Memory for flip-flopping: Detection and recollection of political contradictions

By: Adam L. Putnam, Christopher N. Wahlheim, Larry L. Jacoby

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Abstract:

During political campaigns, candidates often change their positions on controversial issues. Does changing positions create confusion and impair memory for a politician's current position? In 3 experiments, two political candidates held positions on controversial issues in two debates. Across the debates, their positions were repeated, changed, or held only in the second debate (control). Relative to the control condition, recall of the most recent position on issues was enhanced when change was detected and recollected, whereas recall was impaired when change was not recollected. Furthermore, examining the errors revealed that subjects were more likely to intrude a Debate 1 response than to recall a blend of the two positions, and that recollecting change decreased Debate 1 intrusions. We argue that detecting change produces a recursive representation that embeds the original position in memory along with the more recent position. Recollecting change then enhances memory for the politician's positions and their order of occurrence by accessing the recursive trace.

Keywords: Change detection | Contradiction | Politics | Proactive interference | Recursive reminding

Article:

> "I'm proud of what we've done. If Massachusetts succeeds in implementing [Romneycare], then that will be a model for the nation." Mitt Romney, January 2007
>
> ". . . I was asked, 'is [Romneycare] something that you would have the whole nation do?', and I said 'no.' This is something that was crafted for Massachusetts. It would be wrong to adopt this as a nation." Mitt Romney, May 2011 (Anderson, 2011)

Prior to and during the 2012 presidential election, Mitt Romney was criticized for flip-flopping on key issues. Some critics suggested that Romney's loss to Barack Obama might have been due to his quickly changing positions on abortion, taxes, and health care (Trumble, 2012). Accusing an opponent of flip-flopping can create the impression of an indecisive politician who changes his or her platform to earn votes. Indeed, Bush's 2004 presidential campaign strategy involved contrasting John Kerry's inconsistencies with Bush's decisive leadership (Morris, 2005). However, it is unclear whether voters remember flip-flopping (or the accusation of flip-flopping) and whether remembering flip-flopping actually influences voting behavior. From a memory perspective, this raises some important questions. How often do voters detect when a candidate flip-flops? How does recollecting that a candidate earlier flip-flopped influence memory for the candidate's current position?

When a candidate changes his or her position on an issue, proactive interference might occur if memory for the original position competes with memory for the most recently held position (for a review of proactive interference research, see Anderson & Neely, 1996). However, recent research by Wahlheim and Jacoby (2013) has shown that change can result in either proactive interference or proactive facilitation, depending on whether the change is recollected. In their experiments, word pairs appeared in two lists, with some pairs repeating across lists, other pairs appearing only in List 2 (control items), and critically, other pairs containing the same cue in both lists (e.g., *knee*) paired with responses that changed from List 1 (*bone*) to List 2 (*bend*). While studying List 2, subjects clicked a button if they thought that an item had changed. During the test, subjects were instructed to recall the List 2 response and had their change recollection measured. When change was detected in List 2 and recollected at test, recall was better for changed than for control items (proactive facilitation). In contrast, when change was not recollected, recall was poorer for changed than for control items (proactive interference). Wahlheim and Jacoby argued that change detection produces a recursive representation that embeds the original response into memory for the changed response and preserves their order of occurrence. Recollecting change was said to provide a means of accessing both the original and the changed response, along with their order of occurrence (see also Jacoby & Wahlheim, 2013; Jacoby, Wahlheim, & Yonelinas, 2013; Wahlheim, 2014).

In the introduction to their article, Wahlheim and Jacoby (2013) used the example of a flip-flopping politician to explain the notion of recursive remindings. In the present experiments, we used procedures similar to those of Wahlheim and Jacoby, but replaced the word pairs with the political views of fictional politicians on current issues (see Table 1). Subjects read about two fictional candidates running against each other for office, and were then presented with those candidates' views on several issues across two debates, with the candidates changing positions on some issues across the debates (flip-flopping). At test, subjects were instructed to recall the Debate 2 position for each issue and to indicate whether each candidate had changed his position across debates. Thus, we could investigate the effects of change detection and recollection on memory performance in the context of political contradictions.

Table 1. Example of positions on an issue

Platform and Extremeness	**Issue: Same Sex Marriage**
Conservative	

More Extreme	Traditional marriage should be *protected through a constitutional amendment*.
Less Extreme	Traditional marriage should be *an issue for individual state legislatures*.
Liberal	
More Extreme	Partners of the same sex should be recognized through *marriage*.
Less Extreme	Partners of the same sex should be recognized through *civil unions*.

The positions above appeared without italics in Debates 1 and 2. At test, the first portion of each sentence served as a cue for recall, and subjects' task was to recall the italicized portion

Exploring interference effects in memory with more realistic materials has been done before. The misinformation paradigm, for example, uses a retroactive interference design with slide shows about car accidents and robberies rather than word lists (Loftus, Miller, & Burns, 1978). These experiments have shown that misleading questions on a survey can cause large deficits in recall for the original scene. The misinformation paradigm has clearly had a huge impact on memory research (see Loftus, 2005); this could be because the realistic materials are inherently interesting, have applications to real-world problems, and allow researchers to examine questions that were unanswerable with more basic materials.

For example, the concept of *memory blending* (i.e., when two different events become intertwined together) emerged out of the misinformation paradigm. In one study, Loftus (1977) showed subjects a green car, but then misinformed some of them that the car was blue; when asked to pick out the color of the car, the subjects exposed to misinformation were more likely to pick a blue–green shade rather than a pure green. One hypothesis for why misinformation occurs is that the misleading question distorts the encoding of the original event, creating a new memory trace that is a blend of both the original experience and the misleading information. Experimental support for such blending has been found when examining memory for color (Loftus, 1977) and facial recognition (Ross, Ceci, Dunning, & Toglia, 1994), whereas theoretical support for memory blending has been found in distributed memory models (e.g., Metcalfe, 1990). Memory blending seems likely to occur in everyday life but would be extremely difficult to explore using basic laboratory materials such as word pairs (e.g., what would a blend of the words "bone" and "bend" look like?).

More realistic materials may support a more nuanced understanding of how and why interference occurs through an examination of how mistakes are made. For example, suppose that one of the fictional politicians in our experiments, Mike Shipman, states at a first debate that "Partners of the same sex should be recognized through marriage," and then at a second debate states that "Partners of the same sex should be recognized through civil unions." If voters are asked to recall Shipman's current position, they could either correctly recall the position from the second debate, or they could commit one of several errors. Aside from omitting or confabulating a response, voters could recall the Debate 1 response ("Partners of the same sex should be recognized through marriage.") or could report a blending of the Debate 1 and Debate 2 responses (“Partners of the same sex should be recognized through the civil union of marriage.”). Both Debate 1 intrusions and blending errors would show that proactive interference was occurring.

The political materials also offer additional advantages. First, these materials may have more external validity; people rarely, if ever, need to remember lists of paired associates, whereas remembering a politician’s views on a controversial issue is an important part of being an informed voter. Second, when attempting to recall a candidate’s position, subjects may be able to use information other than their memory for the candidate’s speech at a debate to inform their recall judgment. Most Americans have a basic understanding of current political issues (Pew Research Center, 2010), so they may be able to use general political knowledge to help remember a candidate’s specific position. Showing that change detection and recollection can still influence memory performance when other variables are at play would provide strong evidence for the importance of change detection and recollection in preventing proactive interference.

Aside from their different framing as a political debate, the present experiments closely paralleled the procedures used by Wahlheim and Jacoby (2013). Subjects were introduced to a Democratic and a Republican politician, and were told that the two candidates were running against each other for office. Subjects read excerpts from two debates in which the candidates voiced their views on current issues; sometimes the candidates repeated themselves across debates, sometimes they addressed a topic at only the second debate, and sometimes they changed their positions. When changing positions, the candidates never changed sides completely, but rather changed from an extreme view to a less extreme view, or vice versa. At test, subjects attempted to recall each candidate’s position from Debate 2 and indicated whether they thought the candidate had earlier changed positions—a measure of change recollection.

We expected an outcome similar to that found by Wahlheim and Jacoby (2013), showing proactive facilitation when change was recollected, and proactive interference when change was not recollected. This pattern of results would suggest that failing to detect and recollect change made by a politician results in deleterious effects on memory for the most recent position. In contrast, when voters detect and later recollect change, they benefit from enhanced memory for the most recently held position.

Experiment 1

In Experiment 1, subjects read statements made by politicians during two debates. At test, the subjects recalled the positions from the second debate and then indicated whether the politicians had changed positions between the debates. Consistent with earlier research, we expected that recollection of change would eliminate proactive interference and result in proactive facilitation for the most recently presented position.

Method

Subjects

A group of 24 students from Washington University in St. Louis participated in groups of one to three people in exchange for partial course credit or $10. Subjects self-reported their own political orientation by using a slider anchored with *Liberal* and *Conservative*. The slider responses were converted to a 100-point scale ranging from 0 (*liberal*) to 100 (*conservative*). The subjects were mostly liberal, with a median score of 24.

Materials

The materials were 36 current political issues with four positions associated with each issue (144 total). Of the four, two positions were liberal and two were conservative. Pilot testing showed that one position was more extreme than the other for both the liberal and conservative positions (see the example in Table 1). The two positions on one side for a topic were written so that the first portion of each statement was the same, with the differences between the statements being at the end of each sentence. This construction allowed the candidates to shift from a more extreme to a less extreme position (or vice versa), and for the first portion of the statement to serve as a cue for the later portion of the sentence during the final recall test. Candidates never changed from a liberal to a conservative position, or vice versa.

Design and counterbalancing

The experiment had a 3 (position: repeated vs. control vs. changed) × 2 (position extremeness: more extreme vs. less extreme) within-subjects design. The 36 issues were divided into three groups of 12. Within each group, items were further divided into two groups, which allowed us to counterbalance whether the more extreme or less extreme version of each position was presented during Debate 2, which yielded a total of six groups of positions. These six groups were rotated through the different conditions. Thus, for each position type (repeated, control, and changed), for six of the topics the less extreme statement was presented in Debate 2, and for another six the more extreme statement was presented in Debate 2. The six groups were assigned equally often to each condition.

During the experiment, the positions held by two fictional candidates (one Democrat, one Republican) were presented for each of the 36 issues in two debates (72 total positions). The majority of positions (30 issues) were congruent with the candidate's political party, whereas the remaining positions were incongruent (six issues): The Democrat held liberal positions on 30 issues and conservative positions on six, whereas the Republican held conservative positions on 30 issues and liberal positions on six. The incongruent positions resulted in the two candidates agreeing on a minority of issues, and were included to prevent subjects from basing their responses on the candidates' political party affiliations. A subset of issues was randomly chosen for the incongruent positions and was not counterbalanced.

Procedure

The experiment consisted of four phases: Debate 1, an intervening task, Debate 2, and a test phase. Subjects were told they would read excerpts from two debates. They were told that Debate 1 occurred in a small town hall on October 2, and saw a picture of a town hall along with the pictures and names of the two fictional candidates: John Baker (D), the Democrat, and Mike

Shipman (R), the Republican. Subjects were told to consider the excerpts carefully so as to form an accurate impression of each candidate. Subjects were also told that the candidates would mostly disagree, but would agree on some issues.

During Debate 1, each trial began with a candidate's face and name appearing above an issue for 3 s. Then, the candidate's position on that issue appeared below for an additional 8 s. Each trial was followed by a blank screen for 500 ms. The positions in Debate 1 were randomized anew for each subject. Those were the first presentations of the repeated and changed positions (24 each), resulting in 48 total presentations.

After Debate 1, subjects completed an intervening task that required them to imagine what they would be doing during the two weeks between the debates, and they wrote down those activities for 3 min. This was done to differentiate the two supposed debates (see Sahakyan & Kelley, 2002).

Following the intervening task, subjects were told that Debate 2 occurred on October 16 in the campus center of a major university. A picture of the campus center appeared above the pictures and names of the candidates. Subjects were then told that issues and positions would appear as in Debate 1, but that their task was to remember the current positions for an upcoming test. Subjects were told that candidates might repeat their previous position, change positions on a topic, or address a new topic that had not been addressed in Debate 1. Subjects were informed that noticing the changed positions would help their memory on the final test.

Finally, during the test phase, subjects completed three tasks. Topics were presented in a random order, along with each candidate's picture, name, and the first portion of the position. Subjects first attempted to recall the position from Debate 2 by typing the remainder of that position. Then they rated how liberal or conservative the Debate 2 position was by moving a slider left for liberal and right for conservative. These ratings were collected to ensure that our materials were calibrated appropriately, but are not reported because they were not of central interest. Finally, a question appeared asking subjects whether the candidate had changed positions (e.g., "Did Mike Shipman change his position on Same Sex Marriage from Debate 1 to Debate 2?"). Subjects responded by clicking the "yes" box if they thought the candidate had changed positions, and clicking the "no" box if they thought the candidate had stayed the same across debates or had only addressed the topic at Debate 2. After subjects made this change recollection judgment, a blank screen appeared for 500 ms, after which the next topic appeared. No time limit was imposed for any task during the test phase. After completing the recall test, subjects were asked to report their own political views by using a slider anchored with *liberal* on the left and *conservative* on the right. The subjects were then thanked and debriefed.

Results and discussion

In the following experiments, effects below $\alpha = .05$ were considered significant. Differences in degrees of freedom for the conditional analyses are due to the exclusion of subjects who did not have at least one observation in each cell. Cued recall answers were scored by two independent raters (Cohen's kappa: .74 for Exp. 1, .83 for Exp. 2, and .81 for Exp. 3), and any differences were resolved by the first author. After coding for accuracy, the errors were grouped into different categories. The “Debate 1 intrusions” category was used when a response would have been counted as correct if subjects had been asked to recall the position from the first debate. The “blending” category was used when a response contained elements from both the first and second debates. For example, the liberal responses for the topic Paying for College were *College students should have fifty percent of their student loans forgiven* (more extreme) and *College students should have the interest on their student loans forgiven* (less extreme). After seeing the cue *College students should have*: one subject responded with “fifty percent of the interest on federal loans forgiven,” using elements from both responses.

We found no systematic effects of position strength (more extreme vs. less extreme), so we collapsed across that variable. Additionally, we checked to see whether there were any effects of position congruency, and finding none, included the incongruent items in all analyses. Finally, an interesting question was whether subjects’ own political orientations would influence their ability to notice and remember changes. On one hand, subjects might be more critical of someone from a different party; on the other hand, subjects might understand the nuances of their own side better, and thus might be more capable of detecting changes there. Regardless, we failed to find any effects of political affiliation on change recollection and recall, as either a main effect or as an interaction with the candidates’ political parties.

Table 2 shows that recall of Debate 2 positions was better for repeated than for control positions, and better for control than for changed positions, ts(23) ≥ 2.85, ps ≤ .009, ds ≥ 0.53.
Table 3 shows the probabilities of correct change recollection for changed positions (hits), along with erroneous change recollection for the control condition (false alarms). Also shown are signal detection measures of discriminability (d') and response bias (c), computed from hit and false alarm rates (Macmillan & Creelman, 2005). Subjects successfully discriminated between changed and control positions: d' was greater than zero, $t(23) = 7.09$, $p < .001$, $d = 1.45$.

Table 2. Probabilities of correct recall as a function of position type and instructions: Experiments 1–3

	Position Type		
	Repeated	**Control**	**Changed**
Experiment 1			
Informed	.83 (.03)	.74 (.04)	.60 (.03)
Experiment 2			
Informed	.80 (.02)	.71 (.03)	.59 (.03)
Uninformed	.85 (.03)	.75 (.03)	.62 (.03)
Experiment 3			
Informed + Detection	.79 (.03)	.57 (.03)	.56 (.03)

Uninformed	.73 (.03)	.61 (.03)	.50 (.03)

Standard errors of the means are presented in parentheses

Table 3. Probabilities of change recollection and signal detection theory measures: Experiments 1–3

	Position		**SDT Measure**	
	Changed (Hits)	**Control (False Alarms)**	***d′***	***c***
Experiment 1				
Informed	.44 (.05)	.13 (.03)	1.12 (.16)	–.72 (.11)
Experiment 2				
Informed	.55 (.05)	.22 (.04)	1.12 (.21)	–.41 (.13)
Uninformed	.45 (.04)	.16 (.05)	1.07 (.21)	–.72 (.12)
Experiment 3				
Informed + Detection	.55 (.03)	.16 (.04)	1.39 (.15)	–.57 (.10)
Uninformed	.52 (.04)	.24 (.04)	0.94 (.14)	–.44 (.11)

Signal detection theory measures include *d′* as a measure of discriminability and *c* as a measure of response bias. Standard errors of the means are presented in parentheses

Paralleling Wahlheim and Jacoby (2013), we expected recall to depend on the recollection of change. Figure 1 shows that for changed positions, no proactive interference emerged when change was recollected, whereas there was large proactive interference when change was not recollected. Recall did not differ between changed positions when change was recollected and control positions, $t(23) = 0.49$, $p = .63$, $d = 0.14$, whereas recall was lower for changed positions when change was not recollected than for control positions, $t(23) = 6.37$, $p < .001$, $d = 1.66$.

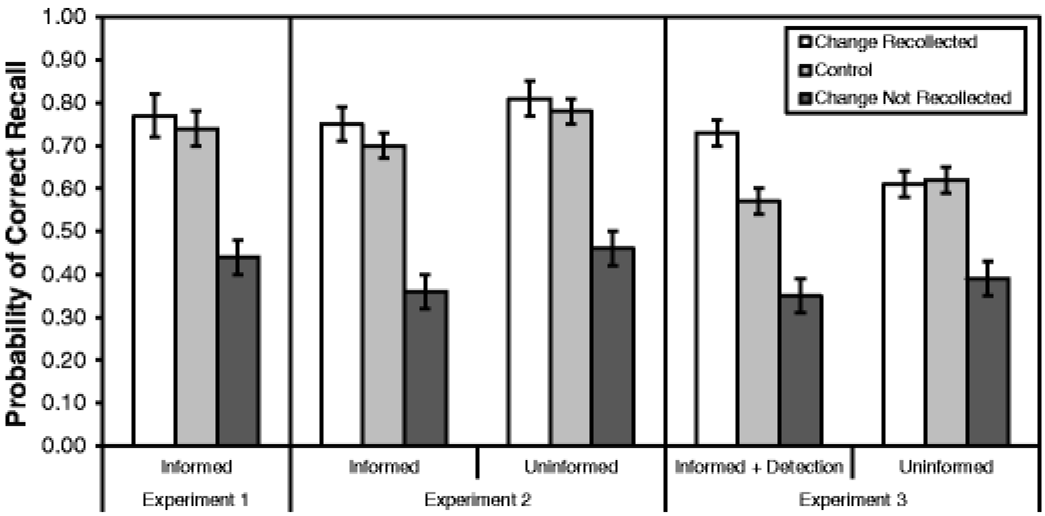

Fig. 1. Cued recall for changed positions conditionalized on change recollection, as compared with control positions (Exps. 1–3). Error bars represent standard errors of the means

Examining the errors that subjects made provided insight into how proactive interference had its effects. The top row of Table 4 shows that for the control and changed positions combined, more Debate 1 intrusions (M = 6.17) occurred than blending errors (M = 0.58), $t(23) = 8.65$, $p < .001$, $d = 2.60$. Critically, more Debate 1 intrusions occurred for the changed positions than for the control positions, $t(23) = 7.51$, $p < .001$, $d = 2.19$, suggesting that subjects were more likely to intrude a Debate 1 response for the changed positions. Debate 1 intrusions could occur for the control positions because both candidates held similar views on the topic, or could represent error variance from coding. Furthermore, for the changed positions (not shown in Table 4), recollecting change moderated how often subjects intruded a Debate 1 response. Subjects were over three times as likely to commit a Debate 1 intrusion when change was not recollected than when it was recollected (M = 3.92 vs. 1.17), $t(23) = 4.71$, $p < .001$, $d = 1.50$. We found no significant difference between the changed and control positions for the numbers of blending errors, nor did recollecting change influence how often blending errors occurred, all $ts(23) \leq 1.17$, $ps \geq .08$, $ds \leq 0.32$.

Table 4. Mean numbers of Debate 1 and blending errors per subject for different position types

	Error Type			
	Debate 1 Intrusions		**Blending Errors**	
	Control	**Changed**	**Control**	**Changed**
Experiment 1				
Informed	1.08 (0.21)	5.08 (0.48)	0.17 (0.08)	0.42 (0.13)
Experiment 2				
Informed	1.29 (0.27)	5.33 (0.60)	0.04 (0.04)	0.04 (0.04)
Uninformed	1.42 (0.26)	5.79 (0.57)	0.00 (0.00)	0.38 (0.15)
Experiment 3				
Informed + Detection	1.83 (0.29)	4.25 (0.30)	0.11 (0.05)	0.28 (0.09)
Uninformed	1.22 (0.19)	4.44 (0.44)	0.28 (0.11)	0.69 (0.18)

A total of 24 items were presented for each position type, including correct responses, the errors reported above, and errors that did not fall into the above categories. Debate 1 intrusions occurred when a subject recalled a position from the first debate. Blending responses were when a response had elements from both Debates 1 and 2. Standard errors of the means are presented in parentheses

In total, these results agree with those reported by Wahlheim and Jacoby (2013) in showing proactive interference when change was not recollected, but they differ in that proactive facilitation was not found when change was recollected. The failure to find proactive facilitation was likely due to the rather high false alarm rate in the change recollection measure. Wahlheim and Jacoby had used an indirect measure of change recollection that was not influenced by the false alarm rate, which may explain why they found proactive facilitation. False alarms are important because conditionalizing recall on change recollection shows evidence of a decrease in proactive interference. Finding a high false alarm rate indicates that change recollection judgments sometimes arose from guessing rather than from actual recollection of change. This means that conditionalizing the recall of changed positions on change recollection underestimates the true probability of correct recall. To anticipate, Experiment 3 will show that improving the accuracy of change recollection judgments can result in proactive facilitation.

Experiment 2

The news media, political opponents, and fact checkers often point out when candidates change positions or have a habit of doing so. Does warning voters about potential flip-flopping influence how they notice and remember changes in position?

In Experiment 2, we examined whether subjects would be able to recollect position changes if they were not prewarned that the politicians might flip-flop. Previous research has indicated that prewarning subjects can enhance recognition of repetitions in paired-associate learning (Asch, Rescorla, & Linder, as reported in Asch, 1969), reduce the effects of misleading information (Greene, Flynn, & Loftus, 1982; Loftus, 1992), and enhance the detection of contradictions (Butler, Zaromb, Lyle, & Roediger, 2009). However, prewarning instructions do not always work. In some situations, prewarning might have to occur directly before the potential misinformation (Greene et al., 1982), or be quite specific about the type of contradiction (Butler et al., 2009).

From a remindings perspective, noticing change requires subjects to be reminded of the first event when processing a second. Although such remindings often occur spontaneously (Benjamin & Tullis, 2010; Hintzman, 2011), other research has suggested that reminding episodes can be controlled by task demands (Jacoby, 1974; Jacoby & Wahlheim, 2013; Wahlheim, Maddox, & Jacoby, 2014). Thus, providing a general warning about flip-flopping may prime subjects to look for inconsistencies, which could increase both the quantity and quality of reminding episodes.

To examine this question, we told one group of subjects to look for change (simulating a voter who is looking for flip-flopping), whereas we did not tell another group to do so (simulating a voter who is not looking for flip-flopping). We expected that instructions to look for change would increase later change recollection, indicating that it had been detected more often. Presumably, subjects who were informed that change might occur would be more likely to think back to the Debate 1 positions when viewing the Debate 2 positions. We also expected that change recollection would eliminate proactive interference in recall, as in Experiment 1.

Method

Subjects

A group of 48 students from Washington University participated in exchange for partial course credit or $10. Again, the subjects were a liberal-leaning group, with a median political self-report of 39. Twenty-four of the subjects were randomly assigned to each instruction group and were tested in groups of one to three people.

Design, materials, and procedure

The design, materials, and procedure were the same as in Experiment 1, with the following exceptions. We manipulated the instructions to look for change in Debate 2 by providing the same instructions as in Experiment 1 to an “informed” group, and by removing reference to changed positions in the Debate 2 instructions for an “uninformed” group. We also partially counterbalanced incongruent positions for each candidate across experimental formats.

Results and discussion

Recall performance in both groups was a near perfect replication of Experiment 1, showing that instructions to look for change had no effect, $F(2, 92) = 0.18$, $p = .84$, $\eta_p^2 < .01$. Table 2 shows that recall was higher for repeated than for control positions, and higher for control than for changed positions, *t*s(47) ≥ 5.32, *p*s ≤ .001, *d*s ≥ 0.64. Table 3 shows that instructions to look for change did not influence discriminability in change recollection; no difference in *d′*s emerged between the informed and uninformed groups, $t(46) = 0.18$, $p = .86$, $d = 0.05$. Subjects in the informed group may have been marginally more likely to report change than those in the uninformed group, as measured by *c*, $t(46) = 1.83$, $p = .07$, $d = 0.05$, but given that bias for the uninformed group was nearly identical to the bias in Experiment 1 (in which subjects had been informed of change), it seems unlikely that the instructions affected the rate of reporting change. In short, the subjects in each group were similarly aware of changed positions, despite differences in instructions to look for them.

Importantly, recall conditionalized on change recollection also replicated Experiment 1 and did not interact with instructions, $F(2, 88) = 0.12$, $p = .89$, $\eta_p^2 < .01$. Figure 1 shows that no proactive interference occurred when change was recollected, whereas there was proactive interference when change was not recollected. Recall for changed positions when change was recollected did not differ from the recall for control positions, $t(46) = 1.68$, $p = .10$, $d = 0.26$, whereas recall was higher for control positions than for changed positions when change was not recollected, $t(46) = 9.67$, $p < .001$, $d = 1.87$. This pattern was identical for both the informed and uninformed groups.

Subjects committed errors in a fashion similar but not identical to that in Experiment 1, as can be seen in the middle rows of Table 4. Subjects committed more Debate 1 intrusions for the changed than for the control positions ($M = 5.56$ vs. 1.35), $F(1, 46) = 76.59$, $p < .001$, $\eta_p^2 = .63$. Instructions did not affect the Debate 1 intrusion rate, as either a main effect or an interaction, *F*s ≤ 0.48, *p*s ≥ .49, η_p^2s ≤ .10. Examining the changed positions (not presented in the table) revealed that fewer Debate 1 intrusions occurred when change was recollected than when it was not recollected (*M*s = 1.42 vs. 4.15), $F(1, 46) = 38.58$, $p < .001$, $\eta_p^2 = .46$, and that no effects of group emerged, *F*s ≤ 1.64, *p*s ≥ .21, η_p^2s ≤ .03.

Subjects made more blending errors for the changed positions than for the control positions (*M*s = 0.21 vs. 0.02), $F(1, 46) = 5.70$, $p = .021$, $\eta_p^2 = .11$, although this main effect was qualified by a significant interaction with group instructions, $F(1, 46) = 5.70$, $p = .02$, $\eta_p^2 = .11$, with the uninformed group committing fewer blending errors for control than for changed positions, whereas the informed group did not differ across position types. This may suggest that instructions to look for change reduced blending errors for the changed positions, although the overall low number of blending errors makes it difficult to tell. As in Experiment 1, change recollection did not influence the number of blending errors for the changed positions, $F(1, 46) = 0$, $p = 1$, $\eta_p^2 = 0$.

In sum, these results replicated the findings of Experiment 1, showing that recollecting change decreased proactive interference, and importantly, revealed that instructions to look for change did not influence recollection of change. Examining the types of errors made revealed that subjects often intruded Debate 1 responses, and rarely committed blending errors.

Experiment 3

Experiments 1 and 2 provided strong evidence that recollecting change enhanced memory for Debate 2 positions. However, telling subjects to look for change did not affect their ability to recollect it, a finding that was inconsistent with other work showing that varying instructions to look back can influence how often change recollection occurs (Jacoby & Wahlheim, 2013). One possibility is that the materials were so rich that subjects had difficulty detecting changes, even when they were encouraged to do so. In Experiment 3, we examined whether a stronger manipulation would increase change recollection. During Debate 2, one group was told to make explicit change detection judgments when they noticed a position had changed, whereas the other group was not told about the changed positions. We expected that requiring explicit change detection during the second debate would increase the accuracy of later change recollection. Requiring subjects to make a judgment, rather than just encouraging them to notice change, should increase the number of changed positions that were detected. As we described earlier, the discriminability of change recollection judgments is important for finding proactive facilitation, because correct change judgments due to guessing result in an underestimate of the probability of correct recall conditionalized on change recollection. Additionally, even though earlier work has shown that change recollection reflects earlier detection (Jacoby et al., 2013; Wahlheim & Jacoby, 2013), inclusion of the change detection measure also allowed us to verify that this was the case here, and to examine the combined effects of the detection and recollection of change on recall.

Finally, concerns about item-selection effects led us to implement a fully counterbalanced design. To do so, we eliminated the incongruent positions from the lists in Experiment 3; Every position was congruent with a politician's political party (e.g., the Democrat held only liberal positions). This change facilitated an analysis of item-selection effects, but it also made comparing results between the experiments illegitimate, because different lists were being used.

Method

Subjects

A total of 72 students from Washington University participated in exchange for partial course credit or $10. The subjects were largely liberal, with a median political self-report score of 24. Thirty-six of the subjects were randomly assigned to each group, and they were tested in groups of one to three people.

Design, materials, and procedure

The design, materials, and procedure were the same as in Experiment 2, with the following exceptions. During Debate 2, an "informed + detection" group was required to make explicit judgments when they noticed that a position had changed from Debate 1. After studying a position in Debate 2, boxes labeled "next" and "changed position" appeared, and subjects were told to click "next" when positions had not changed and "changed position" when positions had changed. This condition was compared to an uninformed group, in which subjects were not told about changed positions. Also, all positions in Experiment 3 were congruent with the candidates' party platforms (i.e., Democrat = all liberal positions; Republican = all conservative positions), which allowed for analyses of item effects.

Results and discussion

Unlike in Experiment 2, recall performance interacted with instructions, $F(2, 140) = 6.77$, $p = .002$, $\eta_p^2 = .09$. The bottom rows of Table 2 show that proactive interference was eliminated in the informed + detection group, whereas it remained in the uninformed group. Recall in the informed + detection group was higher for repeated than for control positions, $t(35) = 11.14$, $p < .001$, $d = 1.46$, but no difference emerged between control and changed positions, $t(35) = 0.41$, $p = .68$, $d = 0.06$. In contrast, the uninformed group replicated earlier results, showing that performance was higher for repeated positions than for controls, and higher for controls than for changed positions, ts(35) ≥ 4.20, ps < .001, ds ≥ 0.58. These results suggest that requiring change detection in Debate 2 enhanced change recollection and subsequently eliminated proactive interference in overall recall performance.

During Debate 2, the informed + detection group correctly detected changed positions ($M = .70$) more often than control positions were incorrectly indicated as changed ($M = .18$), $t(35) = 9.63$, $p < .001$, $d = 2.17$. Change recollection reflected earlier detection, as indicated by change recollection being substantially higher when change was earlier detected ($M = .68$) than when it was not ($M = .23$), $t(35) = 9.19$, $p < .001$, $d = 2.11$. The bottom two rows of Table 3 show that change recollection was more accurate when change detection was required. The informed + detection group had greater d' scores than the uninformed group, $t(70) = 2.17$, $p = .03$, $d = 0.52$, but no difference in c was apparent between the groups, $t(70) = 0.84$, $p = .40$, $d = 0.21$. This suggests that requiring change detection led to better discrimination of which positions had actually changed.

As is shown in Fig. 1, analyses of recall conditionalized on change recollection revealed an interaction with the manipulation of instructions, $F(2, 138) = 5.78$, $p = .004$, $\eta_p^2 = .08$. In the informed + detection group, comparisons with the control condition revealed proactive facilitation when change was recollected, versus proactive interference when change was not recollected, ts(35) ≥ 5.22, ps ≤ .001, ds ≥ 0.91. In the uninformed group, recall for changed positions was not different from the control condition when change was recollected, $t(34) = 0.21$, $p = .84$, $d = 0.03$, but proactive interference was found when change was not recollected, $t(35) = 5.31$, $p < .001$, $d = 0.99$. The difference in recall when change was recollected can be explained by the difference between the effects of instructions on the discriminability of change recollection judgments: The increased discriminability of change judgments in the informed + detection group increased the probability that a judgment of change would reflect recollection of change, providing a more accurate estimate of recall conditionalized on change recollection.

A critic might argue that the proactive facilitation in the informed + detection group is due to decreased recall of the control positions (as compared to the earlier experiments), rather than to a boost to the changed positions. However, as we stated earlier, comparisons across experiments are inappropriate because of the change in materials. Also, control position recall did not differ between the groups in the present experiment, further undermining the claim that abnormally low recall of the control positions in the informed + detection group was responsible for the proactive facilitation.

Figure 2 shows that for the informed + detection group, recall depended on both the detection and recollection of change, just as had been found by Wahlheim and Jacoby (2013). As compared to the control positions, proactive facilitation occurred when change was detected and recollected, whereas proactive interference occurred when change was not recollected, regardless of earlier detection, *t*s(35) ≥ 2.14, *p*s ≤ .04, *d*s ≥ 0.46. Also, we observed greater proactive interference when change was detected and not recollected than when it was neither detected nor recollected, $t(35) = 3.40$, $p = .002$, $d = 0.80$. The difference in proactive interference can be explained by the detection of change in Debate 2 involving retrieval of the Debate 1 position, resulting in increased accessibility of the competing position. When the increased accessibility of the Debate 1 position was not opposed by the recollection of change, the Debate 1 position was recalled more often than when change was not detected, resulting in greater proactive interference. In sum, these results suggest that whether the detection of contradictory positions has positive or negative effects on memory depends heavily on voters' ability to recollect the contradictions.

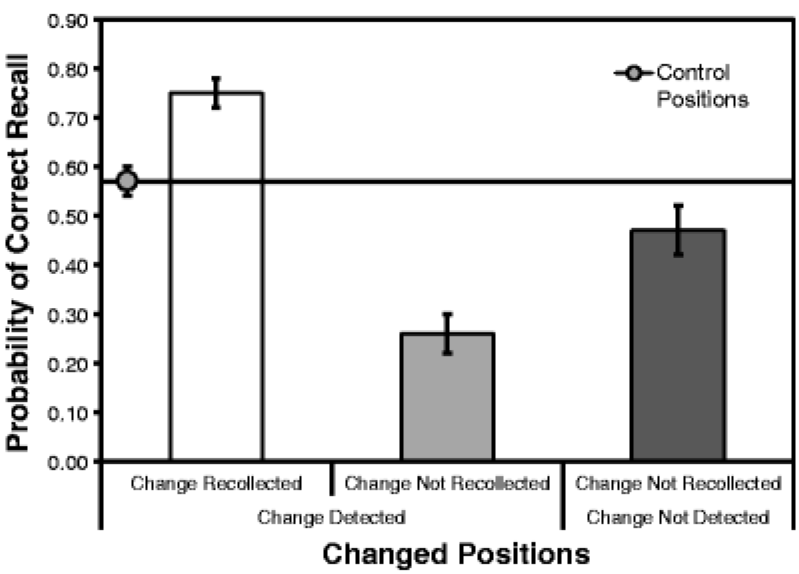

Fig. 2. Cued recall for changed positions, conditionalized on change detection and change recollection in the informed + detection group in Experiment 3. The black line across the figure indicates recall performance on control positions, with standard error. The observations included in each column are as follows: changes detected and recollected, 416; changes detected and not

recollected, 183; changes not detected or recollected, 206. Error bars represent standard errors of the means

As in Experiment 2, we examined how instructions and position types influenced the numbers of Debate 1 intrusions and blending errors. The bottom rows of Table 4 show that subjects committed more Debate 1 intrusions for the changed positions than for the control positions, $F(1, 70) = 75.74$, $p < .001$, $\eta_p^2 = .52$. However, instructions did not affect the Debate 1 intrusion rate, as either a main effect or an interaction, $F\text{s} \leq 0.45$, $p\text{s} \geq .22$, $\eta_p^2 \leq .02$. Examining the changed positions (not in the table) revealed that fewer Debate 1 intrusions occurred when change was recollected than when it was not recollected ($M\text{s} = 1.39$ vs. 2.96), $F(1, 70) = 25.69$, $p < .001$, $\eta_p^2 = .27$, with no effects of group, $F\text{s}(1, 70) \leq 0.50$, $p\text{s} \geq .72$, $\eta_p^2\text{s} \leq .002$.

For the blending errors, subjects committed more blending errors for the changed than for the control positions, $F(1, 70) = 5.66$, $p = .02$, $\eta_p^2 = .08$, and the uninformed group committed more blending errors than the informed + detection group ($M\text{s} = 0.49$ vs. 0.20), $F(1, 70) = 6.75$, $p = .011$, $\eta_p^2 = .09$. The interaction was not significant, $F(1, 70) = 1.04$, $p = .31$, $\eta_p^2 = .02$. Recollection of change did not affect the blending error rate for the changed positions $F(1, 70) = 0.03$, $p = .87$, $\eta_p^2 = 0$. Together, these results show that subjects were more likely to commit Debate 1 intrusions and blending errors for the changed than for the control positions (and that recollecting change prevented Debate 1 intrusions for the changed positions), and that the addition of the change detection task reduced the number of blending errors, but not the Debate 1 intrusions.

One limitation of reliance on conditional analyses for evidence of effects of change detection and change recollection is the possibility of item selection effects and differences in the general memory ability of the subjects. To circumvent this limitation, we used hierarchical multiple regression to examine the contribution of change recollection to recall of changed positions, while controlling for item effects and general memory ability in Experiment 3 (see the Appendix for an additional mixed-effect analysis that includes both item effects and general memory abilities in the same model). We predicted that recollecting change would lead to increased recall for the changed positions, as was expected from earlier results (see Fig. 1). Both models included as predictor variables: recall of control positions on the first step, change recollection as measured by d' on the second step, and the interaction of control position recall and d' on the third step. The outcome variable was recall of changed positions. In other words, the first step captured item effects or general memory ability, and the second step captured discrimination in change recollection. Using d' (with responding "changed" to changed positions treated as hits and responding "changed" to control positions treated as false alarms) rather than the change recollection rate for the changed positions captured the level of change recollection while correcting for any erroneous change recollection due to subjects' guessing.

At the item level, estimates for each measure were computed for each of the 144 items. The left column of Table 5 shows that item differences explained a significant proportion of variance, but prediction was improved by including the discriminability of change recollection when controlling for item differences. The interaction did not improve prediction. Examining the two groups of subjects separately revealed that change recollection explained unique variance in recall of the changed positions for the informed + detection group ($\Delta R^2 = .12$, $p < .001$), but not for the uninformed group ($\Delta R^2 = .02$, $p = .10$). The failure for additional variance to be explained by change recollection in the uninformed group is likely due to a higher false alarm rate in the change recollection measure.

Table 5. Proportions of variance in recall of changed positions explained by item differences, general memory ability, and change recollection: Experiment 3

	Unit of Analysis	
	Items	**Subjects**
Step 1		
Item differences / General memory	.30*	.33*
Step 2		
Change recollection (*d′*)	.06*	.16*
Step 3		
Interaction	.01	.01

The values displayed above are ΔR^2s on each step of the model, computed at the item level collapsed across subjects (left), and at the subject level collapsed across items (right). "Item differences" refers to item differences in control position recall performance; "General memory" refers to individual differences in control position recall performance; and "Change recollection (*d′*)" refers to individual differences in the discriminability of change recollection for changed positions. * $p \leq .001$

At the subject level, estimates for each measure were computed for each of the 72 subjects. The right column of Table 5 shows that general memory differences explained a significant proportion of variance, but prediction was improved by including the discriminability of change recollection. The interaction did not improve prediction. Change recollection accounted for more unique variance in the informed + detection group ($\Delta R^2 = .15$, $p = .004$) than in the uninformed group ($\Delta R^2 = .11$, $p = .01$). Together, these results show that the memory benefits presumably due to change recollection cannot be solely explained by item and subject differences.

Both the hierarchical regressions and the linear mixed model reported in the Appendix indicate that change recollection enhanced recall for the changed positions above and beyond any item or subject differences. However, change recollection appeared to explain a smaller proportion of variance in recall of changed items here than in previous research (Jacoby et al., 2013). This was likely due to the poorer discrimination of change recollection judgments in the present experiments, meaning that change recollection would have less of an effect on overall recall. The more complex materials likely made it more difficult to assess when an item had actually changed. Although the complex materials may show a smaller effect of change recollection on recall, noticing change when none has actually occurred is in itself an interesting phenomenon.

General discussion

The results from the present experiments showed that the detection and recollection of change enhanced memory for flip-flopped positions on controversial political issues. Telling subjects to look for change in Debate 2 did not influence change recollection, but requiring explicit change detection improved the accuracy of change recollection. Across experiments, recollecting change either eliminated proactive interference or produced proactive facilitation, whereas proactive interference occurred when change was not recollected. Memory for changed positions was enhanced as compared to control positions when change recollection was made more accurate by explicit attempts to detect change during Debate 2 (Exp. 3). Furthermore, examining the types of errors made revealed that subjects were more likely to intrude a Debate 1 response than to commit a blending error for the changed positions, and that recollecting change reduced the number of Debate 1 intrusions.

The present findings demonstrate that the detection and recollection of change are both necessary for remembering contradictory political positions. Past research has shown that detecting contradictions can enhance memory in a variety of situations (e.g., Bottoms, Eslick, & Marsh, 2010; Butler et al., 2009; Otero & Kintsch, 1992; Umanath & Marsh, 2012), whereas other research has shown that detecting contradictions can harm memory (e.g., Umanath, Butler, & Marsh, 2012). The present results suggest that whether detecting contradictions produces a positive or a negative effect depends on whether those contradictions are recollected at test.

The present research is a first step toward understanding the memorial consequences of political flip-flopping. Our results replicate and generalize the findings of Wahlheim and Jacoby (2013) by demonstrating the effects of detection and recollection of change using materials other than word pairs. The materials employed in the present study could be used to answer many questions about how people remember political information, informing theories of both memory and politics.

From a memory perspective, using more complex materials shines new light on how background knowledge affects memory. As we showed above, individual differences in memory ability play a role in the detection and recollection of change. Perhaps individual differences reflect differing amounts of political expertise. A politically savvy subject will understand that civil unions and marriage are distinctly separate positions, whereas a less savvy subject may not. Consequently, the less-informed subject may not notice the change and be unable to recollect it later, and thus may have impoverished recall of that position.

As well, switching to a retroactive interference design with the political materials opens a new arena in which to explore misinformation-style effects. For example, blatant misinformation is not only ineffective, but actually causes subjects to notice other misinformation that would have gone unnoticed (Loftus, 1979). A parallel question in politics is whether a blatant flip-flop by a candidate highlights other smaller changes in position that may have gone unnoticed. Current work in our lab is beginning to explore misinformation effects with political materials and change recollection measures.

From a political perspective, understanding how voters remember political contradictions could provide new insights into voting behavior. Political scientists have long debated whether voters think back to campaign events when they step into the voting booth, or whether they continually update their perceptions of candidates throughout the election season (Lodge, Steenbergen, & Brau, 1995; Redlawsk, 2001). Even if participants do not explicitly think about earlier detected contradictions, having detected such contradictions could have automatic influences on impression formation, and thus influence voting behavior.

Moving forward, the ultimate goal with this line of research would be to simulate real-world phenomena as closely as possible while still having experimental control. During campaigns, politicians make hundreds of public appearances, creating many opportunities to contradict themselves. As well, the news media sometimes misrepresents candidates or accuses them of flip-flopping, whether they have done so or not. Media interactions also raise other questions, such as how voters process and reconcile information from multiple sources and whether candidates should openly acknowledge change or insist that they have believed the same thing all along.

Finally, it is unclear how voters will actually react to a candidate changing positions. Traditionally, flip-flopping accusations are intended to imply that a candidate is willing to say anything to earn votes, may not fulfill campaign promises, or generally lacks conviction (Safire, 1988). Social psychologists (e.g., Cialdini, 1993) have suggested that people value commitment and consistency, and typically frown upon broken commitments. From this view, it is not surprising that flip-flopping accusations are still a common political strategy. An alternative view, however, is that changing a position to make a platform more electable is fine, as long as the candidate is open about the change (e.g., Geraghty, 2008). This raises the question of whether candidates can flip-flop in a way that actually endears them to voters. Providing a reason for a change in position, such as a recent terrorist attack or a family member coming out as gay, may suggest that the candidate is thoughtfully changing his or her mind, rather than pandering for votes.

Did Mitt Romney's flip-flopping hurt his chances in the 2012 election? Perhaps. Without more focused research examining how voters remember and notice flip-flopping, it is impossible to tell. Flip-flopping in the political arena represents a complex interaction between memory, change detection, change recollection, attitude formation, and voting behavior. These experiments are a first step in exploring this rich environment that may influence both theories of memory and American politics.

Notes

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Appendix

To supplement the hierarchical regression from Experiment 3, we also conducted a linear mixed-effect analysis that allowed us to examine the effects of change recollection while including both subjects and items in the same model (Bates, Maechler, Bolker, & Walker, 2014; R Development Core Team, 2013). The models were treated as binomial logistic regressions (thus, all values are logits), and *p* values for random effects were calculated by using the likelihood ratio test comparing the full model against a model without the effect in question.

We started with a simple model and added factors that improved the fit of the model. Our final model included position type (control vs. changed), change recollection, and their interaction as fixed effects, and included random intercepts for subjects and items as the random effects. We did explore more complex models, such as allowing slopes to vary across items for subjects, or including the interaction between subjects and items as a random intercept, but those models either failed to converge (the first case) or did not warrant including the random effects (the second case). As well, we explored a model that included instructional group as a predictor, but the improvement in model fit was relatively small given the increase in degrees of freedom. Thus, in interest of parsimony our final model is presented in Table 6.

Table 6. Final model in our linear mixed-effect analysis from Experiment 3

	Estimate (*b*)	***SE b***	***z***	***p***	**95 % CI**
Fixed Effects					
Intercept	0.43	0.13	3.41	.001*	[0.18, 0.67]
Item Type	–0.97	0.10	–9.32	.001*	[–1.17, –0.76]
Change Recollection	0.22	0.15	1.46	.145	[–0.07, 0.51]
Item Type × Change Recollection	1.07	0.19	5.77	.001*	[0.71, 1.44]
	SD	χ^2	*df*	*p*	95 % CI
Random Effects					
Subjects	0.68	163	1	.001*	[0.55, 0.84]
Statements	0.89	260	1	.001*	[0.76, 1.05]

All displayed values are logits, as is customary with binary logistic regression. Only control and changed positions were included in this analysis. For item type, the control positions were treated as the reference group; for change recollection, a failure to recollect change was treated as the reference group

As can be seen, there was significant variance across intercepts for both subjects and items, indicating that model fit was improved if it was assumed that some items were easier or more difficult than others to recall, and that some subjects had better recall than others. Examining the fixed effects (top panel) shows that control positions were recalled better than changed positions, but that change recollection by itself did not improve recall; however, the interaction between change recollection and item type was significant, fitting with our hypothesis that change recollection should enhance recall for the changed positions but not for the control positions.

To investigate the interaction, we created two additional models, one for control positions and one for changed positions, but with the same predictors as the full model (change recollection as a fixed effect; subjects and items as random effects). For the control positions, we found significant variance for both random effects, χ^2s(1) > 105, *p*s < .001, but critically, change recollection did not have a significant effect, *b* = 0.13, *SE* = 0.17, *z* = 0.79, *p* = .427, 95 % CI [–0.21, 0.48]. For the changed position, we also found significant variance for the random effects, χ^2s(1) > 19, *p*s < .001, and critically, a significant effect of change recollection, *b* =

1.42, *SE* = 0.12, *z* = 11.74, p < .001, 95 % CI [1.18, 1.67]. Thus, change recollection improved recall for the changed positions, but not for the control positions.

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