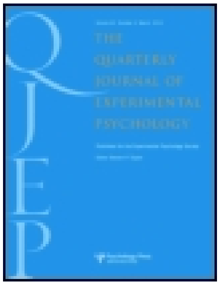

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The fate of being forgotten: Information that is initially forgotten is judged as less important

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The fate of being forgotten: Information that is initially forgotten is judged as less important

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Is forgotten information deemed less important than remembered information? The present study examined potential biases regarding the importance of information that was initially forgotten. In Experiment 1 participants studied words paired with varying point values that denoted their importance and were encouraged to recall higher value words. Participants recalled more high-value words on an initial test. However, on a later cued recall test for the values, initially forgotten words were rated as less valuable than remembered words. Experiment 2 used a similar procedure with the exception that participants rated the importance of traits when evaluating a significant other (e.g., *honest*, *intelligent*). Participants were more likely to recall highly valued traits but regarded forgotten traits as less valuable than remembered traits. These results suggest that a forgetting bias exists: If information is initially forgotten, it is later deemed as less important.

Keywords: Metamemory; Forgetting: Judgment; Retrieval; Metacognitive illusions.

The ability to remember important information at the expense of less central information allows efficient use of memory. For example, when asked to remember what has happened in our life in the past year, we often recall important events (e.g., birth of a child, a vacation). However, what happens when information is not initially recalled and we must determine the relative importance of this forgotten information? Recall failure may lead to the conclusion that forgotten information was less important and more important information was recalled. The present study examines whether such a bias exists when evaluating forgotten information.

A considerable amount of research has investigated systematic influences of information available

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David P. McCabe passed away unexpectedly on January 11, 2011. He was a good friend, an insightful collaborator, and is dearly missed. An article, "In Memory of David McCabe: Friend, Collaborator & Colleague", can be found in the *APS Observer*, March 2011, Vol. 23, No. 3, pp. 27–28.

We would like to sincerely thank Bob Bjork, John Dunlosky, Danny Oppenheimer, Jonathan Schooler, and Lael Schooler for insightful comments, and Aaron Dobson for help with data collection.

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to the memory system at the time of judgment (Kahneman & Tversky, 1974). Indeed, estimates of the frequency of occurrence are positively related to the ease of retrieving examples (Schwarz et al., 1991). Similarly, the accessibility of information (cf. Tulving & Pearlstone, 1966) can influence a variety of judgements (e.g., Benjamin, Bjork, & Schwartz, 1998; Schwarz, 2004). However, assessments regarding the importance of forgotten information remain largely unexplored. Thus, we examined how people remember the associated importance of remembered and forgotten information.

The act of forgetting likely serves an adaptive function (Bjork, 2011). That is, an efficient memory system should reduce interference by making the most important information accessible while forgetting less important information. Consistent with this, participants exhibit superior memory for information that is deemed more valuable (Castel, 2008) and accurately predict that they will better remember information they were told to remember relative to information they were told to forget (Friedman & Castel, 2011). Other work suggests that people are often biased to misremember the past to make it more positive (e.g., Bahrick, Hall, & Berger, 1996) or consistent with current beliefs (i.e., the hindsight bias, Fischhoff, 1975).

Although such biases may be beneficial, it remains unclear how forgotten information is evaluated. We examined whether forgotten information is remembered as having been less valuable than it actually had been. Specifically, an adaptive memory system might not only forget less important information, in order to remember more important information (cf. Anderson & Schooler, 2000), but also devalue forgotten information. For example, if you had an idea for a new experiment before going to bed in the evening, and in the morning you failed to remember this idea, you might dismiss it as not important. Such a “forgetting bias” could impact appraisals of forgotten information.

We investigated this potential forgetting bias in two experiments, with value either arbitrarily assigned (Experiment 1) or defined by participants (Experiment 2). In both experiments, we investigated whether participants would assign lower values to items that were initially forgotten compared to remembered items. If a forgetting bias exists, participants should later deem forgotten information to be less important than remembered information.

EXPERIMENT 1

In Experiment 1, participants studied four lists of words paired with point values (see also Castel, Benjamin, Craik, & Watkins, 2002) with the goal of remembering as many words as possible in order to maximize their score (i.e., the sum of the point values of the recalled words). The unique point value paired with each word indicated how important it was to remember the word, such that words paired with higher point values (e.g., spoon 10) were more important to remember than words paired with lower values (e.g., apple 1). After recalling words from all lists, participants indicated the value associated with each word. We were specifically interested in whether participants would assign lower values to forgotten compared with remembered items.

Method

Participants

Eighty-eight undergraduate students at Colorado State University participated for course credit.

Materials and procedure

Forty-eight common nouns were taken from previous studies with a similar selectivity task (Castel et al., 2002). These nouns had an everyday occurrence of approximately 35 times per million (Thorndike & Lorge, 1944) and were divided into four 12-word lists. Each word in each list was randomly assigned a point value between 1 and 12. Participants were presented with the word–value pairings one at a time at a 2 s rate in a fixed-random order on a computer screen.

Participants were tested in groups, and were told that each point value indicated the importance of remembering that word. Participants were further instructed to regard the experiment as a game with the goal of maximizing the total number of points by recalling as many words as possible, especially those with a high value, although recalling any words would enhance their score (cf. Castel et al., 2002). A practice list was presented prior to the four experimental lists to familiarize participants with the procedure. Immediately following each list participants were given one minute to recall the words on a sheet provided, before beginning the procedure with a new list. After the four lists were recalled, participants were given a sheet of paper with all 48 words from the four experimental lists presented in a random order. Participants were instructed to write the point value that they believed had been associated with each word, being as accurate as possible even if they could not remember the exact value. Participants were not forewarned of this test and were not asked to recall point values during the initial recall tests.

Results and discussion

Figure 1 displays the mean proportion of words recalled as a function of point value. As expected, participants recalled more words that were paired with higher point values. In order to reduce noise in the data and enhance the number of observations for lower and higher values, we grouped each value into quartiles starting from the lowest values (1–3) to the highest values (10–12). However, we note that the results hold if analyses are conducted using individual values rather than quartiles. The alpha level was set at .05, unless otherwise specified.

Overall, participants recalled 49% of the words. A repeated-measures analysis of variance (ANOVA) examining recall as a function of value quartile (see Figure 1) revealed a main effect of value, $F(3, 261) = 112.44$, $\eta^2 = .48$, as participants selectively remembered more valuable information. Cued recall accuracy for the values associated with each item was modest ($M = 0.16$; $SD = .08$), but exceeded chance given 12 possible choices (.083), $t(87) = 9.00$.

Of greatest interest were potential biases in how people remembered associated values. These data are presented in Figure 2, in terms of the remembered value of studied items as a function of whether the item was recalled or forgotten. Listwise deletion due to missing cases (e.g., instances in which a participant did not recall or forget an item for a particular set of values) excluded 12 participants from the omnibus analysis. The remaining data were analysed in a 2 (Item Status: remembered, forgotten) × 4 (Value

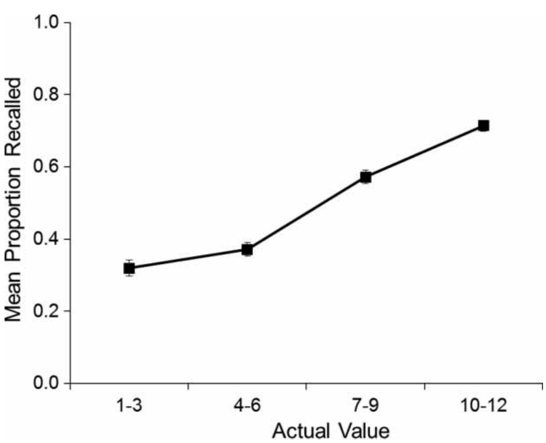

Figure 1. *The mean proportion recalled as a function of point value (in groups of 3) in Experiment 1. Errors bars reflect one standard error of the mean.*

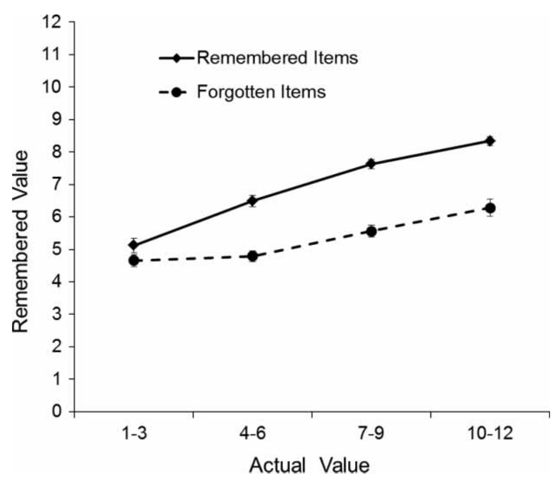

Figure 2. *The mean remembered value and actual value for words that were initially remembered and words that were initially forgotten in Experiment 1. Errors bars reflect one standard error of the mean.*

Quartile: 1–3, 4–6, 7–9, 10–12) repeated-measures ANOVA. Overall, remembered items were assigned higher values ($M = 6.92$; $SE = .10$) than forgotten items ($M = 5.37$; $SE = .14$), $F(1, 75) = 80.11$, $\eta^2 = .52$. As well, assigned value increased as value increased, $F(3, 225) = 64.37$, $\eta^2 = .46$. These main effects were qualified by a reliable Item Status × Value Quartile interaction, $F(2, 225) = 6.85$, $\eta^2 = .08$. Follow-up tests were conducted to explore this interaction by examining remembered value for forgotten and remembered items for each value quartile. (The alpha level was adjusted to .0125 using a Bonferroni correction for four comparisons.) For items with values of 1–3, values for remembered items did not reliably differ from values for forgotten items, $t(79) = 1.41$, $p = .16$, $d = .21$. However, for the remaining value quartiles, participants reported higher values for remembered relative to forgotten items, t values > 6.79, d values > 1.07.

We note that participants were more likely to remember high-value than low-value items (see Figure 1), creating a disparity in the number of high-value items that were remembered compared to low-value items. Therefore, in an additional analysis, we equated for memory at each value by only analysing data for values for which two items were forgotten and two items were remembered. Overall, remembered items were given a higher value ($M = 6.85$; $SE = .18$) than forgotten items ($M = 5.14$; $SE = .17$), $t(87) = 7.11$, $d = 1.04$, consistent with the other analyses reported (see Figure 2). Indeed, ratings for remembered items did not differ from the actual value of the items ($M = 6.54$; $SE = .20$), $t(87) = 1.38$, $p = .17$, whereas ratings for forgotten items were reliably lower than the actual value, $t(87) = 5.78$, $d = .80$. Thus, the pattern of data reported is not an artefact of memory performance and holds when data from all participants are included.

EXPERIMENT 2

Participants in Experiment 1 deemed remembered information to be more valuable than forgotten information. However, this occurred under conditions where the experimenter arbitrarily assigned point values to words. Does the forgetting bias also occur when participants themselves assess the importance of information at study? To investigate this, participants in Experiment 2 were given a list of positive trait adjectives (e.g., *honest*, *intelligent*, etc.) and rated how important each trait was when evaluating a significant other. Participants were later asked to recall the traits and were then given a cued recall test for the initial rating provided for each trait. If the forgetting bias persists in this context then initially forgotten traits should be given lower ratings than initially remembered traits.

Method

Participants

Forty undergraduate students at Colorado State University participated for course credit. One participant was removed for failure to follow instructions.

Procedure

The method for Experiment 2 was similar to Experiment 1, except as noted. Experiment 2 began with a self-paced rating phase prior to the study phase. In this rating phase, four eight-word lists of common positive trait adjectives (e.g., *honest*, *intelligent*, *confident*, etc.) were presented on a rating sheet. The adjectives had an everyday occurrence of approximately 35 times per million (Thorndike & Lorge, 1944). For each eight-word list participants were asked, “If you were evaluating a significant other, which of the traits would you value most, and which would you value least?”. They were further instructed to read all traits in each list prior to ranking them, and to use each number (1–8) only once with “8” denoting the most valued trait. After all lists were rated, participants read an unrelated vignette for five minutes, during which time the research assistant programmed the experiment using the recently obtained ratings. This was followed by the study phase. Participants were presented with the 32 trait adjectives paired with the value they had assigned earlier (e.g., honest 8), though they were not told the point values reflected their initial ratings. The instructions for the study phase were identical to Experiment 1. Traits were presented one at a time for 2 s. After all 32 words were studied, participants were given five minutes to recall as many words as possible with instructions to maximize their score. Finally, following the recall phase, the 32 adjectives were presented one at a time on a computer screen. Using a computer keyboard, participants entered the point value that they believed had been associated with each word, being as accurate as possible even if they could not remember the exact value.

Results and discussion

Figure 3 displays the mean proportion of traits recalled as a function of the assigned subjective value; as expected, participants recalled more words associated with higher values. As in Experiment 1, we grouped each value into quartiles starting from the lowest values (1 and 2) to the highest values (7 and 8). However, all patterns of data reported hold if analyses are conducted including individual values.

Overall, participants recalled 33% of the trait adjectives that they had initially studied. A repeated-measures ANOVA showed that participants selectively remembered the more valuable information (see Figure 3), $F(3, 114) = 55.18$, $\eta^2 = .59$. Cued-recall accuracy for the initial ratings ($M = .35$, $SD = .13$) was greater than chance performance given eight possible choices (.125), $t(38) = 10.71$.

The primary findings regarding a forgetting bias are shown in Figure 4 in terms of the remembered value of studied items as a function of whether the item was recalled or forgotten. Listwise deletion due to missing cases (e.g., instances in which a participant did not recall or forget an item for a particular set of values) excluded 16 participants from the omnibus analysis. The remaining data were analysed in a 2 (Item Status: remembered, forgotten) ´ 4 (Value Quartile: 1–2, 3–4, 5–6, 7–8,) repeated-measures ANOVA. Overall, remembered items were assigned a higher value ($M = 4.77$; $SE = .09$) than forgotten items ($M = 4.44$; $SE = .08$), $F(1,22) = 7.58$, $\eta^2 = .26$. As well, assigned value increased as value increased, $F(3, 66) = 64.29$, $\eta^2 = .75$. Further, Item Status did not reliably interact with Value Quartile, $F(5, 305) = 1.10$, $p = .36$, $\eta^2 = .05$. Thus, participants assigned lower values to initially forgotten items, consistent with a forgetting bias.

As in Experiment 1, participants remembered more high-value traits than low-value traits (see Figure 3), creating a disparity in the number of high-value items that were remembered compared to low-value items that were remembered. To address this, we did an additional analysis that

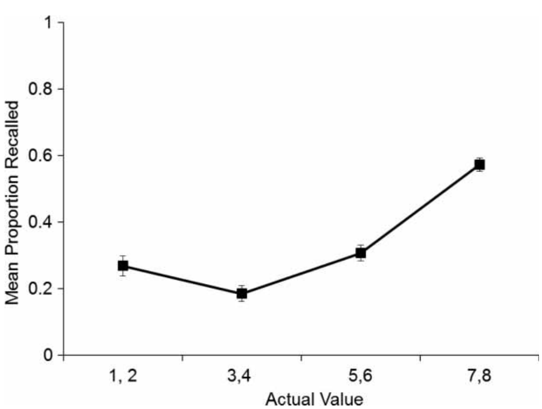

Figure 3. *The mean proportion recalled as a function of the subjective value (in groups of 2) in Experiment 2. Errors bars reflect one standard error of the mean.*

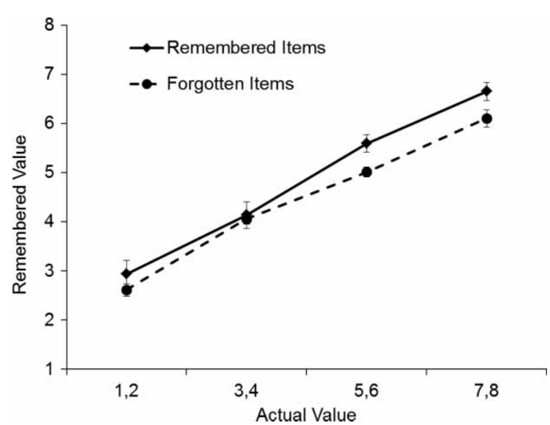

Figure 4. *The mean remembered value and actual value for words that were initially remembered and words that were initially forgotten in Experiment 2. Errors bars reflect one standard error of the mean.*

equated for memory at each value. Thus, we analysed data for values for which two items were forgotten and two items were remembered. Overall, remembered items were given a higher value ($M = 5.27$; $SE = .22$) than forgotten items ($M = 4.81$; $SE = .19$), $t(34) = 3.41$, $d = .37$. As well, ratings for remembered items did not differ from the actual value of the items ($M = 5.34$; $SE = .25$), $t < 1$, whereas ratings for forgotten items were reliably lower than the actual value, $t(34) = 3.55$, $d = .38$. Thus, the forgetting bias reported in Experiment 2 was not an artefact of memory performance and held when nearly all participants' data were included.

GENERAL DISCUSSION

The present research suggests that a forgetting bias exists: Individuals downplay the importance of forgotten information. This may reflect an inferential process, suggesting that people regard memory as sensitive to important information, with forgetting more likely for less important information. Bahrick et al. (1996) showed that people display a memory bias when recalling high school grades, such that they were more likely to inflate their grades, suggesting a bias in reconstructive inferences. Relatedly, Kassam, Gilbert, Swencionis, and Wilson (2009) observed that information rendered important after the fact is judged as more memorable (see also Soderstrom & McCabe, 2011). In the present study, we demonstrate a metacognitive bias such that forgotten information was deemed less important.

The forgetting bias we report may reflect adaptive mechanisms. For example, memory may be tuned to the environment with the most important memories most available for retrieval (Anderson & Schooler, 2000). In turn, people may hold implicit beliefs consistent with this and regard forgotten information as unimportant. Forgotten items may be perceived as less fluent, diminishing their familiarity and thus leading such items to be judged as less valuable. Relatedly, forgotten items may also be less fluent because they were less effectively encoded than remembered items. Whereas various forms of fluency have been shown to influence judgements (see Alter & Oppenheimer, 2009; Kelley & Rhodes, 2002), the potential role of fluency in the present study is somewhat unique in that it appears to bias judgements such that disfluent information is deemed less important (see also Ozubko & Fugelsang, 2011). This may reflect an implicit theory (cf. Jacoby & Kelley, 1987), or form of reasoning, regarding the value of forgotten information ("If I forgot it, it probably wasn't that important"), or an assessment during recognition that encoding would have been effective if an item was important (e.g., "If it was important, I would have learned it").

The forgetting bias might also reflect a more consciously controlled process. For example, participants might anchor their judgements of value starting with high values (e.g., 12) for remembered items and low values (e.g., 1) for forgotten items and adjust their judgements from those anchors (cf. Madan & Spetch, 2012). This might be most prevalent for participants who predominantly recalled high-value items and thus might be more likely to use such anchors compared with participants whose recall was less sensitive to value. A follow-up analysis showed that the most selective participants exhibited the greatest forgetting bias; however, a robust forgetting bias was still prevalent even among participants who showed lower levels of selectivity, indicating that anchoring could not be the sole causal factor. Thus, while anchoring may be one factor influencing judgements of value, our data suggest a unique role for remembered value to be contingent on the status of a memory as forgotten or remembered. Further research is needed to examine this issue in greater detail and to potentially distinguish remembrance of value from value judgements made in the present.

Overall, the results support a forgetting bias that influences assessments of the importance of forgotten information. Such findings have implications for how we remember or reconstruct the past, and suggest that the importance we attach to our memories, be it a previously experienced event or the qualities of a former partner, may largely be a function of the accessibility of these memories. From this perspective, the forgotten may be deemed the irrelevant.

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