

# On-line *and* Memory-based: Revisiting the Relationship Between Candidate Evaluation Processing Models

Young Mie Kim · Kelly Garrett

© Springer Science+Business Media, LLC 2011

**Abstract** Reexamining the relationship between the on-line and memory-based information processing models, this study presents a theoretical basis for the co-occurrence of on-line and memory-based processes and proposes a hybrid model. The study empirically tests the hybrid model by employing real-time tracking of participants' reactions to two candidates in a US presidential primary election debate. The findings confirm an independent, but complementary relationship between on-line and memory-based information processing in an individual's candidate evaluation and vote choice. The co-occurrence of the two modes applies to an individual's comparison of candidates as well. The implications of the hybrid model for the functioning of democracy are discussed.

**Keywords** Hybrid model · On-line information processing · Memory-based information processing · Candidate evaluation · Vote choice · Presidential election debate

Scholarly perspectives on information processing are diverse, but two contrasting models are most prominent in political psychology: the memory-based and on-line processing models. The memory-based model asserts that individuals form their opinions at the time of judgment, retrieving relevant information from long-term memory (Kelley and Mirer 1974; Zaller 1992; Zaller and Feldman 1992).

---

Y. M. Kim (✉)  
University of Wisconsin-Madison, 5115 Vilas Hall, 821 University Avenue, Madison,  
WI 53706, USA  
e-mail: ymkim5@wisc.edu

K. Garrett  
Ohio State University, 3016 Derby Hall, 154 N. Oval Mall, Columbus, USA  
e-mail: garrett.258@osu.edu

The on-line model, in contrast, posits that individuals' attitudes are formed in real time, at the moment of information exposure by updating an affective integrator (i.e., on-line tally) as new information is encountered (Hastie and Park 1986; Lodge et al. 1989; McGraw et al. 1990). Scholars frequently argue that the two information processes are mutually exclusive (e.g., Lodge et al. 1989; Lavine 2002). When it comes to using information for political judgment, citizens rely *either* on their impression of a candidate at the time of information exposure *or* on the recollection of their memories of the candidate at the time of judgment, but not both.

Recently, however, scholars have begun to raise questions about the dichotomy, proposing that on-line and memory-based processes may operate in concert, jointly shaping evaluative judgments (Redlawsk 2001; McGraw et al. 2003; Lau and Redlawsk 2006). We agree with this assessment and propose a hybrid model where on-line and memory-based information processes work together. Viewing individuals as "flexible processors" (see Uleman et al. 1996), we seek to extend the theoretical basis for a hybrid model and empirically test this proposition by assessing how time-of-exposure impressions (the on-line model) and time-of-judgment memories (the memory-based model) simultaneously influence judgment in the context of real political debate. At a methodological level, we strive to enhance the validity of the research, which has been a long-standing concern for researchers in this area (e.g., Lodge et al. 1989). We conduct the study in the context of a dynamic and complex information environment by tracking reactions to a real presidential primary election debate between actual candidates. We also adopt more realistic decision-making tasks when exploring the impact of information on decision-making. Most importantly, we utilize real-time measures of the on-line tally, which is more consistent with the theoretical assumptions of the on-line processing model than measures taken at the time of assessment. This study seeks to advance our understanding of how citizens use information in political judgment.

## Processing Political Information: Memory-based and On-line Models

Memory-based and on-line processing models are typically conceived of as competing explanations of political judgment. According to the memory-based information processing model, individuals only construct opinions when a political decision is required (e.g., when voting). In this moment, individuals shift relevant information from long-term to working memory, and then compute a judgment based on what they recall (Kelley and Mirer 1974; Zaller 1992; Zaller and Feldman 1992). The on-line information processing model, in contrast, proposes that individuals' attitudes are the product of a series of evaluative impressions formed at the time of information exposure. Individuals incorporate the evaluative implications of novel information by routinely updating an affective integrator (i.e., an on-line tally) whenever new information is encountered. When they need to make a judgment, they simply retrieve this on-line tally (Lodge et al. 1989, 1995; McGraw et al. 1990, 2003).<sup>1</sup>

---

<sup>1</sup> From the normative perspective, the implications of each model for citizen competence and democracy are quite different. According to the memory-based model, political knowledge is the assumed standard

Mixed empirical findings have helped to sustain the debate, with evidence supporting both the memory-based and the on-line information processing models. In order to explain these otherwise contradictory results, the literature has evolved to specify conditions under which each model works.<sup>2</sup> Still, scholarly disagreement remains and both models have been roundly criticized.

## Critiques of Prior Research

### The Need for a Hybrid Model

The theoretical and methodological limitations of prior research raise several important questions about the two processing models. McGraw (2003) concludes, “there is good reason to suspect that a hybrid approach, incorporating both *time-of-exposure* and *time-of-judgment* information effects on evaluative judgments may provide a more psychologically realistic model” (p. 408). Lau and Redlawsk (2006) reach a similar conclusion, observing that “the pure on-line model underspecifies evaluation when it is embedded into an election environment that requires a choice between candidates” and suggesting instead that “often both the on-line evaluation and memory matter” (pp. 181, 183). Kim et al. (2010)’s model also integrates two modes into a theoretical framework, synthesizing cognitive and affective structures of information processing. Just et al. (1996)’s in-depth interviews empirically demonstrate that individuals make inferences about candidates as they encounter new information, but they also recall the evaluative inferences based on memory when they need to make an overall judgment.

Despite growing interest and obvious appeal, however, the theoretical basis for the hybrid approach remains underspecified. Few theoretical details have been offered in political psychology, but recent discussion of dual process models in social psychology may afford us a deeper understanding of the hybrid approach (for an overview of dual-processing models, see Chaiken and Trope 1999). The key insight offered by these models is that individuals often rely on multiple processes simultaneously in order to achieve a cognitive goal. Rather than assuming that human beings are either “cognitive misers,” always engaging in effortless and

---

Footnote 1 continued

for opinion quality. American’s consistently low levels of political knowledge (e.g., Delli Carpini and Keeter 1996) therefore implies that citizens fail to live up to this democratic standard. In contrast, the on-line information processing model suggests that political knowledge is not necessarily an appropriate measure on which to judge the soundness of democracy. What really matters for competent political decision making is not recollection of detailed political information *per se*, but individuals’ evaluative responses to information. By updating an affective integrator at the time of exposure and retrieve their updated global attitudes, citizens can still be “responsive voters” (Lodge et al. 1989) despite limited recall for political facts.

<sup>2</sup> Factors that have been shown to moderate these effects include information processing goals (e.g., Hastie and Park 1986; Lodge et al. 1989), political sophistication (e.g., McGraw et al. 1990), situational complexity (e.g., Rahn, Aldrich et al. 1994), the type of media in which information is presented (Redlawsk 2001; Kim and Vishak 2008), and individual differences (e.g., McConnell and Leibold 2001; Tormala and Petty 2002).

chronic processing (e.g., Fiske and Taylor 1984), or “naïve scientists,” always practicing careful piecemeal processing (e.g., Kelly 1972), dual process theories assume that human beings are “flexible processors” (Uleman et al. 1996) who are capable of choosing (consciously or unconsciously) different combinations of the different modes of information processing. Individuals engage in information processing spontaneously *and* purposefully, effortlessly *and* conscientiously. “The flexibility itself is fundamental” (Uleman et al. 1996, p 270).

More recent discussions of dual process models delineate the predictable ways in which multiple modes of information processing work together (e.g., Chaiken et al. 1989; Sloman 1996; Chen and Chaiken 1999; Smith and DeCoster 1999; Epstein and Pacini 1999; Hamilton et al. 1999). According to this “co-occurrence” argument, people do not alternate between different modes of processing, but use them simultaneously. The two modes have distinct and independent influences on decision-making. Situational, cognitive, and motivational factors may render one mode more or less influential, but a judgment outcome must integrate *both*.

Analogous to the “co-occurrence” dual processing approach developed in social psychology (Chen and Chaiken 1999; Smith and DeCoster 1999; Hamilton et al. 1999), we believe that on-line and memory-based processes operate *simultaneously* rather than alternately. When individuals encounter new political information, they engage in real-time, on-line processing via relatively effortless updates to an amalgam of impressions (i.e., an affective integrator). On-line information processing, which is a relatively spontaneous inference based on a schematically accessible affective integrator, *continues* to exert independent influences in real-time, *not* ceasing before the memory-based processing begins or is completed.<sup>3</sup> At the time of judgment, however, when individuals need to express their conclusive attitudes, they retrieve the judgment relevant memory and engage in memory-based processing. One advantage of this approach is that memory-based processing, which is the more computationally and analytically complex process of the two, can be used to confirm or revise evaluative responses. Thus, the judgmental outcome or global evaluation is an integration of both on-line and memory-based processes.

The simultaneous operation of the on-line and memory-based processes in decision-making also implies that the co-occurrence of the two modes can produce seemingly contradictory patterns of influence during integration. They can produce consistent and additive effects, but they can also lead to conflicting beliefs, which

<sup>3</sup> In this sense, our hybrid model assumes the simultaneous (but independent) influences of the two modes, rather than sequential influences. This view diverges from other dual-process models, such as Gilbert (1989)’s correspondent/attributional inferences model or Lodge et al. (2006)’s dual process model of public opinion. For instance, Lodge et al. (2006) argue that affective, effortless responses enter into the decision stream *earlier* than cognitive association, thus, affective components cascade across subsequent high-order processes. Similarly, some co-occurrence dual process models suggest that effortless and effortful processes co-operate initially but because the effortless process finishes faster, only the more effortful process exerts influences in the end (see Smith and Decoster 1999). However, recent evidence in social psychology (e.g., Chen and Chaiken 1999; Epstein and Pacini 1999; Hamilton et al. 1999) lend more weight to simultaneous co-occurrence than to sequential occurrence. The on-line and memory-based models cannot occur contemporaneously by definition, but we assume they co-operate in parallel exerting independent influences simultaneously. A judgment outcome (e.g., global evaluation) is therefore an outcome of both of the two modes.

then must be resolved and integrated into a judgment outcome. If the evaluative implications of the two processes are consistent then both modes of information processing should have a significant influence, but the effect of on-line processing will be larger than that of memory-based processing. This is because on-line processing, an effortless, spontaneous updates of an amalgam of evaluative responses and memories, exerts an influence on the integration process more easily than effortful and deliberate memory-based processing.<sup>4</sup> However, when the evaluative implications of the two modes conflict, individuals have additional incentives to systematically and analytically engage in processing in order to revise (or reinforce) the evaluative implications, enlarging the relative influence of the effortful and deliberate memory-based process in the integration. Although situational, cognitive, and motivational factors can render one mode more influential than the other (Chen and Chaiken 1999), our assertion is that regardless of the patterns of influences, both on-line and memory-based information processes co-occur, exert simultaneous influences, and work in complementary ways.<sup>5</sup>

### Unrealistic Political Environment, Unrealistic Decision-Making

A second source of criticism of prior research concerns the validity of empirical research settings. Critics assert that the experimental tasks adopted in earlier studies were too simple and did not realistically represent how individuals process political information in the real world (Rahn, Krosnick et al. 1994). Regardless of the amount of information presented in these studies, the structure of information is “*person-centered*”, that is, each candidate is fully described before turning to the next. This format might lead individuals to form impressions of a candidate, inadvertently favoring the on-line model (Rahn, Krosnick et al. 1994; Redlawsk 2001).

The “*person-centered*” structure used in most experimental settings is in stark contrast to the real world, in which most public discourse surrounding political

<sup>4</sup> Some co-occurrence dual process models in social psychology explain how the effect of an effortless, spontaneous, automatic process overpowers that of an effortful, deliberate, process when the evaluative implications of the two processes are consistent. Chaiken and colleagues (Chaiken and Maheswaran 1994; Chen et al. 1996) note that the judgment implications of an effortless process may establish expectancies and bias the implications of an effortful process (termed a bias effect). Such an effect is more likely to be observed when information is ambiguous but perceived consistent. Similarly Zajonc (1980, 2000) argues that the effect of an affective, automatic process cascades across that of systematic, deliberate process (termed primacy effect).

<sup>5</sup> In contrast to our hybrid approach, prior scholarship has tended to assume that on-line and memory-based processes occur under unique, mutually exclusive circumstances. For instance, Lau and Redlawsk (2006) argue that the importance of the issue about which a decision is being made determines how much influence memory-based rationality has. They also suggest that memory-based processes are engaged when information about the evaluative targets being compared is delivered over extended periods of time. For instance, in order for voters to compare information about two candidates that was learned at different times, they must rely on memory. Lavine’s hybrid model (2002) suggests that piecemeal (or memory-based) processing only occurs when individuals are exposed to new information. McGraw (2003) argues that uncertainty and ambiguity are the keys to the utilization of memory-based processing. These assertions that individuals alternate between on-line and memory-based processes according to situational or motivational factors are fundamentally distinct from our claim that the two modes of processing occur simultaneously and exert independent influences, but produce complementary effects.

campaigns has a “*dimension-centered*” structure, shifting rapidly among candidates’ profiles, issue positions, and pundits’ interpretations. Political news is a typical example of dimension-centered information, where political parties, policies, leaders, and candidates are often compared based on multiple dimensions.<sup>6</sup> Election campaigns have also recently adopted a more dimension-centered format, as evidenced by increases in contrast advertising and advocacy group campaigns (An et al. 2006). Presidential debates provide another well known example of dimension-centered information presentation. In a presidential debate candidates take turns sharing their views on a common set of issues. In such information environments, citizens might engage in memory-based information processing by “comparing” different arguments presented in the information stimuli (Rahn, Krosnick et al. 1994; Redlawsk 2001).

A more realistic decision-making situation might also influence individuals’ information processing differently. Most prior studies have focused on the *evaluation* of a single candidate rather than on a *vote choice* between multiple candidates. In the real world, however, ultimately citizens need to make a choice, not just form evaluations of the various candidates. Lau and Redlawsk (Lau and Redlawsk 2001; Redlawsk 2001; Lau and Redlawsk 2006) argue that in a dynamic political environment, where multiple candidates compete with each other, voters are more inclined to “learn” information about the various candidates, and then to “compare” them side-by-side. For this reason, these scholars have argued that the unrealistic decision-making tasks used in previous research, such as forming an evaluation of a single candidate, have inadvertently made subjects more likely to engage in on-line information processing. More dynamic decision-making tasks might require different information processing strategies.

We seek to address these concerns in this study. First, we utilize a dimension-centered political information structure, conducting the research during a Democratic presidential primary election debate held in 2008 and examining how on-line and memory-based processes jointly influence political decision-making. Second, we asked participants both to form evaluations of the two candidates, but also to make an explicit vote choice after viewing the debate, resembling citizens’ voting decision in the real world.

### Limitations of Information Processing Measures

The most serious methodological issue in prior research concerns measurement of the on-line and memory-based tallies. In previous studies, a memory tally has typically been measured at the time of judgment (usually after an overall candidate

---

<sup>6</sup> The routine use of a dimension-centered structure in news is due in part to objectivity norms and journalistic professionalism, which strongly promote two-sided reporting of controversies (Gans 1979; Schudson 1978, 1998). Conflict-oriented, two-sided, dimension-centered stories also tend to have a higher news value as they are expected to draw more attention from the audiences (Bennett 1996; Hallin 1992). Election campaigns have also recently adopted a more dimension-centered format, as evidenced by increases in contrast advertising and advocacy group campaigns (An et al. 2006).

evaluation) by asking individuals to recall all relevant information and rate each recalled item as a positive, neutral, or negative trait. Surprisingly, an on-line tally also has been measured using a series of evaluative questions about candidate traits generated *after* an overall candidate evaluation, that is, at the time of judgment (not at the time of exposure). This is a problematic strategy that directly contradicts the theory on which the on-line model is based.

As Lau and Redlawsk (e.g., Lau 1995; Lau and Redlawsk 2001; Redlawsk 2001) have underscored, information processing measures must capture the “process”. Given that the fundamental distinction between on-line and memory-based processes lies in the temporal parameter of when an individual’s opinion is formed (Hastie and Pennington 1989), the on-line tally must be measured as information is encountered and integrated into evaluation. The memory tally, on the other hand, must be measured after the information stimulus is *over*, as the individual conducts a retrospective memory search. Furthermore, the on-line tally must take into account individuals’ initial opinions and subsequent updates, while the memory tally is based on an aggregation of what individuals can recall.

Although the groundbreaking “process-tracing method”, in which candidate ratings are generated based on real-time information exposure (Lau 1995; Lau and Redlawsk 2001; Redlawsk 2001), is more consistent with the theoretical underpinnings of the on-line model, it is still limited by its reliance on *implicit* attitude updates.<sup>7</sup> Although actual information exposure was tracked, real-time attitudes based on exposure to new information was not directly assessed (for details, see Redlawsk 2001). The process-tracing approach largely ignores the influence that non-issue-related matters, such as personal background, have on candidate evaluations. Furthermore, it is limited by the assumptions that participants attended equally to all information that they encounter and that time-of-exposure impressions are necessarily consistent with global issue positions, assumptions that may prove to be inaccurate in some situations.

To address these longstanding measurement issues, this study utilizes a novel means of measuring the on-line tally. We collect real-time measures of overall candidate impressions based on the information to which individuals have just been exposed for every topic addressed during a debate. Our measure of impressions at the time of exposure is less ambiguous than the process-trace method (Lau and Redlawsk 2001; Redlawsk 2001; Lau 1995) because it directly measures the impact of new information, and does not assume that participants continuously attend to new information or that their time-of-exposure impressions always line up with their issue positions (for details of tally measures, see “[Method](#)” section).

---

<sup>7</sup> In these studies, the experimenters first measured participants’ attitudes toward a variety of social issues and political groups, and then compared those attitudes to the positions attributed to the candidates and the endorsements that the candidates’ received over the course of the experiment. If the participant was exposed to candidate positions that were consistent with their own, the researchers made the reasonable assumption that the participant would adjust the on-line tally for the candidate upward. If the candidate’s positions were inconsistent with the participant’s, then the on-line tally is assumed to move downward.

## Reassessing Information Processing Models with an Innovative Approach

Taking into account the major critiques of prior research, the present study employs a novel approach theoretically and methodologically. At a theoretical level, this study builds on the co-occurrence of on-line *and* memory-based information processing in political decision-making. Specifically, it extends the hybrid approach by underscoring the independent but complementary influences of the two simultaneous processes. At a methodological level, the study empirically investigates whether and how the hybrid model occurs in more realistic contexts by employing a real US presidential primary election debate as an information stimulus and by adopting more realistic decision-making tasks (both overall candidate evaluations and vote choice). Furthermore, the present study takes an innovative measurement technique, in particular, in measuring the on-line tally. In this section, we outline a series of hypotheses that we will test.

### Do Memory-based and On-line Processing Models Operate Simultaneously?

First, the present study examines whether memory-based and on-line modes of information processing operate simultaneously, not alternately. Based on the hybrid model explicated previously, we expect that in a conventional debate setting, *both* memory-based and on-line tallies will exert significant influences on political judgment (*H1*).

We also examine *how* the hybrid model works, that is, how two modes—one based on time of exposure (on-line) and the other on time of judgment (memory-based)—co-occur. The relative impacts of on-line and memory-based tallies on political judgments are examined both in terms of candidate evaluation and vote choice. The literature leads us to generate a set of competing hypotheses. If the co-occurrence of the two-modes produces consistent and additive effects then the on-line process will easily dominate during the integration of evaluative implications, and it will have a stronger impact on candidate evaluations than the memory tally (*H2a*). A comparable pattern should exist when comparing multiple candidates and making a choice, meaning that the on-line tally will have a stronger impact on vote choice than the memory tally (*H2b*).

Other scholars, however, have suggested that when individuals have to consider multiple candidates, rather than form an attitude toward a single candidate in the absence of competitors, memory-based information processing should be a stronger predictor than on-line information processing (Rahn, Krosnick et al. 1994; Lau and Redlawsk 2001; Redlawsk 2001). If this is correct, then the memory tally will have a bigger effect on single-candidate evaluations than the on-line tally in the context of the debate, where multiple evaluations for multiple candidates are involved (*H2c*). And since choosing one preferred candidate out of several is more complex (and presumably likely to produce conflicting beliefs) than evaluating a single candidate (e.g., Redlawsk 2001) the memory tally will have a stronger impact on a vote choice than the on-line tally (*H2d*).



## Do On-line and Memory Processes Co-occur When Voters Make Comparisons?

The present study also examines whether individuals compare candidates when forming their political judgments. Rahn and colleagues (Rahn, Krosnick et al. 1994) argue that when individuals are exposed to dimension-centered information, such as a debate, they make direct comparisons across the candidates, reflecting the way in which the information is structured. Lau and Redlawsk (Redlawsk 2001; Lau and Redlawsk 2006) suggest that individuals' tend to rely on memory-based information processing when they make issue-by-issue comparisons between multiple candidates. Based on these claims, we expect that a comparison of memory tallies will influence comparative candidate evaluations (*H3a*). Lau and Redlawsk extend this line of reasoning to vote choice (Redlawsk 2001; Lau and Redlawsk 2006) by arguing that the ultimate goal of decision making is not to learn about each candidate separately, but to learn "comparable" information about multiple candidates. Lau and Redlawsk go on to assert that searching for comparable information requires effortful retrieval of long-term memory (i.e., memory-based information processing). This suggests that a comparison of memory tallies will also influence vote choice (*H3b*). We note, however, that Lodge and colleagues (1995) disagree with these predictions. According to these authors, candidate evaluations are impression-driven and independent of one another. No direct comparison should be made when forming candidate evaluations or vote choice (the nulls of hypotheses *H3a* and *H3b*). Comparisons could also shape judgments formed through on-line information processing. Hastie and Park (1986) underscore that on-line processing is, by nature, a spontaneous inference based on comparisons of two (or more) objects. An on-line judgment is a snap judgment that involves a prototypical "anchoring and adjustment" with reference to another. For instance, individuals make spontaneous inferences about a person by comparing that individual to others they have encountered in everyday life. If Hastie and Park are correct, comparisons between multiple candidates should be relatively effortless because individuals will default to on-line information processing, just as they do in other situations. This suggests that the on-line tally will have significant influences on both candidate evaluation (*H3c*) and vote choice (*H3d*). Taken altogether, it is reasonable to argue that *both* on-line and memory-based processes should co-occur even when comparisons are made in candidate evaluation and in vote choice.

## Method

### Overview

The study was conducted during the February 2008 Democratic Party primary debate held in Ohio between Senators Hillary Clinton and Barack Obama. Data collection was conducted online and occurred in real time. Using an Internet connection and a web browser, participants evaluated the two candidates before and after the debate, reported their impressions of the candidates at regular intervals *during the debate*—a uniquely accurate measure of the on-line process—and listed

what they remembered about the candidates after the debate. Because data were collected online, participants could watch the debate in a natural social setting, providing a more realistic picture of how individuals assess candidates in everyday life.<sup>8</sup>

### Sampling Procedure and Participants

The research team employed three strategies to attract participants for this study: we recruited undergraduate students from an introductory communication course at a large Ohio university; we placed an advertisement in an email newsletter distributed to faculty and staff at the university for 3 days prior to the debate; and we sent a recruitment message to the email list of an Ohio-based grassroots organization not affiliated with the university. As incentives, students were offered extra credit and non-students were offered a small gift certificate to an online merchant.

A total of 280 individuals participated in the study, most of whom were affiliated with the university.<sup>9</sup> The racial composition of the sample resembles that of the US—most participants are white (75%), with notable African American (12%), Asian American (6%), and other minorities (7%)—and the sample is split about evenly between men and women (54% female). However, the sample is less representative in terms of age, education, and political identity. Approximately two-thirds (65%) of participants were between 18 and 29 years, and most (29%) of the remaining third were between the ages of 30 and 49. The remaining 6% were between 50 and 70 years of age. Educational attainment also varied across the sample. A slight majority (53%) had completed some college, but another one in five (20%) held an undergraduate degree, and almost one in four held an MA or PhD (23%). Only one in twenty-five (4%) held less than a college degree. In terms of politics, participants were predominantly liberal (60 vs. 17% moderate and 23% conservative) Democrats (57 vs. 18% Independent, 19% Republican, and 6% another party). The sample also exhibited a high level of civic knowledge. A plurality of participants (36%) had a perfect score on a common four-item civic knowledge index ( $M = 3$ ,  $SD = 1$ ).<sup>10</sup>

### Procedure

Data were collected in three stages: a pre-debate questionnaire, a series of real-time assessments during the debate, and a post-debate questionnaire. The pre-debate questionnaire began with a feeling thermometer for each of the two candidates (see Fig. 1), and included several additional demographic measures. At the end of this stage, participants were instructed to leave their computer on and their browser

<sup>8</sup> For instance, two in three participants (66%) watched the debate in the company of at least one other person, such as a roommate (18%), a friend (23%), or a family member (30%). These categories are not mutually exclusive. For instance, a participant could watch the debate with a roommate and a friend.

<sup>9</sup> There were 162 students, 92 faculty/staff, and 26 unaffiliated with the university.

<sup>10</sup> The four items were: “Who determines constitutionality of law?”; “Which party controls the house?”; “What majority is required to override a Presidential veto?” (This was an open-ended item); and “What office is now held by Dick Cheney?”.

## 2008 Democratic Presidential Primary Debate





**Before Debate Questionnaire**

Please answer these questions before the debate begins. Remember to check your computer throughout the debate. After candidates answer a question, your browser will refresh automatically and you will be asked a few questions.

### Feeling Thermometer

We'd like you to rate each of the candidates using something called a "feeling thermometer". You can choose any number between 0 and 100. The higher the number, the warmer or more favorable you feel toward the person; the lower the number, the colder or less favorable. You would rate the person at the 50 degree mark if you feel neither warm nor cold toward them.

Move the slider to the right if you are warm toward a candidate. Move the slider to the left, if you are cold toward a candidate.

			
Hillary Clinton		Barack Obama	
<input type="range" value="50"/>		<input type="range" value="50"/>	

**Fig. 1** Screenshot of pre-debate feeling thermometer measures (same as post-debate feeling thermometer measures)

connected to the study web site. This allowed researchers to control the timing of data collection once the debate was underway.

In the second stage, participant assessments were solicited at regular intervals (every 5–10 min) for the duration of debate. The exact length of the intervals varied by debate topic: a member of the research team started a new rating session immediately after both candidates had responded to each question from the moderator. There were a total of sixteen rating sessions during the debate. For participants, the start of a new rating session meant that the study web page was refreshed, replacing instructions (e.g., “Continue to watch the debate...”) with questions related to the candidate’s performance during the most recent segment of the debate (see Fig. 2). We also randomly assigned approximately one quarter of participants to a control condition, which allowed us to test whether our novel on-line tally measure produced any undesirable artifacts. These participants only had to click a button confirming that they were still watching the debate; there were no questions or prompts concerning candidate performance.

In the final stage, once the debate was over, participants completed a post-debate questionnaire. The questionnaire began by asking about demographics, political knowledge, and media use. Answering these questions also served as a distracter task, clearing lingering reactions to candidate performance from working memory. Participants then indicated their overall post-debate candidate evaluations using feeling thermometers. Next, participants were asked to list what they had learned from the debate about each of the two candidates and to rate the emotional valence

**2008 Democratic Presidential Primary Debate**

**Your Reaction**

Based on what you saw in this segment of the debate, how do you feel about each candidate?

If you have a positive feeling toward the candidate, move the slider to the right. If you have a negative feeling, move it to the left.

	
Hillary Clinton	Barack Obama
Dislike <input type="range"/> Like	Dislike <input type="range"/> Like

**Fig. 2** Screenshot of real-time debate assessment measures (basis for on-line measures)

(favorable or unfavorable toward the candidate) of each recalled item. Finally, participants were asked to indicate which of the five candidates competing for the presidential nomination they would vote for if the election were held on the day of the debate.

## Measures

### *Candidate Evaluation*

Participants indicated their opinions of the candidates before and after the debate (following a distracter task) using feeling thermometers. Directions accompanying the thermometers explained that possible scores range from 0 to 100, and that higher numbers correspond to more favorable attitudes. Participants used an interactive slider, positioning a pointer along a horizontal bar with endpoints labeled “0” and “100” to express their opinion. The mean pre-debate favorability score for Clinton is 44.8 ( $SD = 28.5$ ); for Obama it is 67.8 ( $SD = 23.7$ ). The mean post-debate favorability score for Clinton is 49.0 ( $SD = 30.5$ ) and for Obama is 74.0 ( $SD = 22.2$ ).

### *Vote Choice*

To indicate their vote choice, participants selected one of five candidates. Two Democrats and three Republicans who were running for the Ohio presidential primary election were listed. The distribution of vote choice is as follows: Obama (D, 59.6%), Clinton (D, 22.3%), McCain (R, 11.2%), Paul (R, 3.7%), and Huckabee (R, 3.2%). Participants who indicated a preference for a Republican candidate were excluded from the comparative vote analyses.

### *On-line Tally*

The on-line tally is a summative measure of the time-of-exposure impressions collected *during the debate*, and two tallies are computed for each participant (Clinton and Obama). At each measurement episode, participants recorded their impression of a candidate by moving a slider along a scale anchored by “like” and “dislike.” The slider position corresponded to a value between 0 and 100, with higher numbers indicating greater liking. The pre-debate feeling thermometer was then subtracted from this value, forming a prior-attitude-relative impression score. Thus, an impression score that was higher than the candidate’s pre-debate rating increased the tally, and an impression score that was lower than the candidate’s pre-debate rating decreased the tally. If a participant’s impression matched the pre-debate thermometer rating, or if the participant failed to respond during a particular measurement episode, the tally was unchanged.

For example, consider a participant whose feeling thermometer score for Clinton prior to the debate was 75. Since adjustments to the on-line tally were made relative to this initial assessment, a time-of-exposure impression score of 95 during the first measurement episode would yield a 20 point increase in the on-line tally. A rating of 75 during the second measurement episode would have no effect on the online tally. In the third episode, a rating of 70 would result in a 5-point decrease in the online tally. Thus, the cumulative on-line tally based on these three impressions would equal 15. Among participants in this study, the on-line tally for Clinton ranges from  $-800$  to  $910$  ( $M = 44.54$ ,  $SD = 298.84$ ). For Obama, the range is  $-775$  to  $826$  ( $M = -31.1$ ,  $SD = 245.38$ ).<sup>11</sup>

### *Memory Tally*

The memory tally is a summative measure of the affect associated with recalled information about each candidate after the debate. The questionnaire asked participants to list anything they learned about the candidates from the debate. For each recalled item, participants were also asked to indicate whether the item reflected positively or negatively on the candidate. Participants gave their assessment on a seven-point scale anchored by “disapprove/negative” and “approve/positive”. We computed our memory-based tally by subtracting four from each response, yielding a score ranging from  $-3$  to  $3$ , and summing the results. Individuals who did not rate any memories of a candidate, but who completed the rest of the post-debate questionnaire were assigned a recall score of zero for that candidate (13 cases for Clinton, 12 cases for Obama), indicating that they felt neutral or nothing about the candidate. Individuals who did not list any recall item at all ( $n = 12$ ) were treated as missing and dropped from the analyses. The mean memory tally score for Clinton is  $-0.42$  ( $SD = 7.13$ ) and for Obama is  $4.14$  ( $SD = 7.3$ ).

<sup>11</sup> Note that Obama’s online tally is lower than Clinton’s because Obama’s pre-debate thermometer scores were higher on average, not because the real-time impressions of him were lower.

## *Comparative Tallies and Comparative Candidate Evaluations*

The comparative measures reflect participants' perceptions of Clinton relative to their perceptions of Obama. Following conventions established in previous studies (e.g., Rahn, Krosnick et al. 1994; Rahn, Aldrich et al. 1994), these measures are computed as the difference in participants' assessments of the two candidates. The comparative on-line tally was obtained by subtracting participants' on-line tally for Obama from that of Clinton ( $M = 75.6$ ,  $SD = 362.3$ ), and the comparative memory tally was obtained by subtracting participants' memory tally for Obama from that of Clinton ( $M = -4.5$ ,  $SD = 9.9$ ). Similarly, the comparative post-debate candidate evaluation is obtained by subtracting participants' post-feeling thermometer for Obama from that of Clinton ( $M = -25.0$ ,  $SD = 39.5$ ), and the comparative pre-debate candidate evaluation is obtained by subtracting participants' pre-feeling thermometer for Obama from that of Clinton's ( $M = -23.4$ ,  $SD = 37.4$ ).

### *Controls*

As indicated in the sample description, a number of control variables known to influence candidate evaluation and vote choice, including gender, race, age, education, household income, party affiliation, and political knowledge, were also measured.

## **Results**

### Random Assignment Check

We begin by confirming that the experimental groups are comparable. We find no statistically significant differences between groups in terms of gender, race, age, education, income, party affiliations, political interest, and political knowledge, and therefore conclude that the random assignment was successful.

### Validity of Real Time Measures

This study employed a novel approach to measuring on-line information processing in real time. Although the conceptual and theoretical discussion of on-line information processing clearly indicates that impressions should be measured "on-line," that is, at time of information exposure, there may be some concern about the validity of repeated real-time measures. In particular, one might question whether these real-time measures interrupt or facilitate a particular type of information processing (either on-line or memory-based), thereby contaminating the results of the study.

To check this, we employed a control group that did not provide real-time impression measures (for details, see "Method" section). Differences between the experimental and control groups in terms of the dependent variables would raise questions about the validity of our approach. Analyses, however, revealed no

statistically significant effects of conditions (experimental vs. control) on variables including pre-to-post-debate differences in candidate evaluations, Clinton  $F(2,245) = 1.61$ ,  $p = 0.20$  and Obama  $F(2,245) = 2.22$ ,  $p = 0.11$ , and vote choice,  $\chi^2(8, N = 248) = 14.5$ ,  $p = 0.07$ , confirming that the real-time impression measures did not contaminate study results.

### The Real World Information Environment and Candidate Evaluation

This study was conducted in a natural setting in which individuals were exposed to a televised presidential primary election debate by actual candidates and asked to indicate their candidate evaluations and ultimate vote choices in real time. One might argue that natural information exposure such as this has little influence on individual attitude formation. On this view, individuals form their attitudes about candidates during the campaign process, before seeing the debate, and so the debate will have little influence on candidate evaluations.

However, the results of this study suggest that individuals' candidate evaluations were altered by exposure to the debate at significant levels. The within-subject pre-post differences in candidate evaluations were statistically significant for Clinton,  $t(187) = -2.906$ ,  $p = 0.004$  and for Obama  $t(187) = -5.191$ ,  $p = 0.000$ . Overall, individuals reported feeling more positively toward both candidates after viewing the debate, Clinton mean difference = 4.68, Obama mean difference = 6.28.

### Testing the Hybrid Model

#### *Do Memory-based and On-line Processing Models Operate Simultaneously?*

Given that exposure to the televised presidential primary election debate influenced individuals' candidate evaluations, the next question concerns how individuals used the debate for their attitude-formation and decision-making processes. Are we correct in asserting that memory-based and on-line information processing modes operate simultaneously, rather than alternately?

The data support the hybrid model, confirming that individuals' processing of the dynamic and complex information environment is simultaneously influenced by impressions at the time of exposure and by considerations that are accessible at the time of judgment. This conclusion is based on a pair of OLS regression models predicting participants' post-debate candidate evaluations (see Table 1). The results clearly demonstrate that both on-line and memory tallies are strong, significant predictors of candidate evaluations, even after controlling for individuals' predispositions including pre-debate candidate evaluations, age, gender, race, education, income, party identification (Democrat or not), and political knowledge (pre-debate evaluations were the only significant control).<sup>12</sup> As proposed by our

<sup>12</sup> Control variables, including party affiliations, were found to be non-significant throughout the models. This may indicate that the effects of those control variables were subsumed by either (or both) of the on-line and memory tallies. In support of this possibility, Lau and Redlawsk (2006) also argue that most control variables work as heuristics that are often subsumed by amalgam of impressions, i.e., on-line processing. Likewise, political knowledge, for instance, can be subsumed by the memory-based process.

**Table 1** Predicting post-debate evaluations by candidate

	Clinton		Obama	
	Beta	<i>t</i>	Beta	<i>t</i>
Female <sup>a</sup>	-0.040	-0.953	-0.001	0.258
African American <sup>b</sup>	-0.005	-0.122	0.016	0.340
Age	-0.022	-0.470	0.034	0.720
Education	0.022	0.485	0.037	0.793
Income	0.041	0.960	-0.059	-1.400
Democrat <sup>c</sup>	0.053	1.193	0.068	1.524
Political knowledge	0.041	0.946	-0.064	-1.463
Pre-debate evaluation	0.978	14.480***	0.969	14.745***
<i>On-line Tally</i>	0.519	8.437***	0.464	7.753***
<i>Memory Tally</i>	0.141	2.724**	0.161	3.477***
<i>R</i> <sup>2</sup>	0.757***		0.745***	

The on-line and memory-based processes co-occur simultaneously and exert independent influences, clearly confirming the hybrid model. The on-line process exerted greater influences on individuals' attitude formation, producing a judgmentally consistent and additive effect

*N* = 166

Based on OLS regression. *Notes.* a, b, and c indicate dummy variables

Entries are standardized coefficients

\*  $p < 0.05$  \*\* $p < 0.01$  \*\*\*  $p < 0.001$

theory, the on-line and memory-based processes appear to be independent as well. The correlations between the on-line and memory-tallies were small and non-significant (Clinton:  $r = 0.122$ ,  $p = 0.088$ ; Obama:  $r = -0.099$ ,  $p = 0.898$ ). The on-line and memory-based processes co-occur simultaneously and exert independent influences. Individuals' attitudes are shaped by on-line *and* memory-based information processing. Thus, *H1* is confirmed.

Given the evidence that both on-line and memory tallies exert simultaneous influences, the next question is how the hybrid model works. Which process exerts greater influence on candidate evaluations? A comparison of the standardized coefficients on these two factors indicates that the on-line tally is generally more powerful. It is worth noting that the on-line tally coefficient is fully half the size of the pre-debate evaluation coefficient. This is a surprisingly large effect given the powerful influence of prior attitudes, and the modest amounts of information introduced during the debate. Thus, we conclude that although both processes are influential, running tallies based on time-of-exposure candidate impressions typically exert a stronger influence on attitude formation than do considerations at the time of judgment. Thus, *H2a* is supported, but *H2c* is not.

However, what happens when the individual must choose among multiple candidates, as when making a vote choice? We examine the relative influences of the on-line and memory tallies in the context of a vote choice using a pair of logistic regression models predicting participants' intention to vote for either Clinton or Obama (see Table 2).



**Table 2** Predicting a post-debate vote for candidate

	Clinton		Obama	
	B	SE	B	SE
Female <sup>a</sup>	0.321	0.723	0.094	0.495
African American <sup>b</sup>	-1.460	1.258	0.989	0.910
Age	0.191	0.344	-0.121	0.280
Education	-0.354	0.357	0.194	0.242
Income	-0.059	0.249	0.101	0.164
Democrat <sup>c</sup>	0.035	0.681	0.579	0.479
Political knowledge	0.711	0.413	-0.093	0.232
Pre-debate evaluation	0.173***	0.038	0.089***	0.021
<i>On-line Tally</i>	0.009***	0.003	0.002	0.001
<i>Memory Tally</i>	0.069	0.064	0.092*	0.040
Chi-square	110.255 ( <i>df</i> = 10)***		92.169 ( <i>df</i> = 10)***	
-2log likelihood	70.743		133.211	
Cox & Snell <i>R</i> <sup>2</sup>	0.485		0.412	

When predicting a vote for Clinton, the co-occurrence of the two modes produced consistent judgmental implications. In contrast, when predicting a vote for Obama, the exposure to the debate appeared to produce conflicting beliefs between the time-of-exposure evaluative responses and the evaluative response associated with the time-of-judgment retrieval of long-term memories. Thus, a vote choice for Obama required more effortful, deliberative information processing, and this in turn exerted a greater influence onto the judgmental outcome

*N* = 166

Based on logistic regression. *Notes.* a, b, and c indicate dummy variables

Entries are unstandardized coefficients (B) and standard errors (SE)

\* *p* < 0.05 \*\**p* < 0.01 \*\*\* *p* < 0.001

Unlike the candidate evaluation models, the results of the vote choice models were mixed, and varied by candidate. When predicting a vote for Clinton, the on-line tally was statistically significant but the memory tally was not, suggesting that as the co-occurrence of the two modes produced consistent judgmental implications. In contrast, when predicting a vote for Obama the on-line tally coefficient was not statistically significant, *p* = 0.17, while the memory tally was, *p* = 0.02. This implies that exposure to the debate may have produced conflicting beliefs between the time-of-exposure evaluative responses and the evaluative response associated with the time-of-judgment retrieval of long-term memories. Thus, a vote choice for Obama required more effortful, deliberative information processing, and this in turn exerted a greater influence onto the judgmental outcome.

In sum, the results of this study thus far confirm that a hybrid model of information processing, which asserts the simultaneous influence of on-line and memory-based processes, realistically describes political information processing in general. The co-occurrence of the two modes of information processing is clearly established in candidate evaluations, with the on-line process exerting greater influences on individuals' attitude formation, producing a judgmentally consistent

and additive effect. When predicting vote choice, however, the mixed patterns of influences were mixed and depended on which candidate was being assessed.

### *Do On-line and Memory Processes Co-occur When Voters Make Comparisons?*

The final question to address is whether individuals use candidate comparisons in their decision-making processes. Critics point out that previous research on information processing models has placed individuals in unrealistically simple decision-making contexts consisting of a single-candidate evaluation, which makes it impossible to test whether individuals' assessments of one candidate are influenced by their perceptions of the other (e.g., Lau and Redlawsk 2001; Redlawsk 2001). With this study, in which two candidates take turns presenting their views and in which participants are asked to simultaneously evaluate both, we have a unique opportunity to look for cross-candidate effects. By testing the simultaneous impact of the comparative online and memory tallies (i.e., differential measures) on comparative post-debate candidate evaluations, this study examines whether individuals' evaluations of one candidate influences their attitudes toward the other.

In these comparison models, we regressed a comparative candidate evaluation on comparative on-line and memory tallies, and on a set of control variables, including a comparative measure of pre-debate attitudes. As noted above, the comparative measures were obtained by subtracting Obama's from Clinton's scores, which means that higher scores reflect a net increase in positive attitudes toward Clinton relative to Obama.

As with the single-candidate evaluations, these results demonstrate that both on-line and memory-based tallies are significant predictors of a comparative candidate evaluation (see Table 3). Furthermore, the impact of the comparative on-line tallies was bigger than that of the comparative memory tallies, which is consistent with our theoretical predictions based on the hybrid model. The results suggest that individuals do compare candidates, and that these comparative evaluations are based on both on-line and memory-based processing. Even when individuals use direct comparisons in forming attitudes toward multiple candidates, however, on-line information processing is more influential than memory-based processing (Table 4).

A similar pattern was observed in explaining a comparative vote choice. To analyze the Clinton-Obama vote choice, we first dropped cases where individuals exhibited a preference for a Republican candidate. The results indicate that on-line and memory-based processes co-occur, but that on-line process exerted greater influence in the context of candidate comparisons. The comparative measure of the on-line tally was a significant factor explaining a decision to vote for either Clinton or Obama. The comparative memory tally, however, was not statistically significant in this model, although it was marginally so,  $p = 0.104$ . Thus, when individuals are making a vote choice, they do compare candidates as they learn about them in real time and this spontaneous comparison appears to overpower the memory-based candidate comparison as they have consistent evaluative implications.

**Table 3** Predicting a comparative evaluation between candidate with comparative tallies

	Comparative evaluation	
	Beta	<i>t</i>
Female <sup>a</sup>	-0.034	-0.859
African American <sup>b</sup>	-0.012	-0.287
Age	-0.025	-0.555
Education	0.005	0.102
Income	0.005	1.267
Democrat <sup>c</sup>	0.052	0.373
Political knowledge	0.062	1.474
Comparative pre-debate evaluation	0.873	15.366***
<i>Comparative On-line Tally</i>	0.449	8.938***
<i>Comparative Memory Tally</i>	0.176	3.676***
<i>R</i> <sup>2</sup>	0.769***	

Individuals do compare when evaluating candidates and these comparative evaluations are based on both on-line and memory-based processing. The spontaneous on-line process was more influential than the deliberative memory-based process even when individuals use direct comparisons in forming attitudes toward multiple candidates

*N* = 166

Based on OLS regression. *Notes.* a, b, and c indicate dummy variables

Comparative scales were obtained by subtracting Obama’s from Clinton’s

Entries are standardized coefficients

\* *p* < 0.05 \*\**p* < 0.01 \*\*\* *p* < 0.001

## Discussion

For more than two decades, the memory-based and on-line information processing models have been pitted against each other in prior research. In resolving this conflict, at the theoretical level, we argue for a hybrid model based on the dual-process theories of social psychology that presumes that individuals rely on both processes simultaneously in forming judgments. Affording much higher external validity, we allowed individuals to engage in a natural information processing task with no explicit manipulation of the information processing goals. This study employs a number of innovative techniques: the use of more appropriate measures of information processing including the real-time measures of the on-line tally; more realistic decision-making tasks including both the candidate evaluation and vote choice among multiple candidates; and more realistic and dynamic information stimulus structures.

The findings enhance our understanding of how people use political information for decision-makings in the real world. Our results suggest that on-line *and* memory-based information processing co-occur, simultaneously influencing the formation of individuals’ political judgments. This is consistent with our view that human beings are “flexible processors,” engaging in both memory-based and on-line information processing simultaneously, rather than alternately.

**Table 4** Predicting a post-debate comparative vote choice with comparative tallies

	Clinton (as opposed to Obama)	
	B	SE
Female <sup>a</sup>	1.545	2.140
African American <sup>b</sup>	3.718	3.488
Age	-0.799	0.799
Education	-0.423	0.646
Income	-0.707	0.621
Democrat <sup>c</sup>	-0.899	1.928
Political knowledge	2.011	1.134
Comparative pre-debate evaluation	0.512**	0.206
<i>Comparative On-line Tally</i>	0.028**	0.013
<i>Comparative Memory Tally</i>	0.273	0.168
Chi-square	140.178 ( <i>df</i> = 10)***	
-2log likelihood	22.812	
Cox & Snell <i>R</i> <sup>2</sup>	0.643	

When individuals are making a vote choice, they do compare candidates as they learn about them in real time. The two modes co-occur, but the spontaneous comparison appears to overpower the memory-based candidate comparison

*N* = 136 (the cases where votes went for Republican candidates were dropped)

Based on OLS regression. *Notes.* a, b, and c indicate dummy variables

Entries are unstandardized coefficients (b) and standard errors (SE)

\*  $p < 0.05$  \*\* $p < 0.01$  \*\*\*  $p < 0.001$

The on-line and memory-based processes are independent and they are also complementary because their evaluative implications must be integrated into a judgment outcome. Furthermore, we argue that which mode is more influential depends on whether the evaluative implications are consistent or conflicting. When the evaluative implications of the two modes conflict, a more effortful and deliberative retrieval of long-term memories at the time of judgment should exhibit relatively greater influence. In most co-occurrence processes, however, evaluative implications of the on-line and memory processes are consistent and additive resulting in an empirical pattern characterized by relatively greater influence of the on-line process. Supporting our theoretical view, our data indicate that the on-line tally, an amalgam of time-of-exposure impressions and memories, has a relatively greater effect than the long-term memory retrieved at time of judgment, especially in candidate evaluations. Furthermore, the comparative on-line tallies consistently exerted relatively stronger influences on both candidate evaluations and vote choices than the comparative memory-based tallies did. These findings suggest that individuals engage in *both* on-line and memory-based processing simultaneously even when they make a direct comparison between multiple candidates. Divergent from previous research (e.g., Rahn, Krosnick et al. 1994; Lau and Redlawsk 2001; Redlawsk 2001), comparisons between multiple candidates do not necessarily require an over-reliance on more effortful memory-based processing. Rather, it

appears that a configuration of attitudes based on direct comparisons also involves with a relatively spontaneous, effortless, and habitual on-line information processing with its overinfluence onto more effortful process.

We acknowledge, however, that although a dimension-centered presidential debate is a more realistic and complex source of information than the more commonly studied candidate-centered pamphlet, we cannot rule out the possibility that our results are shaped by the format. It may be that watching candidates take turns responding to a common set of questions provided insufficient motivation for participants to engage in more effortful memory-based processing. More research is needed. Nevertheless, the empirical findings of this study appear to lend greater weight to our hybrid model, where both memory-based and on-line information processing online co-occur and exert independent but complementary influences in a judgmental integration of evaluative implications of the two modes.

The empirical observations—the co-occurrence of the two modes with a relatively stronger influence of the on-line rather than memory-based process—can be explained in part by the superior measure of the on-line tally adopted in this study. The measurement of on-line tallies used in most previous studies has failed to precisely capture individuals' *real-time* updates of candidate impressions at the time of information exposure. As a consequence, the online tally has often been contaminated by the memory tally, leading scholars to underestimate the impact of on-line processing. Even Lau and Redlawsk's innovative process-tracing method is limited, as it presumes that attitude-consistent information increments the tally and that attitude-discrepant information decrements it. Because an on-line tally is more than a measure of attitude consistency between the voter and the candidate, we argue that our real-time measures of individuals' candidate assessments in a real-world decision-making setting are empirically more precise and theoretically more appropriate. At the same time, however, we acknowledge that our approach, which relies on repeatedly asking for explicit time-of-exposure impressions, might artificially promote on-line processing. This is a limitation, but given that our argument is for the co-occurrence of on-line and memory-based processes, we believe this measurement strategy is a robust test of our claim. If anything, this measurement strategy makes it more likely that the effects of memory-based processes would be washed out by on-line processes.

The unique study setting, utilizing an actual televised debate between real presidential candidates, may provide another explanation for the findings reported in our study. It is not implausible to think that the real-world information environment might have encouraged an overinfluence of the naturalistic, less effortful, on-line process. It is reasonable to assume that participants in this study previously encountered the candidates and campaign information similar to that presented in the debate. As Lavine (2002) argues, the repeated exposure to similar information and the same candidates over the course of a campaign might facilitate on-line information processing, even when individuals have to make comparisons between multiple candidates to make an ultimate vote choice (which has been assumed to require more effortful memory-based processing, e.g., Lau and Redlawsk 2006; Redlawsk 2001). Similarly, although the subjects were asked to recall what they learned from the debate, this measure might have been contaminated with memories

created prior to the debate. If the subject had not been exposed previously to the candidates or the campaign information presented in the study, he or she might have engaged in more effortful, piecemeal information processing based on memory (e.g., Lavine 2002). However, we found no interaction effect between prior interest in campaigns and information processing in this study, which undermines claims of moderating effects of prior exposure to similar information in the campaign environment. Nevertheless, further investigation is needed to examine this possibility. Finally, the sample of this study consisted of highly educated members of a liberal community, which might also have influenced the findings of this study. Previous scholarship suggests that on-line information processing is more prevalent among political sophisticates (McGraw et al. 1990). Although this study observed no significant interaction of information processing and education or ideology, additional research is needed to replicate the results with more representative samples in various political information and decision-making environments.

It is important to note here that the hybrid model presented here does *not* discount the importance of memory in political judgment. The study observed consistently significant effects of memory-based processing on candidate evaluation, as well as vote choice. The moderate level of correlation between the memory and online tallies also implies that memory-based processing exerts independent influences in the co-occurrence model. This study also found that memory-based processes had even a greater influence than on-line processes when participants' vote choice reflected a preference for Obama. Although we cannot know with certainty the cause of this difference, we speculate briefly. It may be that Obama supporters relied more heavily on long-term memories about the candidate than on real-time updates of their impressions because the evaluative implications of the on-line and memory-based models conflicted with each other. That is, perhaps the candidate did not perform as well as his supporters expected, and thus they were forced to survey their long-term memory, rather than relying solely on real-time updates of their impressions verifying their attitudes, in order to reach a judgment conclusion. Supporting this possibility, we observe that subjects' on-line tally for Obama were less favorable than for Clinton.

The importance of memory in political judgment is further demonstrated by the fact that the online tally is itself an amalgam of memories and evaluative responses. In this sense, the term, "memory-based" is misleading because both memory-based and on-line information processing are based on memory to some extent (Hastie and Pennington 1989). Thus, the issue is not whether memory *per se* plays a role in political judgment, but *how* memory comes into play in political decision-making.

The complexity of information processing found in this study implies that it is still too early to reach normative conclusions. Our hybrid model, characterized by the co-occurrence of on-line and memory-based processing and a relatively consistent and strong influence of the on-line process, paints a moderately rosy picture for citizen competence in democracy. Even though citizens are not masters of political knowledge, they are still able to make judgments by effectively responding to information as they encounter it. Still, normative concerns about the legitimacy of democracy remain, given evidence that when individuals have an opportunity to revise their judgments, their use of memory-based information

processing is in general consistent with their political predispositions (Taber and Lodge 2006). More systematic research is needed to fully understand individuals' political information processing and its implications for democracy.

**Acknowledgment** We would like to thank Prabu David for his support for data collection.

## References

- An, S., Jin, H. S., & Pfau, M. (2006). The effects of issue advocacy advertising on voters' candidate issue knowledge and turnout. *Journalism and Mass Communication Quarterly*, 83(1), 7–24.
- Bennett, W. L. (1996). *News: The politics of illusion* (7th ed.). New York: Longman.
- Chaiken, S., Liberman, A., & Eagly, A. H. (1989). Heuristic and systematic information processing within and beyond the persuasion context. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 212–252). New York: Guilford Press.
- Chaiken, S., & Maheswaran, D. (1994). Heuristic processing can bias systematic processing: The effect of source credibility, argument ambiguity and task importance on attitude judgment. *Journal of Personality and Social Psychology*, 66, 460–473.
- Chaiken, S., & Trope, Y. (Eds.). (1999). *Dual-process theories in social psychology*. New York: Guilford Press.
- Chen, S., & Chaiken, S. (1999). The heuristic-systematic model in its broader context. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 73–96). New York: Guilford Press.
- Chen, S., Shechter, D., & Chaiken, S. (1996). Getting at the truth or getting along: Accuracy- versus impression-motivated heuristic and systematic processing. *Journal of Personality and Social Psychology*, 71, 262–275.
- Delli Carpini, M. X., & Keeter, S. (1996). *What Americans know about politics and why it matters*. New Haven: Yale University Press.
- Epstein, S., & Pacini, R. (1999). Some basic issues regarding dual-process theories from the perspective of cognitive-experiential self-theory. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 462–482). New York: Guilford Publishers.
- Fiske, S. T., & Taylor, S. E. (1984). *Social cognition*. Reading Mass: Addison-Wesley Pub. Co.
- Gans, H. (1979). *Decidin what's news: A study of CBSEvening news, NBC Nightly news, newsweek and time*. New York: Vintage.
- Hallin, D. C. (1992). Sound bite news: Television coverage of elections, 1968–1988. *Journal of Communication*, 42(2), 5–24.
- Hamilton, D. L., Sherman, S. J., & Maddox, K. B. (1999). Dualities and continua: Implications for understanding perceptions of persons and groups. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology*. New York: Guilford Press.
- Hastie, R., & Park, B. (1986). The relationship between memory and judgment depends on whether the judgment task is memory-based or on-line. *Psychological Review*, 93(3), 258–268.
- Hastie, R., & Pennington, N. (1989). Notes on the distinction between memory-based versus on-line judgments. In J. N. Bassili (Ed.), *On-line cognition in person perception* (pp. 1–17). Hillsdale: Erlbaum.
- Just, M. R., Crigler, A. N., Alger, D. E., & Cook, T. E. (1996). *Crosstalk: Citizens, candidates, and the media in a presidential campaign*. Chicago: The University of Chicago Press.
- Kelley, S., Jr., & Mirer, T. W. (1974). The simple act of voting. *American Political Science Review*, 68(2), 572–591.
- Kelly, H. H. (1972). Attribution in social interaction. In E. E. Jones, D. E. Kanouse, H. H. Kelly, R. E. Nisbet, S. Valins, & B. Weiner (Eds.), *Attribution: Perceiving the causes of behavior*. Morristown, NJ: General Learning Press.
- Kim, S.-Y., Taber, C. S., & Lodge, M. (2010). A computational model of citizens as motivated reasoner: Model of the dynamics of the 2000 Presidential election. *Political Behavior*, 32, 1–28.
- Kim, Y. M., & Vishak, J. (2008). Just Laugh! You don't need to remember: The Effects of entertainment media on political information acquisition and information processing in political judgment. *Journal of Communication*, 58, 338–360.

- Lau, R. R. (1995). Information search during an election campaign: Introducing a processing-tracing methodology for political scientists. In M. Lodge & K. M. McGraw (Eds.), *Political judgment: structure and process* (pp. 179–206). Ann Arbor, MI: University of Michigan Press.
- Lau, R. R., & Redlawsk, D. (2001). An experimental study of information search, memory, and decision making during a presidential campaign. In J. H. Kuklinski (Ed.), *Citizens and politics: perspectives from political psychology* (pp. 136–159). Cambridge: Cambridge University Press.
- Lau, R. R., & Redlawsk, D. P. (2006). *How voters decide: Information processing during election campaigns*. New York: Cambridge University Press.
- Lavine, H. (2002). On-line vs. memory-based process models of political evaluation. In K. R. Monroe (Ed.), *Political psychology* (pp. 225–247). Mahwah, NJ: Erlbaum.
- Lodge, M., McGraw, K. M., & Stroh, P. (1989). An impression-driven model of candidate evaluation. *American Political Science Review*, 83(2), 399–419.
- Lodge, M., Steenbergen, M., & Brau, S. (1995). The Responsive Voter: Campaign information and the dynamics of candidate evaluation. *American Political Science Review*, 89(2), 309–326.
- Lodge, M., Taber, C., & Weber, C. (2006). First steps towards a dual-process accessibility model of political beliefs, attitudes, and behavior. In D. Redlawsk (Ed.), *Feeling politics: Emotion in political information processing (Ch.2)*. New York: Palgrave Macmillan.
- McConnell, A. R., & Leibold, J. M. (2001). Relations among the implicit association test, discriminatory behavior, and explicit measures of racial attitudes. *Journal of Experimental Social Psychology*, 37(5), 435–442.
- McGraw, K. M. (2003). Political impressions: formation and management. In D. O. Sears, L. Huddy, & R. Jervis (Eds.), *Oxford handbook of political psychology* (pp. 394–432). New York: Oxford University Press.
- McGraw, K. M., Hasecke, E., & Conger, K. (2003). Ambivalence, uncertainty, and processes of candidate evaluation. *Political Psychology*, 24(3), 421–448.
- McGraw, K. M., Lodge, M., & Stroh, P. (1990). On-line processing in candidate evaluation: The effects of issue order, issue importance, and sophistication. *Political Behavior*, 12(1), 41–58.
- Rahn, W. M., Aldrich, J. H., & Borgida, E. (1994a). Individual and contextual variations in political candidate appraisal. *American Political Science Review*, 88(1), 193–199.
- Rahn, W. M., Krosnick, J. A., & Breuning, M. (1994b). Rationalization and derivation processes in survey studies of political candidate evaluation. *American Journal of Political Science*, 38(3), 582–600.
- Redlawsk, D. (2001). You must remember this: A test of the on-line model of voting. *Journal of Politics*, 63(1), 29–58.
- Schudson, M. (1978). *Discovering the news: A social history of American newspapers*. New York: Basic.
- Schudson, M. (1998). *The good citizen: A history of American public life*. New York: Free Press.
- Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin*, 119(1), 3–22.
- Smith, E. R., & DeCoster, J. (1999). Associative and rule-based processing: A connectionist interpretation of dual-process models. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. xiii, 657 p). New York: Guilford Press.
- Taber, C. S., & Lodge, M. (2006). Motivated skepticism in the evaluation of political beliefs. *American Journal of Political Science*, 50(3), 755–769.
- Tormala, Z. L., & Petty, R. E. (2002). What doesn't kill me makes me stronger. *Journal of Personality and Social Psychology*, 83(6), 1298–1313.
- Uleman, J. S., Newman, L. S., & Moskowitz, G. B. (1996). People as flexible interpreters: Evidence and issues from spontaneous trait inference. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 28, pp. 179–211). San Diego, CA: Academic Press.
- Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist*, 35, 151–175.
- Zajonc, R. B. (2000). Feeling and thinking: Closing the debate over the independence of affect. In J. P. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition*. New York: Cambridge University Press.
- Zaller, J. R. (1992). *The nature and origins of mass opinion*. New York: Cambridge University Press.
- Zaller, J. R., & Feldman, S. (1992). A simple theory of the survey response: Answering questions versus revealing preferences. *American Journal of Political Science*, 36(3), 579–616.