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**Remembering Facts versus Feelings in the Wake of Political Events**

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### Abstract

Amid rising political polarization, inaccurate memory for facts and exaggerated memories of grievances can drive individuals and groups further apart. We assessed whether people with more accurate memories of the facts concerning political events were less susceptible to bias when remembering how events made them feel. Study 1 assessed participants' memories concerning the 2016 U.S. presidential election ( $N = 571$ ), and included 33 individuals with Highly Superior Autobiographical Memory (HSAM). Study 2 assessed participants' memories concerning the 2018 referendum on abortion in Ireland ( $N = 733$ ). Participants rated how happy, angry, and scared they felt days after these events. Six months later, they recalled their feelings and factual information. In both studies, participants overestimated how angry they had felt but underestimated happiness and fear. Adjusting for importance, no association was found between the accuracy of memory for facts and feelings. Accuracy in remembering facts was predicted by media exposure. Accuracy in remembering feelings was predicted by consistency over time in feelings and appraisals about past events. HSAM participants in Study 1 remembered election-related facts better than others, but not their feelings. Thus, having a good grasp of the facts did not protect against bias in remembering feelings about political events.

*Keywords:* emotion memory; event memory; politics; Highly Superior Autobiographical Memory

### **Remembering Facts versus Feelings in the Wake of Political Events**

Societies are becoming increasingly polarized as people stockpile memories of political achievements and grievances. These memories can be inaccurate. Conflicting accounts, fake news, and conspiracy theories sow confusion about even the most basic facts concerning political events (Carothers & O'Donohue, 2019; Finkel et al., 2020). People's memories of their emotional response to political events are also prey to distortion (Levine, 1997). The relation between the accuracy of memory for facts and feelings is not known. Bringing to mind a detailed, accurate representation of a past political event may promote accuracy when people remember how that event made them feel. If so, those with a good grasp of the facts may be less prone to biases that deepen partisan divide such as exaggerating anger over past grievances (Yip & Schweitzer, 2019). Then again, different factors may promote accuracy in memory for facts and feelings, leaving the well-informed just as susceptible to misremembering their feelings as the ill-informed. The current investigation addressed these issues by examining predictors of accuracy in memories of facts and feelings in the wake of two highly-emotional political events: the 2016 U.S. presidential election and the 2018 Irish referendum concerning abortion.

### **Predictors of Accuracy in Memory for Facts and Feelings**

Memory for facts refers to representations of details concerning a past external event – what happened, when and where it happened, who was involved. A key source of accuracy in memory for facts is importance. People pay close attention to, and encode details about, events they appraise to be important for achieving their goals (Conway, 2005; Levine & Edelstein, 2009). They also seek out media reports and talk with others about important events (Rime, 2009; Tinti et al., 2014). Inaccurate descriptions of events in media reports and conversations can lead people to develop false memories (Gabbert et al., 2004; Murphy et al., 2019). But to the extent that accounts are true, the repetition of details in media reports and conversations would

promote accurate memory for facts (Tinti et al., 2014). Thus, appraising events as important, media exposure, and rehearsal should be associated with greater accuracy in memory for factual information concerning political events.

Memory for feelings refers to representations of details concerning people's internal state, such as how intensely happy, angry, and scared they were. Accuracy matters here too because people's memories of how past outcomes made them feel influence their decisions about how much effort to invest in promoting or preventing similar outcomes in the future (e.g., Kahneman et al., 1993). As with memory for facts, appraising events as important should be associated with accuracy in memory for feelings. Events that people appraise as important evoke intense emotion (Lench et al., 2011) and moments of peak emotional intensity are particularly memorable (Kahneman et al., 1993; Kaplan et al., 2016). Even when emotion is intense, however, episodic memory becomes less accessible and more subject to bias over time (Robinson & Clore, 2002). When people recall how an event made them feel, what comes to mind depends partly on their episodic memory of their initial emotional experience, and partly on their current appraisals and feelings about the event. The more their appraisals and feelings have changed over time, the greater the bias in memory for emotion (Kaplan et al., 2016).

Providing a real-world example, Levine (1997) had supporters rate how hopeful and angry they felt when candidate Ross Perot unexpectedly withdrew from the U.S. presidential race in July of 1992. In November, after Perot had reentered the race, the same individuals recalled how they had felt. Memories of emotion were biased in the direction of participants' current appraisals of Perot. Those who appraised Perot positively in November overestimated how hopeful they had felt when Perot dropped out of the race, and underestimated how angry they had felt. In contrast, those who had turned against Perot underestimated how hopeful they had felt and recalled the full force of their anger. Similarly, U.K. citizens' memories of their

feelings about Brexit were predicted by their current appraisals and feelings about the outcome (Schmidt et al., 2021). These findings suggest that, as episodic memories of emotion fade, people draw on their current feelings and interpretations of past events to help them reconstruct how they must have felt. Those who have come to appraise an event as more or less important or favorable over time tend to misremember their emotional response as more consistent with their current feelings and appraisals than it actually was. Thus, the direction of bias in memory for emotion should depend on how people's feelings and appraisals have changed over time.

Certain changes in feelings and appraisals may be widely shared in the wake of complex political events, biasing memory for specific emotions. Importance and uncertainty decline as people accommodate to successes and defeats and as other life concerns take precedence (e.g., Wilson & Gilbert, 2008). These changes may lead people to underestimate past emotions, particularly fear which is elicited by uncertainty (Lench et al., 2011). As event details and complexity fade from memory over time, people may retain just the gist of how political outcomes thwarted their goals, leading them to overestimate anger, which is elicited by goal obstacles and motivates efforts to remove them (Lench et al., 2011; Lerner & Tiedens, 2006). Thus, this study also explored the direction of bias in memory for specific emotions.

The findings reviewed above suggest that, except for importance, the predictors of accuracy differ for memories of facts versus feelings. Media exposure and rehearsal should promote more accurate memory for facts. Consistency over time in people's feelings about, and appraisals of events, should promote more accurate memory for feelings. But several models of flashbulb memory argue instead that memory for facts and feelings should be closely related. According to Brown and Kulik's (1977) original definition of flashbulb memory, people's feelings are part of the autobiographical context in which they learn about important public events. As such, feelings were one of the canonical categories of information expected to be

retained with near photographic accuracy. Since that early account, errors have been found to be common when people recount the circumstances in which they learned about highly-emotional public events (Hirst et al., 2015; Neisser & Harsh, 1992). Yet, several models of flashbulb memories maintain that, the more accurate an individual's memory for the facts about an event, the better their memory will be for the autobiographical context in which they learned the news (Er, 2003; Luminet, 2009; Tinti et al., 2009; for an opposing view, see Muzzulini et al., 2020; Tinti et al., 2014). Drawing on accessible memories of facts (e.g., "the FBI Director made a negative announcement about my candidate days before the election") may also allow people to accurately reconstruct how they felt (e.g., "I must have been really angry"). According to this view, people with detailed and accurate factual memories of significant public events should also remember how those events made them feel.

### **Highly Superior Autobiographical Memory**

We had a unique opportunity to test these competing views in Study 1 by assessing memory for both facts and feelings in individuals with Highly Superior Autobiographical Memory (HSAM). Individuals with HSAM remember personal and public events with remarkable detail and accuracy, including events that occurred decades ago (LePort et al., 2012, 2016, 2017). Fewer than 100 people with HSAM have been identified worldwide based on extensive testing of their memories of verifiable public events, verifiable autobiographical events (e.g., recorded in diaries, weather reports), and the consistency of their memories over time (McGaugh, 2017). For example, LePort et al. (2012) gave participants with HSAM and age- and sex-matched controls 10 randomly-generated dates spanning decades. Participants were asked to describe a verifiable public event and an autobiographical event that occurred within  $\pm$  one month of each date, and to indicate the day of the week. The overall score of people classified as having HSAM averaged 85% whereas the average was just 8.2% for controls.

Yet people with HSAM do not excel on all memory tasks. Their abilities are most evident when tested concerning events drawn directly from their own autobiographical experience and when tested after long retention intervals. In a series of experiments, participants with HSAM did not differ from control participants on laboratory tests of working memory or recognition of pictures or word lists (LePort et al., 2016). They also did not show superior memory for autobiographical events from the prior week. After delays of a month and longer, however, participants with HSAM retained those autobiographical memories in far greater detail than controls. These findings suggest that people with HSAM do not encode events differently from others. Instead, they appear to benefit from exceptionally efficient consolidation and retrieval of autobiographical events and closely associated public events (LePort et al., 2016).

People with HSAM often describe their memories as full of emotion (e.g., Parker et al., 2006), but only two studies have examined memory for emotion in this group (Levine et al., 2020; Patihis et al., 2013). Neither study included a long retention interval, and the findings were mixed. Patihis et al. (2013) assessed the consistency of participants' memories at two sessions, one week apart, for how they felt after the September 11, 2001 terrorist attacks. Compared to controls, participants with HSAM showed slightly greater consistency in their memory for emotions associated with low control (upset, distressed, sadness, grief) and no difference in the consistency of memory for emotions associated with high control (anger, frustration). Levine et al. (2020) found that participants with HSAM did not differ from controls in the accuracy with which they remembered their emotional response to Trump's victory in the 2016 U.S. presidential election after three weeks. Because superior memory may only become apparent in people with HSAM after a longer retention interval, and recognition memory for facts concerning public events had not been tested in this group, we examined memory for facts and feelings concerning the 2016 U.S. presidential election after six months. Thus, the current



investigation examined the relation between memory for facts and feelings concerning two political events in large, diverse groups of participants. Including individuals with HSAM in Study 1 provided an additional, novel way to assess whether better memory for facts concerning temporally distant events confers greater accuracy when remembering feelings about events.

### **The Current Investigation**

This investigation was designed to advance understanding of memory for political experiences by addressing three questions: 1) What predicts accuracy in people's memories of the facts and their feelings concerning political events? 2) What accounts for the direction of bias in memory for emotions? 3) Are people with more accurate memories of the facts concerning political events less susceptible to misremembering how events made them feel? Study 1 assessed memories concerning the 2016 U.S. presidential election, and included 33 individuals with HSAM. Study 2 assessed memories concerning the 2018 referendum on abortion in Ireland. In both studies, participants rated how they felt days after the event and, six months later, they recalled their feelings and factual information. We chose to investigate memory for happiness, anger, and fear because these emotions are common responses to political outcomes (e.g., Pew Research Center, 2016).

People who viewed events as more important were expected to have more accurate memory for both facts and feelings (e.g., Conway, 2005). With the exception of importance, however, we expected no association between memory for facts and feelings. We further expected the predictors of memory accuracy to differ for facts and feelings. Repetition of details via media exposure and rehearsal should promote accuracy in memories of facts but not feelings (Tinti et al., 2014). Consistency over time in participants' feelings and appraisals of political events should promote accuracy in memories of feelings but not facts (Levine et al., 2020). Individuals with HSAM in Study 1 were expected to remember election-related facts, but not

their feelings, more accurately than the main group of participants.

## Study 1

### Method

This study was part of a larger investigation of affective forecasting. Some variables in this study were included in publications that addressed different research questions. In a study discussed in the introduction, Levine et al. (2020) compared the vividness and accuracy of affective forecasts versus memories concerning the 2016 election across 3-week intervals. To assess accuracy, this study included the intensity of happiness, anger, and fear experienced days after the election, as well as valence, importance, age, sex, and ethnicity. These variables were also reported in a paper on bias in affective forecasts (Lench, Levine, Perez, Carpenter, et al., 2019). A paper examining subjective well-being after the election included demographic information (Lench, Levine, Perez, Haggemiller, et al., 2019). Only the current study assessed memory for emotions six months after the election and memory for facts. Data are available online: <https://osf.io/er9hv/files/>.

**Participants.** Participants ( $N = 571$ ) completed online questionnaires about two days after, and about six months after, the 2016 U.S. presidential election. As part of the larger investigation, 957 individuals completed online questionnaires three weeks before, days after, and three weeks after the election (Lench et al., 2019; Levine et al., 2020). Different groups were sampled to capture a range of political preferences. An a priori power computation for the difference between two dependent means (e.g., experienced and remembered emotion) gave a total sample size of 327 to have power of .95 to detect an effect size of .20. The current study included all participants who agreed to complete a follow-up questionnaire when contacted about 6 months after the election. The sample included 407 U.S. participants recruited through Amazon Mechanical Turk (MTurk), 93 undergraduate students enrolled in a large public research

university in Texas, 38 participants enrolled in a large public research university in California, and 33 individuals with Highly Superior Autobiographical Memory (HSAM).<sup>1</sup> Of the sample, 58% were women, the average age was 34.28 years ( $SD = 13.49$ , range = 18 to 70 years). Participants reported their ethnicity as White (73%), African American (8%), Hispanic (7%), East Asian (6%), South Asian (3%), or other (3%). Demographic information for each group of participants is available online at <https://osf.io/er9hv/files/> in Supplemental Table S1.<sup>2</sup>

The research was carried out in accordance with Institutional Review Boards (IRB) at the University of California, Irvine and Texas A&M University. The main group of participants was invited to participate through the Amazon Mechanical Turk system or university subject pools. We invited all 51 individuals with Highly Superior Autobiographical Memory to participate who had email addresses and had consented to participate in research at the University of California, Irvine. Participants with HSAM had been previously identified using a multi-step, IRB-approved process, at the University of California, Irvine.<sup>3</sup>

**Time 1 questionnaire: The week of the election.** Participants completed an online questionnaire about 2 days after the election (November 9 - 14,  $M = 1.62$  days,  $SD = 1.04$ ). They rated how intensely happy, angry, and scared they were feeling about Donald Trump being elected president, from 1 (*not at all*) to 9 (*extremely*). To assess participants' appraisal of the valence of the election outcome, we asked them to rate how much they agreed that, "It will be good for the country that Donald Trump was elected President" on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Participants also rated, "How important is the outcome of the 2016 presidential election to you" from 1 (*not at all important*) to 9 (*extremely important*). To assess media exposure and rehearsal, participants were asked, over the last three days, how many hours they spent attending to media coverage concerning the election, and how many hours they spent talking with others about the election (*0 to 72 hours*). They also reported demographic

information, whether they voted and, if so, for whom.

**Time 2 questionnaire: Six months after the election.** Participants completed a second online questionnaire slightly less than six months after the election (between April 21 and May 1, 2017, hereafter referred to as six months for simplicity). They reported how intensely happy, angry, and scared they were currently feeling about Donald Trump being elected president, from 1 (*not at all*) to 9 (*extremely*). Participants were also asked to remember how they had felt about Trump's election days after the election. They were instructed, "One evening, during the week of November 8th, just days after the election, you completed a questionnaire about how you were feeling. In the next set of questions, please tell us how you remember having felt at that time." Participants rated how intensely happy, angry, and scared they remembered having felt, using a scale from 1 (*not at all*) to 9 (*extremely*). Participants also reported their current appraisal of the importance of the election outcome, as at Time 1.

Finally, participants completed 15 four-option, forced-choice questions that assessed their memory for events, facts, and dates concerning the election campaign (Cronbach's  $\alpha = .61$ ). For example, participants were asked how Trump launched his campaign; on which congressman's laptop did James Comey report finding new email pertinent to the investigation into Hillary Clinton's email use; and when the first presidential debate between Clinton and Trump took place (adapted from Walsh, 2016; see Appendix A for the complete list of questions).

**Measures and analyses.** To provide an accuracy score for memory for facts, we calculated the percentage correct of the 15 factual questions. [Following recommended practice \(e.g., Roy et al., 2005\), we assessed the accuracy of memory for emotion in two ways: We assessed overall accuracy by computing the degree of overlap between experienced and remembered emotion, independent of the direction of bias. We also assessed the direction of bias for each individual emotion – happiness, anger, and fear – by subtracting experienced emotion](#)

from remembered emotion. Assessing overall accuracy is important because averaging the direction of memory bias across individuals masks the magnitude of inaccuracy if some people overestimate and others underestimate.

To assess the overall accuracy of emotion memory, we first created composite indices of emotion. Using composite indices allowed us to compare, in a parsimonious way: (a) the factors that predicted overall memory accuracy for facts versus feelings, (b) the overall accuracy with which participants with HSAM versus the main group remembered their feelings, and (c) how participants' feelings about the election outcome changed over time. Participants' initial ratings of anger and fear were positively correlated ( $r = .77$ ), and were negatively correlated with happiness ( $r_s < -.66$ ). Thus, as often done for parsimony (e.g., Kahneman & Krueger, 2006), we subtracted the mean rating of anger and fear from happiness to create three composite indices: Time 1 experienced emotion, Time 2 remembered emotion, and Time 2 current emotion. Composite indices ranged from -8 to 8, with higher ratings indicating a more positive response.

Next, as our measure of overall accuracy, we computed the percentage of agreement between composite ratings of experienced and remembered emotion. The resulting measure was similar in sign (+/-) and format (percentage correct) to the accuracy measure for fact memory. Specifically, we calculated the absolute value of the difference between experienced and remembered emotion. We then transformed this measure of inaccuracy to indicate the proportion of agreement between experienced and remembered emotion:  $(1 - \frac{|experienced\ emotion - remembered\ emotion|}{16})$ , and multiplied the result by 100. Thus, identical ratings for experienced and remembered emotion yielded an accuracy score of 100%. Values of -8 for experienced emotion and 8 for remembered emotion, or *vice versa*, yielded an accuracy score of 0%. Values of 2 for experienced emotion and 6 for remembered emotion yielded an accuracy score of 75%. Using this measure in analyses (e.g., z-tests, regression betas) gives

identical results to using the absolute value of the difference between experienced and remembered emotion, except that the +/- sign is reversed.

The number of participants with HSAM was necessarily small, so we used non-parametric, two-tailed, Mann-Whitney  $z$ -tests to compare them with the main group, which consisted of MTurk participants and students from California and Texas.

## Results and Discussion

**Preliminary analyses.** Days after the election, participants indicated that they had voted for Trump (27%), Clinton (48%), another candidate (8%), or did not vote (13%); 4% did not indicate their vote. Trump voters strongly agreed that his election was good for the country ( $M = 5.87$ ,  $SD = 1.14$ ) whereas those who did not vote for Trump strongly disagreed ( $M = 1.98$ ,  $SD = 1.42$ ),  $t(569) = 30.47$ ,  $p < .001$ ,  $d = 2.77$ , 95%  $CI_{mean\ diff}$  [3.64, 4.14]. Indeed, agreement that Trump's election was good for the country was significantly below the midpoint of the 7-point scale for participants who voted for Clinton ( $M = 1.49$ ,  $SD = 0.89$ ), another candidate ( $M = 2.77$ ,  $SD = 1.49$ ), did not vote ( $M = 3.16$ ,  $SD = 1.88$ ), and did not indicate their vote ( $M = 2.97$ ,  $SD = 1.85$ ); all  $t$ s  $> 3.93$ ,  $ps < .001$ . Therefore, we defined the valence of the election outcome as positive for Trump voters and as negative for participants who did not vote for Trump.

At Time 1, participants reported many hours of election media exposure ( $M = 8.30$  hours,  $SD = 6.75$ ), and talking about the election ( $M = 4.71$  hours,  $SD = 5.33$ ), over the past three days. They appraised the election outcome as highly important days after the election ( $M = 7.24$ ,  $SD = 2.05$ ), but as somewhat less important six months later ( $M = 6.86$ ,  $SD = 2.22$ ),  $t(563) = 5.68$ ,  $p < .001$ ,  $d = .18$ , 95%  $CI$  [0.25, 0.52]. Participants with HSAM did not differ from the main group in media exposure, rehearsal, or appraised importance ( $ps > .11$ ).

**Memory for facts.** We compared participants with HSAM to the main group with respect to the accuracy of their memory for facts concerning the election campaigns. Participants

with HSAM remembered facts more accurately ( $M = 61.82\%$  correct,  $SD = 20.90$ , range =  $13.33\% - 100\%$ ) than did the main group ( $M = 50.57\%$  correct,  $SD = 17.20$ , range =  $6.67\% - 100\%$ ),  $z = 3.35$ ,  $p = .001$ ,  $d = 0.28$ . Participants with HSAM also remembered facts more accurately than each subgroup: California students, Texas students, and MTurk participants (all  $ts > 2.81$ ,  $ps < .006$ ). However, this memory advantage was not extreme. In prior studies, relative to controls, individuals with HSAM showed far superior memory for temporally-distant autobiographical events (e.g., LePort et al., 2012, 2016). Participants with HSAM in the current study may have shown a smaller memory advantage because the facts they were asked to remember were only loosely linked to their personal autobiographies.

To assess predictors of memory for facts, we conducted a regression analysis. The model included group (main group = 0, HSAM = 1), Time 1 appraisal of the importance of the election outcome, media exposure, rehearsal, and the valence of the election outcome (negative = 0, positive = 1). We also included **overall** change in appraised importance (the absolute value of the difference between Time 1 and Time 2 importance) and **overall** change in feelings about the election outcome (the absolute value of the difference between Time 1 emotion and Time 2 current emotion); lower values represent greater consistency. Table 1 shows descriptive statistics and correlations among memory for facts, memory for feelings, and all model variables. Table 2 shows the results of the regression analysis.

As Table 2 (Panel A) shows, the model was significant. Variance inflation values ranged from 1.04 to 1.60, indicating that multicollinearity was not a concern. More accurate memory for facts was predicted by having HSAM, by appraising the election outcome as more important, and by media exposure. With media exposure included in the model, talking more about the election was actually negatively associated with accurate memory for facts. Memory for facts was not significantly predicted by valence or by change in participants' appraisals or feelings concerning

the election outcome. A follow-up regression analysis showed that no variable interacted with HSAM status to predict memory for facts ( $ts < 1.58$ ,  $ps > .11$ ).

**Memory for feelings: Overall accuracy.** Next, we assessed the overall accuracy with which participants remembered their emotional response to the election. That is, independent of the direction of bias, how much overlap was there between experienced and remembered emotion? Consistent with past research, participants remembered the intensity of emotion they had experienced with high accuracy (e.g., Kaplan et al., 2016). The accuracy of memory for emotion did not differ significantly for participants with HSAM ( $M = 91.57\%$ ,  $SD = 8.57$ , range = 62.50 – 100%) and the main group ( $M = 90.90\%$ ,  $SD = 9.87\%$ , range = 28.13 – 100%),  $z = 0.26$ ,  $p = .79$ ,  $d = .02$ . Indeed, HSAM participants and the main group did not differ on any measure of emotion. Specifically, the intensity of emotion experienced the week after the election did not differ (HSAM:  $M = -1.42$ ,  $SD = 4.60$ ; main group:  $M = -1.34$ ,  $SD = 5.42$ ),  $z = -0.18$ ,  $p = .86$ ,  $d = .02$ . The intensity of emotion remembered six months later did not differ (HSAM:  $M = -1.80$ ,  $SD = 4.89$ ; main group:  $M = -1.48$ ,  $SD = 5.37$ ),  $z = -0.18$ ,  $p = .85$ ,  $d = .02$ . Current feelings about the election outcome after six months also did not differ (HSAM:  $M = -1.05$ ,  $SD = 4.66$ ; main group:  $M = -1.10$ ,  $SD = 4.71$ ),  $z = 0.05$ ,  $p = .96$ ,  $d = .002$ . Follow-up analyses of each emotion, happiness, anger, and fear, also showed no group differences in experienced, remembered or current emotion, or memory accuracy ( $zs < 1.05$ ,  $ps > .14$ ).

Although the overall accuracy of memory for emotion was high when averaged across participants, this does not mean that memories were accurate for individual participants. Indeed, 41% of participants remembered a more negative emotional response than they experienced, 37% remembered a more positive emotional response, and 22% remembered the same emotional response. We conducted further analyses to explain this variation.

To assess predictors of overall accuracy in memory for emotion, we conducted the same



regression analysis as for fact memory. As Table 2 (Panel B) shows, the model was significant. Participants who appraised the election outcome as more important remembered their emotional response more accurately. In addition, the less importance changed over time, the more accurately participants remembered their emotional response. The less participants' current feelings about the election changed over time, the more accurately they remembered their initial emotional response. HSAM status, media exposure, and rehearsal were not significant predictors of overall accuracy in memory for emotion. Thus, as anticipated, no overlap except for initial importance was found between the predictors of overall accuracy in memory for facts and feelings. Moreover, despite the low correlation shown in Table 1, a partial correlation that adjusted for Time 1 appraised importance showed no significant association between memory for facts and feelings,  $r(568) = .06, p = .14$ .<sup>4</sup>

**Memory for feelings: Direction of bias.** We also examined the direction of bias in memory for specific emotions. We conducted a mixed model ANOVA with emotion (happy, angry, scared) and time (Time 1 experience, Time 2 memory) as within subject variables, and with valence (voted for Trump, did not vote for Trump) as the between subject variable. The results showed significant effects of valence,  $F(1, 569) = 55.92, p < .001, \eta_p^2 = .09$ , emotion,  $F(1, 569) = 26.59, p < .001, \eta_p^2 = .04$ , and their interaction,  $F(1, 569) = 785.34, p < .001, \eta_p^2 = .58$ . As Figure 1 shows, not surprisingly, Trump voters experienced and remembered feeling happier than those who did not vote for Trump. Participants who did not vote for Trump experienced and remembered more anger and fear. An interaction between time and emotion was also found,  $F(2, 569) = 11.46, p < .001, \eta_p^2 = .02$ . As a group, participants underestimated in recalling happiness (Mean difference = -0.17),  $t(571) = -3.18, p = .002, d = .06, 95\% CI [-0.28, -0.07]$ , and fear ( $M_{diff} = -0.30$ ),  $t(571) = -3.89, p < .001, d = .10, 95\% CI [-0.46, -0.15]$ , but overestimated in recalling anger ( $M_{diff} = 0.28$ ),  $t(571) = 3.49, p < .001, d = .09, 95\% CI [0.12, 0.44]$ .

**Predictors of the direction of bias in memory for feelings.** What might account for these differing biases in memory for discrete emotions? Inconsistency between participants' initial and current feelings about the election outcome was the strongest predictor of overall inaccuracy in memory for emotion (Table 2, Panel B). We conducted a repeated measures ANCOVA to find out whether change in current feelings predicted the direction of bias in memory for happiness, anger, and fear. Memory bias was defined as remembered minus experienced emotion for happiness, anger, and fear, thus positive values indicate overestimation, zero indicates no bias, and negative values indicate underestimation. Change in current feelings was defined as the difference between the composite measure of current emotion six months after, versus days after, the election ( $M = 0.23$ ,  $SD = 2.67$ , range = -15 to 9.5). The model included the same covariates as prior models of overall accuracy: group (HSAM, main group), Time 1 appraised importance, media exposure, rehearsal, valence, and change in appraised importance.

The results showed a main effect of change in feelings,  $F(1, 545) = 68.95$ ,  $p < .001$ ,  $\eta_p^2 = .11$ , and an interaction between emotion and change in feelings,  $F(2, 1090) = 200.66$ ,  $p < .001$ ,  $\eta_p^2 = .27$ . Figure 2 depicts this interaction. The figure shows predicted values for memory bias, adjusted for covariates, with shaded error bands indicating 95% confidence intervals. Change in current feelings is shown from 1 *SD* below 0 (feelings became more negative over time) to 1 *SD* above 0 (feelings became more positive). As Figure 2 shows, the more negative participants came to feel about the election outcome, the more they overestimated in remembering how angry and scared they had initially felt, and underestimated happiness. Overestimation was more pronounced for anger than fear. Participants whose feelings about the election outcome had not changed after six months showed little bias. The more positive participants came to feel about

the election outcome, the more they underestimated in remembering how angry and scared they had felt and overestimated happiness.

Significant effects, with much smaller effect sizes, were also found for some covariates. The results showed a main effect of valence,  $F(1, 545) = 18.54, p < .001, \eta_p^2 = .03$ , and an interaction between valence and emotion,  $F(2, 1090) = 27.12, p < .001, \eta_p^2 = .05$ . Participants who viewed Trump's victory as negative overestimated anger more than those who viewed it as positive ( $M_{diff} = 0.38$ ),  $t(570) = 2.11, p = .04, d = .20, 95\% CI [0.03, 0.73]$ , whereas bias in memory for happiness and fear did not differ by valence ( $ts < 0.86, ps > .39$ ). Media exposure was associated with greater bias (overestimation) in remembering discrete emotions,  $F(1, 545) = 5.09, p = .03, \eta_p^2 = .01$ . In contrast, media exposure predicted greater *accuracy* in memory for facts (see Table 2, Panel A). Finally, rehearsal did not predict the direction of memory bias for any emotion individually but a main effect of rehearsal, with a small effect size, was found such that talking more about the election outcome was associated with overestimation,  $F(1, 545) = 4.36, p = .04, \eta_p^2 = .008$ . In comparison, rehearsal predicted less accurate memory for facts, and was not associated with overall memory accuracy for feelings (see Table 2, Panels A & B).

**Discussion.** In summary, only the importance of the election outcome predicted **overall memory** accuracy for both facts and feelings. After adjusting for importance, no association between **overall** memory **accuracy** for facts and feelings was found. Participants with HSAM remembered election-related facts, but not their feelings, better than others. Accuracy in memory for facts was also predicted by media exposure. In contrast, **overall** accuracy in memory for feelings was predicted by greater consistency over time in participants' feelings about, and the appraised importance of, the election outcome. With respect to memory for specific emotions, the **magnitude and** direction of bias was **strongly** related to how an individual's feelings about

the election changed over time. As a group, however, participants overestimated how angry they had felt but underestimated how scared and happy they had felt.

In Study 2, we assessed whether these findings would hold for a different political event and type of memory assessment. We investigated memory for facts and feelings concerning the 2018 referendum on abortion in Ireland. This study assessed recall, rather than recognition, of facts. Finally, whereas Study 1 assessed memory for facts and feelings concerning different aspects of the election (facts about the campaigns, feelings about the election outcome), Study 2 assessed memory for both facts and feelings concerning the referendum outcome.

## Study 2

Study 2 focused on the 2018 referendum on abortion in the Republic of Ireland. The referendum was held on whether to repeal the Eighth Amendment to the Constitution that stated that ‘the unborn’ had a right to life equal to that of the mother. This amendment meant that Ireland had some of the strictest abortion laws in the world, with abortion only permitted in cases of substantial risk to the life of the mother (Taylor, 2015). Voters could vote Yes (to repeal the 8<sup>th</sup> amendment) or No (to retain the amendment and keep abortion restricted). The Yes side won a landslide victory with 66% voting to repeal (Bohan, 2018).

This study was part of a larger investigation of false memory that followed participants for 12 months after the referendum. [Some variables reported in the current study were included in publications that addressed different research questions. Specifically, a study of false memories of fake news reports a week before the referendum included participant age \(Murphy et al., 2019\). A study of the effectiveness of debriefing in false memory studies included age, sex, vote, importance, media exposure, and rehearsal \(Murphy et al., 2020a\). These variables were also included in a study of voter’s memories of the reasons for their vote \(Murphy et al., 2020b\). Only the current study assessed memory for emotions and memory for facts about the](#)

outcome of the referendum. Data are available online: <https://osf.io/er9hv/files/>.

## Methods

**Participants.** An initial sample of 1009 individuals completed online questionnaires in both June and November of 2018. An a priori power analysis conducted as part of the larger investigation (Murphy et al., 2019) showed that a sample of 260 participants was needed to detect the smallest effect size reported in similar investigations (e.g., memory accuracy in groups with differing political orientations). The current study included all participants ( $N = 733$ ) who responded to questions concerning memory for both facts and feelings of happiness, anger, and fear. Participants were recruited via university student emails and via social media posts and articles in TheJournal.ie (an Irish news website). They ranged in age from 18 to 82 years ( $M = 36.81$  years,  $SD = 12.34$ ). Participants reported their sex as female (71%), male (28%), other or declined to answer (1%). Although recruitment targeted voters who wanted to retain the amendment restricting abortion as well as voters who wanted to repeal it, 91% of the respondents who completed memory questions at both time points favored repeal (for more details concerning recruitment, see Murphy et al., 2019).

**Time 1 questionnaire: The week after the referendum.** The referendum took place on May 25, 2018. The results of two exit polls were released that evening, and the result of the vote was announced the next day. The Time 1 questionnaire was emailed on May 30, 2018 and completed during the week following the referendum. Participants were asked how they had voted, and could select “I voted Yes”, “I didn’t vote but would have voted Yes”, “I voted No”, “I didn’t vote but would have voted No”, “I didn’t vote and wasn’t leaning either way”, or “I’d prefer not to say”. Participants rated how much they had followed media coverage, and talked about the referendum outcome, since the result was announced, from 1 (*not at all*) to 5 (*a great deal*). They rated, “How important was the referendum to you?” from 1 (*not at all important*) to

9 (*extremely important*). They also rated how intensely happy, angry, and scared they were feeling about the referendum outcome, using a scale from 1 (*not at all*) to 9 (*extremely*).

**Time 2 questionnaire: Six months after the referendum.** In November of 2018, about six months after the referendum, participants were emailed an invitation to complete a follow-up questionnaire. They were asked to remember how they felt the week after the referendum:

“Think back to about a week after the 8<sup>th</sup> amendment referendum, after it had passed. How were you feeling about the result at that time? How intensely did you feel [happy / angry / scared]?”

Participants rated their remembered feelings from 1 (*not at all*) to 9 (*extremely*).

To assess memory for facts, participants responded to eight open-ended questions about the referendum outcome (e.g., Who conducted the two exit polls? What percentage of the country voted to repeal the 8<sup>th</sup> amendment?) (Cronbach’s  $\alpha = .67$ ). Several questions focused on two exit polls released the evening of the vote. This was done because these large-sample polls revealed that a strong majority had voted to repeal the restrictive amendment. The poll results were widely known and discussed in the media before the formal results were released.

Questions and scoring are shown in Appendix B. Correctly answering all eight questions yielded a score of seven points (two questions were related and had a maximum score of 0.5 points each). Responses to the fact memory questions for all participants were coded independently by two research assistants (*kappa* ranged from .84 to .99 for the 8 questions,  $M = .95$ ).

Discrepancies were resolved by a third coder.

Participants then rated how happy, angry, and scared they were currently feeling about the referendum outcome, from 1 (*not at all*) to 9 (*extremely*). They also rated the current importance of the referendum outcome, from 1 (*not at all important*) to 9 (*extremely important*).

**Measures and analyses.** To provide an accuracy score for fact memory, we calculated the percentage of points received out of seven, the total points possible. As in Study 1, we

examined both the overall accuracy of memory for emotion and the direction of bias in memory for happiness, anger, and fear. Initial ratings of anger and fear were positively correlated ( $r = .58$ ), and were negatively correlated with happiness ( $r_s < -.42$ ). Thus, we subtracted the mean of anger and fear from happiness to create three composite indices of emotion: Time 1 experienced emotion, Time 2 remembered emotion, and Time 2 current emotion. These emotion indices ranged from -8 to 8, with higher ratings indicating a more positive response. To provide an overall accuracy score for emotion memory, we calculated the percentage of agreement between experienced and remembered emotion, as in Study 1.

## Results and Discussion

**Preliminary analyses.** The majority of participants voted “yes” to repeal the amendment restricting abortion ( $n = 624$ ) or indicated that they would have voted “yes” ( $n = 41$ ). Few voted “no” to retain the amendment ( $n = 62$ ) or indicated that they would have voted “no” ( $n = 5$ ), or “I didn’t vote and wasn’t leaning either way” ( $n = 1$ ). We defined the valence of the referendum outcome as positive for participants who voted, or would have voted, “yes” (91%), and as negative for participants who voted, or would have voted, “no” (9%). The week after the referendum, participants reported exposure to media coverage ( $M = 3.56$ ,  $SD = 1.10$ ) and talking with others ( $M = 3.53$ ,  $SD = 1.03$ ) about the outcome, using a scale from 1 (*not at all*) to 5 (*a great deal*). Participants appraised the referendum outcome as extremely important the week after it was announced ( $M = 7.82$ ,  $SD = 1.37$ ), using a scale from 1 (*not at all*) to 9 (*extremely*), and appraised importance had not decreased significantly six months later ( $M = 7.79$ ,  $SD = 1.55$ ),  $t(724) = 0.84$ ,  $p = .40$ ,  $d = .02$ , 95% *CI* [-0.04, 0.11].

**Memory for facts.** We conducted a regression analysis to assess predictors of accuracy in memory for facts. As in Study 1, the model included Time 1 appraised importance, media exposure, rehearsal, the valence of the referendum outcome, overall change in appraised

importance, and overall change in feelings about the referendum outcome. Table 3 shows descriptive statistics and correlations among memory for events, memory for emotion, and variables in the model. Table 4 shows the results of the regression analysis. As Table 4 (Panel A) shows, the model was significant. Variance inflation factor values ranged from 1.04 to 1.71, indicating that multicollinearity was not a concern. More accurate memory for events was predicted only by media exposure and rehearsal.

**Memory for feelings: Overall accuracy.** We also examined memory for feelings about the referendum outcome, and the results were very similar to those found in Study 1. We first conducted a regression analysis to assess predictors of overall accuracy in memory for emotion. This analysis included the same predictors as in the analysis of memory for facts. As Table 4 (Panel B) shows, the model was significant. The less participants' feelings about the referendum changed over time, the more accurately they remembered their initial emotional response. In addition, positive valence predicted greater overall accuracy. The simple profile of emotions experienced by those who favored the referendum outcome (intense happiness and very little anger or fear; see Figure 3) may have been easier to remember. No other variable predicted the accuracy of memory for emotion. Importantly, as Table 3 shows, there was no significant association between overall memory accuracy for facts and feelings.<sup>5</sup>

**Memory for feelings: Direction of bias.** To examine the direction of memory bias for discrete emotions, we conducted a mixed model ANOVA with emotion (happy, angry, scared) and time (Time 1 experience, Time 2 memory) as within subject variables, and with valence as the between subject variable. The results showed a main effect of emotion,  $F(2, 1462) = 223.91$ ,  $p < .001$ ,  $\eta_p^2 = .23$ , and interactions between emotion and valence,  $F(2, 1462) = 1211.63$ ,  $p < .001$ ,  $\eta_p^2 = .62$ , emotion and time,  $F(2, 1462) = 32.16$ ,  $p < .001$ ,  $\eta_p^2 = .04$ , and emotion, valence, and time,  $F(2, 1462) = 22.10$ ,  $p < .001$ ,  $\eta_p^2 = .03$ .



As Figure 3 shows, **not surprisingly**, participants for whom the referendum outcome was positive experienced and recalled **more happiness**, **whereas** participants for whom the outcome was negative experienced and recalled more anger and fear. **Participants** overestimated how angry they had felt **regardless of whether they viewed the referendum outcome as positive** ( $M_{diff} = 0.24$ ),  $t(664) = 5.26$ ,  $p < .001$ ,  $d = .23$ , 95%  $CI$  [0.15, 0.33], **or negative** ( $M_{diff} = 0.62$ ),  $t(67) = 2.29$ ,  $p = .02$ ,  $d = .23$ , 95%  $CI$  [0.08, 1.15]. **Participants who favored the outcome underestimated how happy they had felt** ( $M_{diff} = -0.11$ ),  $t(664) = -2.20$ ,  $p = .03$ ,  $d = .08$ , 95%  $CI$  [-0.20, -0.01], **whereas**, those who viewed it as negative showed no significant bias in memory for happiness ( $M_{diff} = 0.22$ ),  $t(67) = 1.11$ ,  $p = .27$ ,  $d = .15$ , 95%  $CI$  [-0.18, 0.62]. **Participants who favored the outcome showed no bias in memory for fear** ( $M_{diff} = 0.01$ ),  $t(664) = 0.13$ ,  $p = .90$ ,  $d = .01$ , 95%  $CI$  [-0.09, 0.10], **whereas** those who viewed it as negative underestimated fear ( $M_{diff} = -0.93$ ),  $t(67) = -3.38$ ,  $p = .001$ ,  $d = .34$ , 95%  $CI$  [-1.47, -0.38]. **In summary, this** pattern of bias was similar to that found in Study 1. **Participants** overestimated how angry they had **felt regardless of valence**. **They** underestimated how happy they had felt about a positive outcome and how scared they had felt about a negative outcome.

**Predictors of the direction of bias in memory for feelings.** Finally, as in Study 1, we conducted a repeated measures ANCOVA to find out whether change in current feelings about the referendum outcome predicted the direction of bias in memory for happiness, anger, and fear. As a reminder, change in current feelings was defined as the difference between the composite measure of current emotion six months after, versus days after, the referendum ( $M = -0.32$ ,  $SD = 1.95$ , range = -11 to 9.5). The covariates were Time 1 appraised importance, media exposure, rehearsal, valence, and change in appraised importance.

The results were again similar to Study 1. Memory bias was predicted by emotion,  $F(2, 1424) = 11.96$ ,  $p < .001$ ,  $\eta_p^2 = .02$ , change in feelings,  $F(1, 712) = 10.50$ ,  $p = .001$ ,  $\eta_p^2 = .01$ , and

their interaction,  $F(2, 1424) = 162.38, p < .001, \eta_p^2 = .19$ . As Figure 4 shows, the more negative participants came to feel about the referendum outcome, the more they overestimated in remembering how angry and scared they had initially felt and underestimated happiness. Participants whose feelings about the referendum had not changed after six months showed little bias. The more positive participants came to feel about the referendum outcome, the more they underestimated in remembering how angry and scared they had felt and overestimated happiness. With respect to covariates, an interaction between valence and emotion was found,  $F(2, 1424) = 18.92, p < .001, \eta_p^2 = .03$ . As can be seen in Figure 3, participants who viewed the referendum outcome as negative overestimated anger more, and underestimated fear more, than participants who viewed it as positive. Bias in memory for happiness did not differ by valence.

### General Discussion

Hazy memory for facts and exaggerated memories of grievances can inflame political debate, driving individuals and groups apart (Yip & Schweitzer, 2019). But are factual memories of past encounters the antidote to misremembering feelings? This investigation examined predictors of accuracy in people's memories of facts and feelings concerning the 2016 U.S. presidential election and the 2018 referendum on abortion in Ireland. The results were strikingly similar across these two highly-emotional political events despite differing political outcomes, countries, and historical backgrounds. In both studies, participants as a group overestimated how angry they **had** felt about negative outcomes. They underestimated both how scared they **had** felt about negative outcomes and how happy they **had** felt about positive outcomes. More accurate memory of the facts concerning political events did not protect against these biases in memory for feelings.

People remember important experiences better than mundane ones, including what happened (Conway, 2005) and how they felt about it (Kaplan et al., 2016). But adjusting for

appraised importance in Study 1, no association was found between the accuracy of memory for facts and feelings in either study. Moreover, predictors of [overall](#) memory accuracy differed for facts and feelings. More accurate memory for facts was predicted by media exposure in both studies, and by talking with others about the referendum outcome in Study 2. Media accounts and conversations may scaffold people's memories by reiterating factual information about political events. In contrast, people [must](#) draw on their own autobiographical memories and current experience when remembering how events made them feel (Tinti et al., 2014). In keeping with this view, participants whose feelings and appraisals of past events remained more consistent over time remembered their past feelings more accurately.

Specifically, on average, participants remembered the intensity of their emotional response to political outcomes fairly accurately in both studies (Kaplan et al., 2016). Nonetheless, the majority of individual participants over- or underestimated in remembering their initial feelings of happiness, anger, and fear. [Change in current feelings about political outcomes predicted the direction of bias in memory for discrete emotions](#). In Study 1, [change](#) in participants' appraisals of the importance of Trump's victory also predicted [overall inaccuracy](#) in memory for emotion. (In Study 2, the importance of the referendum outcome had not decreased after six months.) These findings suggest that memory biases result when people have salient, competing emotional experience and appraisals at the time of recall. Consistency in emotions and appraisals allows people to retrieve more accurate memories of their past emotional experience. Even after memories of emotion have faded, drawing on consistent current feelings and appraisals may allow people to correctly reconstruct how they felt in the past (Levine et al., 2020; Robinson & Clore, 2002).

Study 1 also included a unique approach to assessing whether accurate memory for events protects against bias in remembering emotion. We examined memory for election-related

facts and feelings in individuals with HSAM. These individuals had previously been tested and shown to have extraordinarily detailed and accurate memories of public and personal events – a memory advantage that was most evident after retention intervals of a month or longer (LePort et al., 2016, 2017). Emotion is an important part of autobiographical experience, but memory for emotion over a lengthy retention interval, and recognition memory for facts, had never been tested in this group. We found that, after six months, participants with HSAM remembered facts concerning the election better than other participants but did not differ in the accuracy with which they remembered their feelings. In past research, people who showed greater accuracy on one false memory task were no less susceptible than others to false memories on other tasks (e.g., Patihis et al., 2018). Similarly, individuals with HSAM were not immune to bias in memory for emotion (Patihis et al., 2018; Levine et al., 2020), even after a lengthy delay.

Participants with HSAM remembered election-related facts significantly more accurately than other participants despite not differing in the appraised importance of the election outcome, the intensity of initial emotion, media exposure, or rehearsal. Yet it must be noted that their memory for facts was not strikingly superior to that of the main group. This may be because the facts assessed were not closely linked to their autobiographical experience. For example, on the 10 Dates Quiz (LePort et al., 2012), participants chose a public event to describe which had occurred  $\pm$  one month of the dates supplied by investigators. The performance of individuals with HSAM on this and similar tasks was many standard deviations above that of control participants (LePort et al., 2016, 2017). Notably, the details of public events that participants recounted (except for the date and day of the week) were selected by participants and may have been associated with events of importance in their own lives. LePort et al. (2016) tested the memories of participants with HSAM and controls for details from their own lives and details that the experimenter had shared about her life. Participants with HSAM showed no memory

advantage for details concerning the experimenter's life though many had worked with her for years. Similarly, the facts that participants were asked to remember about the 2016 campaigns may not have been closely associated with autobiographical events for participants with HSAM.

Taken together, the current findings refine our understanding of the abilities and the limitations of a unique group and highlight differences between remembering facts and feelings. Although their primary memory advantage lies in storing and retrieving their own autobiographical histories (LePort et al., 2016), we found that individuals with HSAM also remember facts about public events significantly better than others. Yet, greater accuracy in remembering events did not confer an advantage when remembering how events made them feel, either for HSAM participants or for the main group of participants.

Limitations of this investigation should be noted. [We found that the accuracy of emotion memories was predicted by consistency over time in people's feelings and appraisals concerning political events. This finding extends to emotion memories concerning other types of events \(e.g., academic achievements, health complaints; Levine et al., 2012; Robinson & Clore, 2002\).](#) [In contrast, greater overestimation of anger than other emotions is not always found \(e.g., Levine et al., 2012\) and may reflect rising political polarization.](#) To explain why participants as a group overestimated anger and underestimated fear and happiness, future studies should assess changes in the particular appraisals that differentiate among these emotions, such as certainty/uncertainty, control/powerlessness, and responsibility (Lerner & Tiedens, 2006). In addition, the correlational nature of the data limits causal conclusions. In Study 1, nonparametric tests were used to compare memory accuracy across groups due to the necessarily small number of participants with HSAM. Although, not a focus of this investigation, the small number of "No voters" in Study 2 may have limited our ability to detect differences in memory accuracy between voters who favored retaining versus repealing the restrictive amendment. Finally, future research should

assess the consequences of biases in emotion memory for political decisions and ways to reduce susceptibility to bias in memory for anger.

In conclusion, following two dissimilar political events, people exaggerated their past anger and underestimated happiness and fear, effectively stripping nuance from their memories of emotional experience. Having an accurate grasp of the facts did not protect people against misremembering their feelings. Reconstruction is a functional feature of memory that allows learning and aids decision making (Schacter, 2012). But in the context of increasing political polarization, misremembering emotion can be detrimental. Norms of tolerance and moderation are eroding in many societies worldwide (Carothers & O'Donohue, 2019). We found that, when people recalled past grievances in the context of current negative feelings, they overestimated how angry they were. In turn, bringing to mind exaggerated past feelings of anger can lead people to downplay risks, overlook commonalities across groups, and seek out confrontation, making the current context even more negative (Yip & Schweitzer, 2019). Thus, memory bias can both stem from and stoke animosity, a destructive cycle of political polarization.

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### Footnotes

<sup>1</sup>All but three of the 33 participants with HSAM were U.S. citizens. These three participants also rated the U.S. election as important, and omitting them did not change any findings in the paper, so all HSAM participants were included.

<sup>2</sup>The questionnaires in Study 1 were brief and did not include attention check questions. However, as part of a larger project on affective forecasting (Levine et al., 2020), Study 1 participants had completed a 60-minute questionnaire weeks before the election which included two attention check questions. Attention check scores ranged from 0 to 2 correct ( $M = 1.78$ ,  $SD = 0.59$ ), and are reported for each subgroup of participants in Supplemental Table S1. Most participants (87%) passed both attention checks, and another 4% passed one check, suggesting that the overall quality of participation was high.

<sup>3</sup>Fewer than 100 people with HSAM have been identified but the actual number of individuals with this ability is not known. A case study (Parker et al., 2006) and media reports sparked public awareness of HSAM. People who contacted the researchers claiming to have HSAM underwent two screening procedures (LePort et al., 2012). In the Public Events Quiz, they were asked to provide the date and day of the week when prompted with significant public events that occurred during their lifetime, and to provide the significant public event and day of the week when prompted with dates. Those who scored 50% correct or more were given the 10 Dates Quiz. They were asked to describe a verifiable public event, and an autobiographical event, that occurred within  $\pm$  one month of 10 randomly generated dates, and to indicate the day of the week for all events. Researchers classified those who scored 65% or above as having HSAM (for a more detailed description of screening, see LePort et al., 2012).

<sup>4</sup>In Study 1, we also conducted separate regression analyses assessing the predictors of overall memory accuracy for happiness, anger, and fear. Results were very similar to those

reported in the text for the composite measure of emotion. Namely, the strongest predictor of overall memory accuracy for all three emotions was consistency over time in current feelings about the election. Appraised importance predicted overall memory accuracy for happiness and anger (as found for the composite measure) but not fear. Change in appraised importance predicted overall memory accuracy for happiness and fear (as found for the composite measure) but not anger. In addition, participants who voted for Trump remembered anger more accurately, likely because they experienced very little anger. Results for discrete emotions are available online at <https://osf.io/er9hv/files/> in Supplemental Table S2.

<sup>5</sup>In Study 2, we also conducted separate regression analyses assessing the predictors of overall memory accuracy for happiness, anger, and fear. Significant predictors were identical to those reported for the composite measure of emotion, except that overall accuracy in remembering happiness was not predicted by valence. Results are available online in Supplemental Table S3: <https://osf.io/er9hv/files/>.

**Appendix A: Study 1 Fact Memory Questions, Answers (in italics), and Scoring**

The final set of questions concerns events leading up to the 2016 presidential election. Please answer each question as best you can without consulting any outside sources.

1. How did Donald Trump launch his presidential campaign?
  - a. During an episode of *The Apprentice*
  - b. *He rode down an escalator into the lobby of a skyscraper bearing his name*
  - c. Via a series of tweets
  - d. While traveling over Washington in a private jet
2. How many Republican candidates were there in total?
  - a. 10
  - b. 13
  - c. *17*
  - d. 21
3. Who formally announced his own presidential bid by saying: "This grotesque level of inequality is immoral. It is bad economics. It is unsustainable. This type of rigged economy is not what America supposed to be about."
  - a. Donald Trump
  - b. Ben Carson
  - c. *Bernie Sanders*
  - d. Rand Paul
4. Who was the Libertarian party candidate?
  - a. Gary Jackson
  - b. *Gary Johnson*
  - c. Gary Jefferson
  - d. Gary Anderson
5. When did the first Democratic primary debate occur?
  - a. September 29, 2015
  - b. *October 13, 2015*
  - c. October 20, 2015
  - d. November 3, 2015
6. Who were the Democratic and Republican winners of the Iowa caucuses?
  - a. Hillary Clinton and Donald Trump
  - b. Bernie Sanders and Ted Cruz
  - c. *Hillary Clinton and Ted Cruz*
  - d. Bernie Sanders and Donald Trump
7. Clinton was attacked by Bernie Sanders for making millions of dollars in speeches to private groups or companies after leaving office as Secretary of State in 2013. What was Clinton's standard fee?
  - a. \$75,000
  - b. \$150,000
  - c. *\$225,000*
  - d. \$400,000
8. When did the first Republican primary debate occur?
  - a. *August 6, 2015*
  - b. August 20, 2015
  - c. September 3, 2015
  - d. September 17, 2015

9. Trump said, "You wouldn't want me to condemn a group that I know nothing about. I'd have to look. If you would send me a list of the groups, I will do research on them and certainly I would disavow if I thought there was something wrong." What group was Trump talking about?
- a. American Nazi Party
  - b. *Ku Klux Klan*
  - c. Golden Dawn
  - d. Front National
10. Sanders fought on against Clinton until late June. How many delegates did he win in total?
- a. 1,247
  - b. 1,463
  - c. 1,893
  - d. 2,128
11. Trump's nomination as official Republican candidate at the GOP convention was overshadowed by a controversial speech by Trump's wife Melania Trump. Whose 2008 speech was she accused of plagiarizing?
- a. Hillary Clinton's
  - b. Gabrielle Giffords's
  - c. Elizabeth Warren's
  - d. *Michelle Obama's*
12. When was the first presidential debate between Clinton and Trump?
- a. August 8, 2016
  - b. August 22, 2016
  - c. September 12, 2016
  - d. *September 26, 2016*
13. Clinton came under fire for a speech in which she claimed 'half' of Trump's supporters are 'racist, sexist, homophobic, xenophobic, islamophobic -- you name it.' How did she describe them?
- a. The hatbox of depravity
  - b. The cave of unacceptability
  - c. The underbelly of evil
  - d. *The basket of deplorables*
14. Which website did Clinton's team dub a "propaganda arm of the Russian government" after the sit released a slew of hacked emails from Clinton campaign chairman John Podesta?
- a. Russia Today
  - b. *Wikileaks*
  - c. 4chan
  - d. Pravda
15. A late October surprise came when James Comey told Congress the FBI had found new email that 'may be pertinent' to a previously closed investigation into Hillary Clinton's email use. The messages were found on the laptop of which former congressman?
- a. Tom Delay
  - b. Mark Foley
  - c. John Edwards
  - d. *Anthony Weiner*

**Scoring:** 1 point per correct answer. Maximum = 15

Adapted from: Walsh, J. (2016). <https://www.theguardian.com/us-news/2016/nov/07/us-election-quiz-donald-trump-hillary-clinton>

**Appendix B: Study 2 Fact Memory Questions, Answers, and Scoring**

Question and answer	Scoring (Maximum = 7)
1. Who conducted the two exit polls? <sup>1</sup>	
Poll 1: the polling company Ipsos MRBI for the Irish Times. Poll 2: the polling company Behaviour and Attitudes for RTE television, released on the Late Show	0.5 points for any mention of Irish Times, MRBI or Ipsos (including misspellings) 0.5 points for any mention of Late Show, RTE or Behaviour & Attitudes 0.25 point penalty for any other polling company/newspaper/TV channel. Maximum penalty 0.5 points
2. Which exit poll was released first? (who conducted it?)	
Irish Times/IPSOS/MRBI	0.5 points for mention of Irish Times/IPSOS/MRBI. No negative marking
3. When were the results of that first exit poll released? (please provide a day and time)	
Friday, 10:00 to 10.30pm	1 point for any time between 10 and 10.30pm Friday. No negative marking
4. Which exit poll was released second? (who conducted it?)	
Late Late/RTE/Behaviour & Attitudes	0.5 points for mention of Late Late/RTE/Behaviour & Attitudes. No negative marking
5. When were the results of the second exit poll released? (please provide a day and time)	
Friday, 11:30 to midnight	1 point for any time between 11.30pm and midnight Friday
6. In the final tally, what was the voter turnout rate (%) across the whole country?	
64.13%	1 point for between 64% and 65%
7. What percentage of the country voted to repeal the 8 <sup>th</sup> amendment (voted Yes)?	
66.4%	1 point for between 66 and 67%
8. Name any constituencies in which the majority voted No.	
Donegal	1 point for Donegal. 0.5 point penalty for mention of any other constituency. Maximum penalty: 1 point

*Note.* For questions with two parts (e.g. Question 1), participants received 0.5 points for correct responses to each part. Questions 2 and 4 were related, thus, correct responses yielded 0.5 points each. Penalties were deducted so participants could not receive full credit for listing all possible answers (e.g. Question 8). [For Questions 6 and 7, we specified a narrow interval for correct responses because these percentages were widely discussed in Irish media. Scoring responses to these questions using continuous scales did not alter the pattern or significance of any results reported in the text.](#)



**Table 1***Descriptive Statistics and Correlations for Variables in Regression Models in Study 1 (N = 571)*

Variables	<i>M</i>	<i>(SD)</i>	1	2	3	4	5	6	7	8
1. Fact memory accuracy	51.22%	17.20								
2. Emotion memory accuracy	90.94%	9.80	.10*							
3. Group (Main=0, HSAM=1)	0.06	0.23	.15***	.02						
4. Importance (Time 1)	7.24	2.05	.28***	.15***	-.04					
5. Media exposure (Time 1)	8.30	6.75	.31***	.13**	-.00	.38***				
6. Rehearsal (Time 1)	4.71	5.33	.09*	.07	.07	.26***	.54***			
7. Valence (neg=0, pos=1)	0.27	0.44	.08*	.07	-.06	.10*	.13**	.01		
8. Overall change in importance	1.01	1.30	-.16***	-.27***	.01	-.23***	-.17***	-.10*	.01	
9. Overall change in feelings	1.91	1.88	-.08	-.50***	-.04	-.02	-.02	.06	-.04	.17***

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Table 2***Linear Regressions Predicting the Accuracy of Memory for Facts and Feelings about the 2016 U.S. Presidential Election in Study 1*

Variable	A. Memory for facts				B. Memory for feelings			
	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>
Group (Main = 0, HSAM = 1)	.16	11.85	2.88	4.11***	.00	0.06	1.53	0.04
Appraised importance (Time 1)	.19	1.58	0.36	4.41***	.08	0.38	0.19	1.99*
Media exposure (Time 1)	.29	0.74	0.12	5.92***	.05	0.07	0.07	1.07
Rehearsal (Time 1)	-.14	-0.45	0.15	-2.96**	.03	0.05	0.08	0.61
Valence (neg = 0, pos = 1)	.04	1.40	1.54	0.91	.03	0.68	0.81	0.84
Overall change in importance	-.08	-1.03	0.55	-1.89	-.16	-1.22	0.29	-4.22***
Overall change in feelings	-.03	-0.27	0.36	-0.76	-.46	-2.39	0.19	-12.50***
<i>R</i> <sup>2</sup> and <i>F</i> values	<i>R</i> <sup>2</sup> = .17, <i>F</i> (7, 552) = 15.89, <i>p</i> < .001				<i>R</i> <sup>2</sup> = .29, <i>F</i> (7, 552) = 31.65, <i>p</i> < .001			

*Note.* Memory for facts refers to the percentage of correct responses to 15 four-option, forced choice questions. Memory for feelings refers to the percentage of agreement between experienced and remembered emotion. \**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

**Table 3***Descriptive Statistics and Correlations for Variables in Regression Models in Study 2 (N = 734)*

Variables	<i>M</i>	<i>(SD)</i>	1	2	3	4	5	6	7
1. Fact memory accuracy	39.77%	25.16							
2. Emotion memory accuracy	92.38%	7.63	.06						
3. Importance (Time 1)	7.82	1.37	.19***	.11**					
4. Media exposure (Time 1)	3.56	1.10	.36***	.10**	.36***				
5. Rehearsal (Time 1)	3.53	1.03	.30***	.10**	.41***	.62***			
6. Valence (neg = 0, pos = 1)	0.91	0.29	.08*	.19***	.11**	.16***	.10**		
7. Overall change in importance	0.60	0.87	-.15***	-.09*	-.44***	-.17***	-.21***	-.13***	
8. Overall change in feelings	1.30	1.49	-.01	-.41***	-.05	-.05	-.02	-.12***	.03

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Table 4**

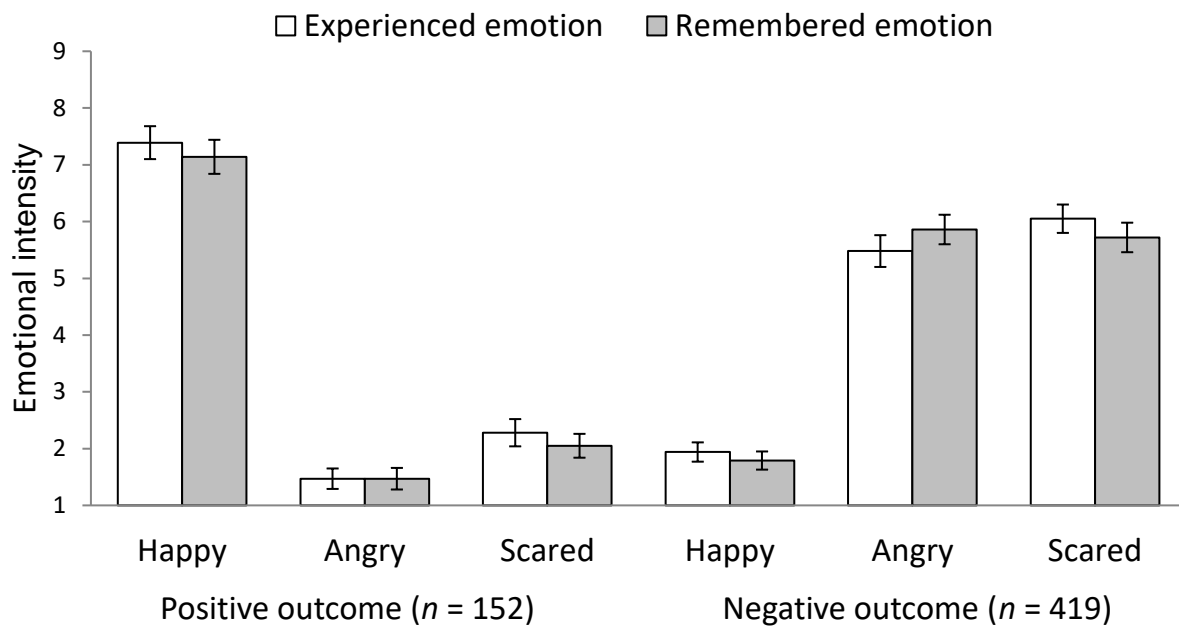
*Linear Regressions Predicting the Accuracy of Memory for Facts and Feelings concerning the Referendum in Study 2*

Variable	A. Memory for facts				B. Memory for feelings			
	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>
Appraised importance (Time 1)	.02	0.34	0.77	0.44	.04	0.20	0.23	0.90
Media exposure (Time 1)	.26	5.88	1.03	5.72***	.01	0.08	0.30	0.25
Rehearsal (Time 1)	.10	2.57	1.11	2.30*	.05	0.37	0.33	1.13
Valence (neg = 0, pos = 1)	.02	1.46	3.04	0.48	.14	3.60	0.91	3.96***
Overall change in importance	-.07	-1.96	1.12	-1.75	-.03	-0.27	0.33	-0.82
Overall change in feelings	-.04	-0.84	0.78	-1.03	-.38	-1.98	0.17	-11.33***
$R^2$ and $F$ values	$R^2 = .14, F(6, 721) = 19.15, p < .001$				$R^2 = .20, F(6, 718) = 28.76, p < .001$			

*Note.* Memory for facts refers to the percentage correct out of a total possible score of 7 for responses to free recall questions. Memory for feelings refers to the percentage of agreement between experienced and remembered emotion. \* $p < .05$ . \*\*\* $p < .001$ .

**Figure 1**

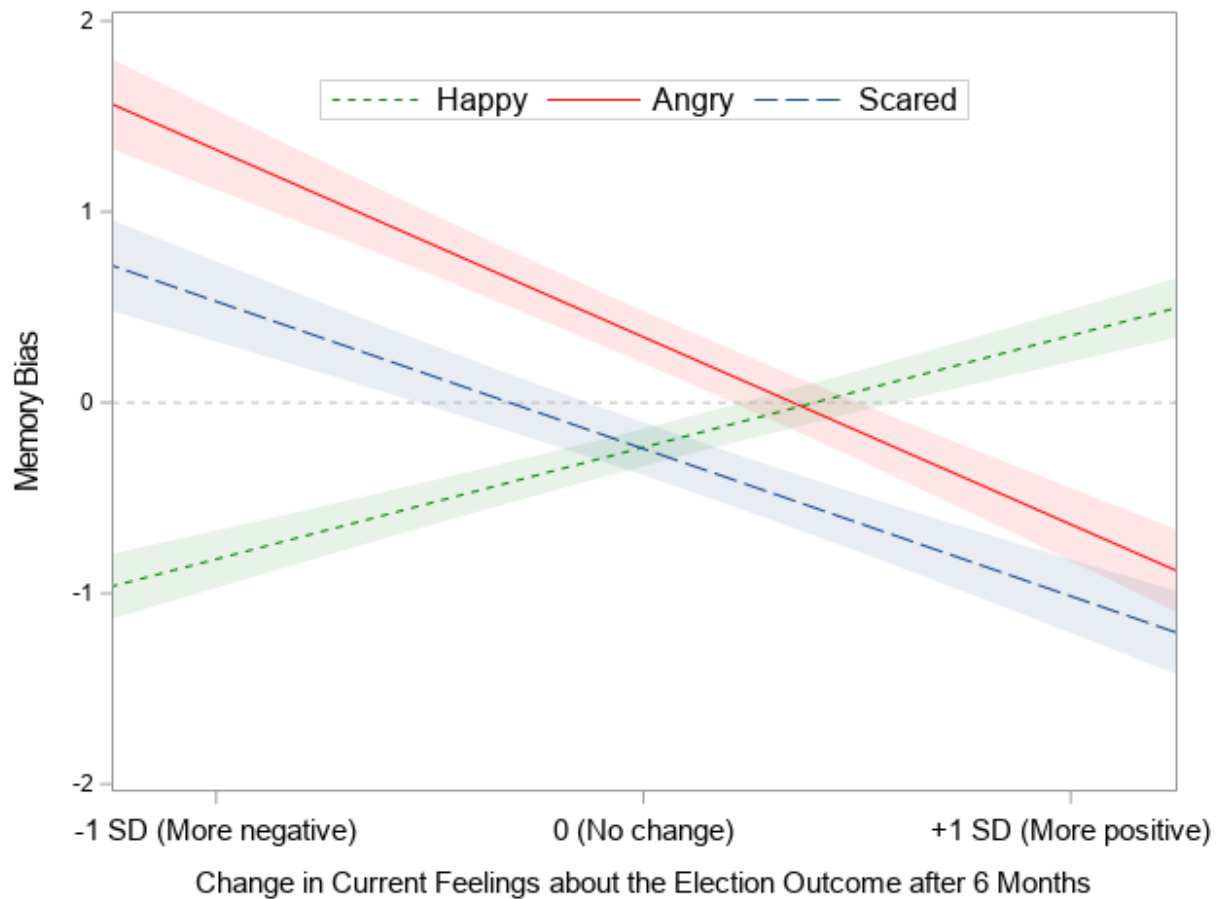
*Mean Intensities of Experienced and Remembered Emotions concerning the Outcome of the 2016 U. S. Presidential Election by Valence in Study 1*



*Note.* Error bars show 95% confidence intervals.

**Figure 2**

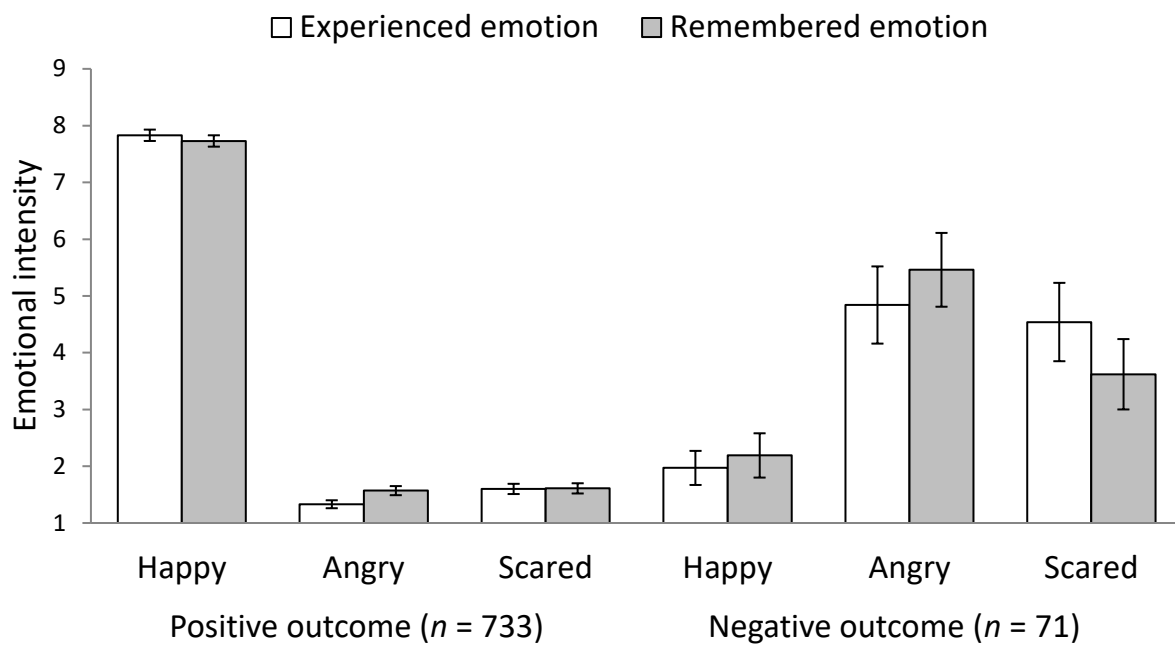
*Bias in Memory for Discrete Emotions as a Function of Change Over Time in Current Feelings about the Election Outcome in Study 1*



*Note.* Change over time in current feelings about the election outcome predicted the magnitude and direction of bias in memory for discrete emotions. Memory bias refers to remembered minus experienced emotion, for happiness, anger, and fear. Change in current feelings refers to the difference between the composite measure of current emotion six months after, versus days after, the election. Predicted values for memory bias, adjusted for covariates, are shown for 1 *SD* below 0 (feelings became more negative), 0 (no change), and 1 *SD* above 0 (feelings became more positive). Shaded error bands show 95% confidence intervals for predicted values.

**Figure 3**

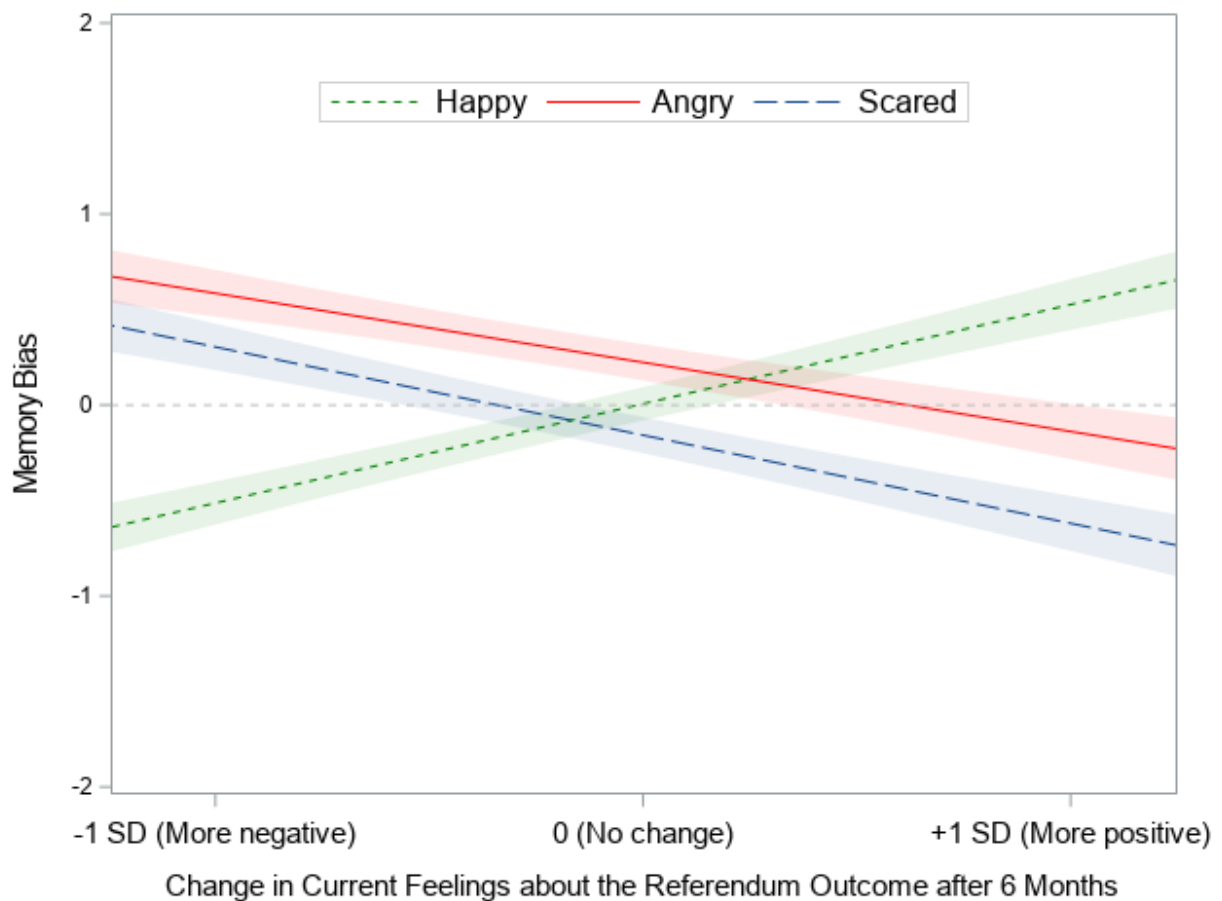
*Mean Intensities of Experienced and Remembered Emotions concerning the Referendum on Abortion in Ireland by Valence in Study 2*



*Note.* The valence of the referendum outcome was defined as positive for participants who indicated that they voted, or would have voted, “yes” to repeal the restrictive amendment, and as negative for participants who indicated that they voted, or would have voted, “no” to retain the restrictive amendment. [Error bars show 95% confidence intervals.](#)

**Figure 4**

*Bias in Memory for Discrete Emotions as a Function of Change Over Time in Current Feelings about the Referendum Outcome in Study 2*



*Note.* Change over time in current feelings about the referendum outcome predicted the magnitude and direction of bias in memory for discrete emotions. Memory bias refers to remembered minus experienced emotion, for happiness, anger, and fear. Change in current feelings refers to the difference between the composite measure of current emotion six months after, versus days after, the referendum. Predicted values for memory bias, adjusted for covariates, are shown for 1 *SD* below 0 (feelings became more negative), 0 (no change), and 1 *SD* above 0 (feelings became more positive). Shaded error bands show 95% confidence intervals for predicted values.



### Supplemental Material

#### Supplemental Table S1

##### *Demographic Characteristics and Political Preferences of Participants in Study 1*

	HSAM	MTurk	CA student	TX student
Demographics				
<i>n</i>	33	407	38	93
Men	25	191	4	17
Women	7	213	32	76
Other or missing	1	3	2	0
Age: Mean ( <i>SD</i> )	42.19 (12.25)	38.47 (12.09)	21.29 (4.67)	18.54 (0.93)
Black	1	44	0	1
East Asian	1	18	10	5
Hispanic	0	14	9	16
Middle Eastern	1	1	4	1
South Asian	2	3	4	6
White	27	317	10	59
Other or missing	1	10	1	5
Political preferences				
Voted for Trump	15%	27%	0%	42%
Voted for Clinton	58%	53%	56%	19%
Voted for other	9%	8%	5%	5%
Did not vote	9%	11%	18%	23%
Did not report vote	9%	1%	21%	11%
Importance of election	6.94 (2.31)	7.46 (1.99)	7.03 (2.07)	6.49 (2.07)
Media exposure (hours)	8.30 (6.14)	9.02 (7.24)	7.16 (5.70)	5.63 (3.80)
Rehearsal (hours)	6.18 (6.78)	4.59 (5.47)	5.18 (5.14)	4.52 (4.05)
Attention check score <sup>1</sup>	1.56 (0.72)	1.96 (0.24)	1.32 (0.93)	1.28 (0.94)

*Note.* <sup>1</sup>Three weeks before the election, as part of a larger study on affective forecasting (Lench et al., 2019; Levine et al., 2020), participants completed two attention check questions embedded in a 60-minute online questionnaire. The attention check score ranged from 0 to 2 correct.

**Supplemental Table S2**

*Linear Regressions Predicting the Overall Accuracy of Memory for Happy, Angry, and Scared Feelings about the 2016 U.S. Presidential Election in Study 1*

Variable	Happy				Angry				Scared			
	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>
Group (Main = 0, HSAM = 1)	-.01	-.88	2.02	-0.44	.04	2.94	2.93	1.00	-.02	-1.13	2.69	-0.42
Appraised importance (T1)	.14	.94	.25	3.70***	.10	.93	.37	2.52*	.05	.40	.33	1.21
Media exposure (Time 1)	.03	.06	.09	0.68	.01	.03	.13	0.24	.05	.13	.12	1.09
Rehearsal (Time 1)	-.02	-.04	.11	-0.42	.01	.03	.16	0.20	.04	.14	.14	0.98
Valence (neg = 0, pos = 1)	-.00	-.04	1.11	-0.03	.13	5.34	1.65	3.23**	.01	.35	1.46	0.24
Change in importance	-.07	-.81	.38	-2.13*	-.06	-.82	.55	-1.49	-.13	-1.73	.51	-3.40***
Change in feelings	-.58	-6.47	.39	-16.59***	-.46	-4.82	.41	-11.66***	-.52	-5.57	.40	-14.05***
<i>R</i> <sup>2</sup> and <i>F</i> values	<i>R</i> <sup>2</sup> = .41, <i>F</i> (7, 553) = 53.60, <i>p</i> < .001				<i>R</i> <sup>2</sup> = .28, <i>F</i> (7, 552) = 30.29, <i>p</i> < .001				<i>R</i> <sup>2</sup> = .32, <i>F</i> (7, 553) = 36.88, <i>p</i> < .001			

*Note.* Overall accuracy refers to the percentage of agreement between experienced and remembered emotion. Change in feelings, for the three regression analyses, refers to the absolute value of the difference between Time 1 and Time 2 current feelings of happiness, anger, or fear, respectively. \**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

**Supplemental Table S3**

*Linear Regressions Predicting the Overall Accuracy of Memory for Happy, Angry, and Scared Feelings about the 2018 Irish Referendum on Abortion in Study 2*

Variable	Happy				Angry				Scared			
	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>	$\beta$	<i>B</i>	<i>SE B</i>	<i>t</i>
Appraised importance (T1)	.06	.49	.35	1.38	.02	.27	.42	0.63	.01	.11	.38	0.29
Media exposure (Time 1)	.01	.06	.47	0.14	.04	.51	.57	0.90	.01	.17	.51	0.34
Rehearsal (Time 1)	.06	.66	.51	1.30	-.02	-.30	.62	-0.49	.01	.16	.55	0.29
Valence (neg = 0, pos = 1)	.04	1.67	1.39	1.21	.14	6.89	1.77	3.90***	.14	6.94	1.55	4.48***
Change in importance	-.05	-.62	.51	-1.22	.04	.65	.62	1.05	-.03	-.47	.56	-0.85
Change in feelings	-.38	-3.97	.36	-11.09***	-.43	-4.98	.39	-12.76***	-.57	-6.34	.34	-18.64***
$R^2$ and <i>F</i> values	$R^2 = .19, F(6, 721) = 27.14, p < .001$				$R^2 = .24, F(6, 719) = 37.86, p < .001$				$R^2 = .38, F(6, 720) = 73.05, p < .001$			

*Note.* Overall accuracy refers to the percentage of agreement between experienced and remembered emotion. Change in feelings, for the three regression analyses, refers to the absolute value of the difference between Time 1 and Time 2 current feelings of happiness, anger, or fear, respectively.

\*\*\* $p < .001$ .