural life script memories ($F(1,934) = 59.84$ $p < .01$). The interaction between Memory Type and Cultural Life Script Correspondence was not significant ($F(1, 934) = 0.16$, $p = 0.69$). Therefore, we can conclude that these results replicate our findings in Experiment 1 and 2.