Received: 1 February 2023 | Revised: 4 April 2023 | Accepted: 5 April 2023

DOI: 10.1002/acp.4068

RESEARCH ARTICLE

WILEY

Memory for tweets versus headlines: Does message consistency matter?

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Funding information
National Science Foundation, Grant/Award Number: 1456928; National Science Foundation Graduate Research Fellowship, Grant/Award Number: 1839287

Abstract

People routinely use news outlets and social media platforms to keep up with recent events. While information from these common sources often aligns in the messages conveyed, news headlines and microblogs on social media also frequently provide contradictory messages. In this study, we examined how people recall and recognize tweets and news headlines when these sources provide inconsistent messaging. We tested this question in person (Experiment 1) and online (Experiment 2). Participants studied news headlines and tweets that provided either consistent messaging or inconsistent messaging, then completed a free recall and recognition memory task sequentially, and provided confidence ratings for recognition judgments. Findings were similar across memory tasks and experiments: Participants had better memory for tweets than news headlines regardless of message consistency. We discuss the implications of these findings for understanding memory in the digital age where social media use is widespread and messaging across sources is often inconsistent.

KEYWORDS
digital age, memory, news headlines, social media, tweets

1 | INTRODUCTION

The unlimited scope and vast reach of the internet has transformed the way we access information and share it with others (Marsh & Rajaram, 2019). We exchange and consume information now not only in face-to-face interactions, but increasingly, via online sources (Stone & Wang, 2019). The internet has given traditional sources (e.g., news outlets) a wider reach, while also creating social networking platforms where people connect and share information at an interpersonal level in an unprecedented fashion. The expanding range of these online sources include news on media outlets and Wikipedia entries, where we gather information from official or public sources as well as social media platforms that include Facebook, Instagram, TikTok, and Twitter, where we socially connect with others. This explosion in access to information raises urgent and important questions about the influence of technology on memory and cognition (Rajaram & Marsh, 2019; Storm & Soares, in press; Wang, 2019).

Online information sources compete for attention. Information that would have been traditionally reported by select print outlets can now be found in many places. Such proliferation of information increases the possibility that people often receive inconsistent messages. While news sources and social media platforms sometimes align in the message conveyed, they also often contradict each other (e.g., Eagle et al., 2018; Vasantavada et al., 2022). For example, a news source might posit that standardized testing is a fair assessment for college admissions; however, someone might send out a social tweet that standardized testing is insufficient tool to measure one's intelligence. These inconsistent messages are prevalent in our new digital world. Therefore, in the current study we ask – what is the impact of such message inconsistency on memory?

We probed this question about memory for inconsistent messages by focusing on two popular online sources – news outlets and the social media platform Twitter. We selected official headlines from the news outlets and social tweets from individuals on Twitter. For the social media platform, we chose Twitter given the ever-increasing chatter and information exchange on Twitter and its vast reach with

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over 396.5 million users around the time of writing (Shepherd, 2022). In this study, we examined, (a) how people remember information from news headlines versus social tweets and (b) what is the impact of message inconsistencies across these two sources. As we elaborate later, this test allowed us to evaluate the competing influences of source credibility associated with news (Hovland & Weiss, 1951) versus a memory advantage for microblog information (Mickes et al., 2013).

To capture the news versus social media sources, as just noted, we selected real news headlines taken from news outlets and real personal tweets taken from Twitter, respectively. We integrated these ecologically valid study materials with rigorous, in-person (Experiment 1) and online (Experiment 2) laboratory methodologies, to identify which source—news headlines or social tweets—is retained better in memory when the information from these sources is inconsistent. Given the rapidly increasing rates at which people are using the internet, this combination of experiments allowed us to not only test this question in the traditional laboratory format but also examine an online test of the phenomenon. Thus, the online experiment enabled a test of generalizability of our in-person laboratory findings in a setting that is ecologically closer to the environment where people "surf" the web for news and social media engagement.

1.1 | Access to news and public perceptions of social media platforms

The internet has become a common source for people to access news, second after television (Rackaway, 2014). Beyond news sources, four in 10 specifically report using social media sites to find news (Mitchell et al., 2018), with news being the most popular topic of conversation on Twitter (Gabielkov et al., 2016). This contrasts with peoples' perceptions about the accuracy of these sites. Nearly six in 10 "social media news consumers expect news there to be inaccurate" (Shearer & Mitchel, 2021). Generally, Americans trust information they get from national (71%) and local (82%) news organizations and even friends and family (71%) more than from social media (33%; Gottfried et al., 2018). These contrasting trends between increasing usage and lower trust of the social media sources provide a broader context for our questions and for the impact that source credibility may have on memory. In the context of growing interest in how technology influences cognition, the question we test in this study also speaks to the process by which information and misinformation spread (Marsh & Rajaram, 2019; Maswood & Rajaram, 2019; Storm & Soares, in press).

1.2 | News and memory

Memory for news has been primarily examined within the fields of communication, media, and journalism, where the major focus has been on the source by which news is delivered. As new communication technologies have been introduced, studies have investigated differences in news retention across these media (e.g., Findahl & Hojier, 1985; Katz et al., 1977; Neuman, 1976; Stauffer et al., 1981; Sundar et al., 1998; Sundar & Nass, 2001). Findings from a laboratory study show that the highest retention levels for print information from a newspaper and a computer (with no difference between these two sources), followed by television, and with radio broadcasts being the worst-retained (DeFleur et al., 1992). Another study found news to be retained better in print than online (Sundar et al., 1998), which researchers attributed to enhanced depth of processing, self-paced processing, and fewer distractions (e.g., DeFleur et al., 1992; D'Haenens et al., 2004; Furnham & Gunter, 1985, 1987; Gunter et al., 1984; cf. Stauffer et al., 1981; Wicks, 1995; William et al., 1957).

Very few studies, however, have considered the effects of information consistency across any sets of media. Those that did, approached the question for different reasons or did not include the necessary comparisons (e.g., using stimuli that conveyed similar news stories; Wicks, 1995; Wicks & Drew, 1992), precluding a direct test and relevant conclusions. While inconsistent information can certainly be present within the same category of sources (e.g., opposing TV news stations, newspapers), our focus here is not on the social and political factors behind inconsistencies that typically arise across news channels. Our interest is also not in a comparison between news sources in print or television versus dissemination of the same news by these news agencies via their social media channels; in fact, official news sources do increasingly access their readership via their own official, social media accounts. Rather, we examine how information is retained when it is consistent or inconsistent across two categorically different sources, namely official news outlets versus personal posts on social media (in our case, Twitter).

One line of research that can provide insight into the influence of message inconsistency is from studies on incongruencies between news headlines, for example, clickbait or sensationalized headlines, and their associated articles (e.g., Condit et al., 2001; Leventhal & Gray, 1991; Pfau, 1995). This work draws upon earlier research on contextual knowledge, schema activation, and retrieval (e.g., Bransford & Johnson, 1972; Johnson et al., 1974; Townsend, 1980), and it alternately reports incongruent headlines to bias, interfere with, or have no effect on memory and comprehension of articles (e.g., Condit et al., 2001; Leventhal & Gray, 1991; Pfau, 1995; Tannenbaum, 1953, 1955). More recent research has clarified these patterns, suggesting that the effects of incongruent headlines depend on the magnitude of incongruency (Ecker et al., 2014).

Together, these findings show that memory for information received from news channels can depend on the medium from which information is delivered (e.g., print, television, or radio) and can be sensitive to incongruencies. However, these findings do not address the specific comparison that motivated the present study, namely memory for information received from news sources (e.g., news headlines) versus social media posts (e.g., tweets on Twitter). Proliferation of digital technologies such as social media raise questions about how memory for information received from news sources may compare with related information propagating on social media platforms.

1.3 | Social media and memory

Researchers have recognized the substantial implications for memory posed by the internet and have called for research on this topic (e.g., Lewandowsky et al., 2017; Marsh & Rajaram, 2019; Rajaram & Marsh, 2019; Stone & Wang, 2019; Storm & Soares, in press; Yamashiro & Roediger III, 2019). Emerging studies on this topic report an interesting range of findings. One study found better memory for events posted online than for events not shared, suggesting that sharing information online can facilitate meaning-making for the autobiographical self (Wang et al., 2017). Other work shows that the cognitive load of deciding whether or not to post social media items leads to poorer comprehension of those items (Jiang et al., 2016). People also show confusability in source memory when retrieving information from memory versus smartphones (Siler et al., 2022).

Consistent with research we noted earlier (and elaborate later) that shows lower reliance on less credible sources (Hovland & Weiss, 1951), another study reported that for misinformation shown following a study phase, participants later reported lower confidence for falsely recognizing misinformation if it was presented in the Twitter feed format compared to a similar feed not referencing Twitter (Fenn et al., 2014). This phenomenon was observed where all the feeds (i.e., test items) were believed to be provided by previous participants, that is, from the same information source, but the text varying to be informal or formal to match the purported medium of transmission (e.g., Twitter or control, respectively). In general, people, including young adults, tend to find social media sources less trustworthy than news sources (Liedke & Gottfried, 2022).

While people may trust microblog information less, they exhibit better retention for microblog information. For example, Mickes et al. (2013) compared memory for microblog information, Facebook statuses, to other common types of information including sentences from books or news articles, and pictures of faces. Across a series of experiments, memory for the microblog information was more accurate and associated with higher confidence compared to other types of information. This pattern was also observed when Facebook statuses excluded any irregular typography (e.g., emoticons, hashtags). Additionally, this pattern cannot be fully explained by the social nature of microblog information at least under conditions where participants were asked to think of someone they knew who might write the microblog and non-microblog information presented at study, since the microblog memory advantage persisted here (Mickes et al., 2013, Experiment 2). The authors attributed this microblog memory advantage to its informal language, spontaneous tone, and gossipy nature that facilitate information processing and retrieval. This interpretation gained further support from their finding that entertainment news was better remembered than breaking news headlines (Mickes et al., 2013, Experiment 3). Similarly, Bourne et al. (2020) reported better memory for tweets than news headlines across young and older adults, and this pattern occurred irrespective of whether the text was presented visually as a Twitter post or as a headline on the CNN website, further supporting the explanation that the interpersonal or gossipy way in which information is written drives the microblog mnemonic advantage (as opposed to simply knowing it is a microblog post).

Taken together, growing use of social media, accompanied by a curious mix of lower trust but better memory for microblog information, suggests many implications for how information is remembered. Given that social media often competes with other sources of information, questions arise about the scope of its memory advantage. Therefore, we focused on the following question: Would a memory advantage for microblogs prevail when information on the social media platforms is inconsistent with other sources that carry greater source credibility and can thereby exert a competing influence on memory?

1.4 | The present study

To evaluate memory for conflicting information across news and social media, we considered the robust memory advantage for social media information (Bourne et al., 2020; Mickes et al., 2013) with another relevant and potentially competing factor, namely source credibility. As we describe below, research on source credibility shows that sources with high credibility have greater influence on memory and cognition. This outcome is particularly relevant for present considerations given the public perceptions of higher levels of trust in news outlets than in social media and people's perception of lower accuracy of information received from social media versus other sources (Fenn et al., 2014; Liedke & Gottfried, 2022; Masta & Shearer, 2018).

People are more persuaded by credible sources (e.g., Hovland & Weiss, 1951) and more likely to unconsciously plagiarize information received from them (Bink et al., 1999). People are also more susceptible to incorporating nonstudied information from credible sources and discount post-event information from less credible sources. For instance, people resist post-event information from children relative to memory psychologists (Underwood & Pezdek, 1998) or police officers (Skagerberg & Wright, 2009), from older than younger adults (Davis & Meade, 2013; Kwong See et al., 2001), from biased parties than unbiased bystanders (Dodd & Bradshaw, 1980), from out-group members than in-group members (Andrews & Rapp, 2014) and from strangers than friends (French et al., 2008; Hope et al., 2008). Related work shows that reliance on misinformation decreases when it is corrected by trustworthy, expert sources (Guillory & Geraci, 2013), and that establishing trust and credibility (by showing accurate information at the outset) can increase susceptibility to misinformation (Zhu et al., 2010), whereas misinformation from low credibility sources (e.g., Twitter feed compared to a generic feed) when shown afterwards (i.e., post-event) is recognized as studied information with lower confidence (Fenn et al., 2014). While much of this literature has examined the influence of source credibility on the spread of misinformation, these studies nonetheless suggest that people are more likely to discount information from less credible sources and incorporate information from highly credible sources into memory. In brief we know that source credibility generally influences the way in which we process information (Kelman, 1958).

The two lines of evidence, a memory advantage for information from high credibility sources versus a memory advantage for social media microblogs, set up competing predictions for how inconsistent news versus social media information may be retained in memory. On one hand, when people encounter contradictory messages between news headlines and social tweets, they will discount the information from social tweets, the less credible source, relative to information from news outlets, the more credible source because of greater attentional processing of information from the credible source (as hypothesized by Bourne et al., 2020). On the other hand, the microblog advantage might persist despite differences in trust and credibility given the processing advantages for information that is gossipy nature, that is, tweets compared to news headlines (Mickes et al., 2013). Given these competing predictions, we asked whether exposure to inconsistent information from news outlets would modulate the memory advantage for microblog information due to effects of higher source credibility for news outlets.

Across two experiments, we tested memory when the information that people received from news outlets versus from tweets was inconsistent in the message conveyed, or when it was consistent. The latter, consistent condition served as a control, where a memory advantage for social media information was expected, while testing our novel question pertaining to inconsistent in the messages. In Experiment 1, participants completed all tasks in a controlled, in-person lab environment. In Experiment 2, we extended this paradigm to a completely virtual environment. Here, participants completed the tasks from their own locations, using their personal devices. This experiment allowed us to assess whether our findings from Experiment 1 generalize to virtual environments that are becoming highly prevalent in our everyday lives. The extent to which phenomena discovered in in-person lab settings generalize to online environments is not always a given (Greeley et al., 2022), making an online test in more ecologically valid settings an informative test.

2 | GENERAL METHOD

The two experiments reported here were designed similarly. Therefore, we outline the general design and procedure for both experiments first, and then detail in their separate sections the differences.

2.1 | Transparency and openness

For both experiments, we follow the JARS reporting guidelines in the current work (Appelbaum et al., 2018). Analyses were conducted using the *rstatix* package (Kassambara, 2021) in R (R Team, 2020) and graphs were generated with *ggplot2* (Wickham et al., 2016). We preregistered Experiment 1 on AsPredicted (The Memorability of News and Social Media Information). We present registered analyses in addition to some exploratory analyses related to our main hypotheses.

2.2 | Participants and design

The experiment consisted of a 2×2 mixed design, with Source (tweets, news headlines) manipulated within-subject and Information Consistency (inconsistent, consistent) manipulated between subjects. Considering the novelty of the effect of interest and a lack of prior research regarding inconsistent information, we conducted a power analysis at a power of .90 and estimated a medium effect size ($f = .39$, according to Cohen's benchmark) for the interaction between Source (news headlines, tweets) and Information Consistency (inconsistent, consistent). Based on the analysis, in each experiment we collected a sample of 72 participants, 36 per between subjects condition. All participants were Stony Brook undergraduates and fluent English speakers who received course research credit as compensation.

2.3 | Materials

Tweets from real accounts on Twitter and news headlines from news media outlets were used as study material. We developed a stimulus set of 192 items (96 headlines, 96 tweets) relating to 6 topics (Standardized Testing, Bitcoin, Brain Games, Keto Diet, Minimum Wage Raise, Plastic Straw Ban). For every topic we compiled headlines and tweets that conveyed messages in favor of the topic (e.g., eight headlines and eight tweets in favor of the keto diet – headline: "Why the ketogenic diet may help fight diabetes, cancer"; tweet: "Wish me luck on this, my first doctor approved keto journey") and headlines and tweets that conveyed messages opposing the topic (e.g., eight headlines and eight tweets opposing the keto diet – headline: "Why This Dietitian Is Completely Against the Keto Diet"; tweet: "My boss who's a chef said Keto isn't actually that good for you"). See Table 1 for more examples.

Tweets were sourced using filtering tools made publicly available by Twitter (Twitter API, search on Twitter). Since news headlines do not typically include any visual information, tweets similarly did not contain any links, images, emojis, emoticons, or gifs. Headlines were sourced using Google News, news media outlet websites, news APIs, and from a variety of media outlets, including major and local news and media organizations (excluding known fake news websites and organizations) – for example, New York Times, Forbes, Daily Bruin, Washington Post, Bloomberg, KMVT 11, Common Dreams, Cumberlink, Truth Out, Cointelegraph, Wall Street Journal, Wired, The Verge, CNN, Independent, Vox, Inverse, Business Insider, Telegraph, Star Tribune, PBS, Reader's Digest, Fox Business, Yahoo! Finance, CBS, The Guardian, MinnPost, The Conversation, Scientific American, and Financial Times.

Within each condition, each participant studied 48 items (24 headlines, 24 tweets), with four headlines, and four tweets from each of the six topics. In the inconsistent condition, for each topic, the message conveyed by the study material was inconsistent across the headlines (e.g., anti-Keto diet – "Why This Dietitian Is Completely Against the Keto Diet") and tweets (e.g., pro-Keto diet – "Wish me luck on this, my first doctor approved keto journey"). In the consistent condition, the message was consistent across the headlines

TABLE 1 Examples of stimuli.

	Consistent				Inconsistent	
	News Anti	Tweet Anti	News Pro	Tweet Pro	News Pro	Tweet Anti
Standardized testing	Standardized testing is a tool of white supremacy	Standardized tests are the worst test to actually interpret a person's knowledge	How students and teachers can benefit from testing	All those years of standardized testing have trained me well!	How students and teachers can benefit from testing	Standardized tests are the worst test to actually interpret a person's knowledge
Bitcoin	If bitcoin is so safe, why does it keep getting hacked?	Another truth: Many find Bitcoin or cryptos difficult to understand.	Bitcoin more powerful than fastest supercomputers	What does bitcoin mean to you? To me it means freedom.	Bitcoin more powerful than fastest supercomputers	Another truth: Many find Bitcoin or cryptos difficult to understand.
Brain games	Brain training games will not help children do better at school	Science shows that "brain training" games do not work…	51 brain games guaranteed to boost your brain power	Just downloaded 3 brain training apps. Brain is gonna be trained.	51 brain games guaranteed to boost your brain power	Science shows that "brain training" games do not work…
Minimum wage	Minimum wage bill could eliminate 1.3 million jobs, CBO says	The argument to raise minimum wage is a joke	Why a higher minimum wage is not all bad news for small businesses	Raise minimum wage so everyone benefits	Why a higher minimum wage is not all bad news for small businesses	The argument to raise minimum wage is a joke
Keto diet	Why this dietitian is completely against the keto diet	Keto day 2 and I think I got keto flu	Why the ketogenic diet may help fight diabetes, cancer	wait omg what's the recipe. I want to try the keto diet	Why the ketogenic diet may help fight diabetes, cancer	Keto day 2 and I think I got keto flu
Plastic straw ban	Plastic straw bans hurt kids and adults with disabilities, advocates say	Boycott stores or restaurants that ban plastic straws.	Making progress in reducing our dependence on plastic straws	Find it so selfish when I see people complaining about the ban on plastic straws	Making progress in reducing our dependence on plastic straws	Boycott stores or restaurants that ban plastic straws.

Note: Examples of stimuli used in the consistent and inconsistent conditions in the current study. For the inconsistent condition, studied items were also counterbalanced such that across participants there were news headlines that were anti position and tweets that were pro position within each topic.

(e.g., pro-Keto diet – "Why the ketogenic diet may help fight diabetes, cancer") and tweets (e.g., pro-Keto diet – "Wish me luck on this, my first doctor approved keto journey").

For each study list, we counterbalanced the position (pro/anti) for each type of information (headlines and tweets). In the inconsistent condition, headlines conveyed the pro position and tweets conveyed the anti-position for three topics and vice versa for the other three topics. In the consistent condition, the headlines and tweets for three topics conveyed the pro position, and for the other three topics, the anti-position.

We also counterbalanced the position (pro/anti) presented for each topic across participants. Across all participants in the inconsistent condition, each topic had headlines as pro and tweets as anti, or vice versa, an equal number of times. Similarly, in the consistent condition, each topic was presented as a pro topic or anti topic an equal number of times.

The remaining 48 of the 96 items for each condition were later used as nonstudied new items in the recognition task. To counterbalance, we presented each item as studied (old) or nonstudied (new) an equal number of times across participants. Nonstudied items in the recognition task conveyed the same position as the corresponding studied headlines and tweets of the same topic (e.g., if studied headlines were pro-Keto diet, nonstudied headlines were also pro-Keto diet). Altogether, counterbalancing resulted in a total of eight study lists (four for each for the consistent and inconsistent conditions) used equally often. The word count for headlines and tweets did not differ, both in the total 192 stimulus set ($p = .68$) and for each of the eight study lists (*ps* ≥.09).

2.4 | Procedure

The sequence of phases was – study, recall task, filled delay, and recognition task.

2.4.1 | Study phase

Participants were told they would see news headlines from news media organizations and tweets from people on Twitter and that we were interested in how people process information. To ensure that participants pay attention to each study item, they were instructed to rate each item for self-relevance (i.e., how personally relevant

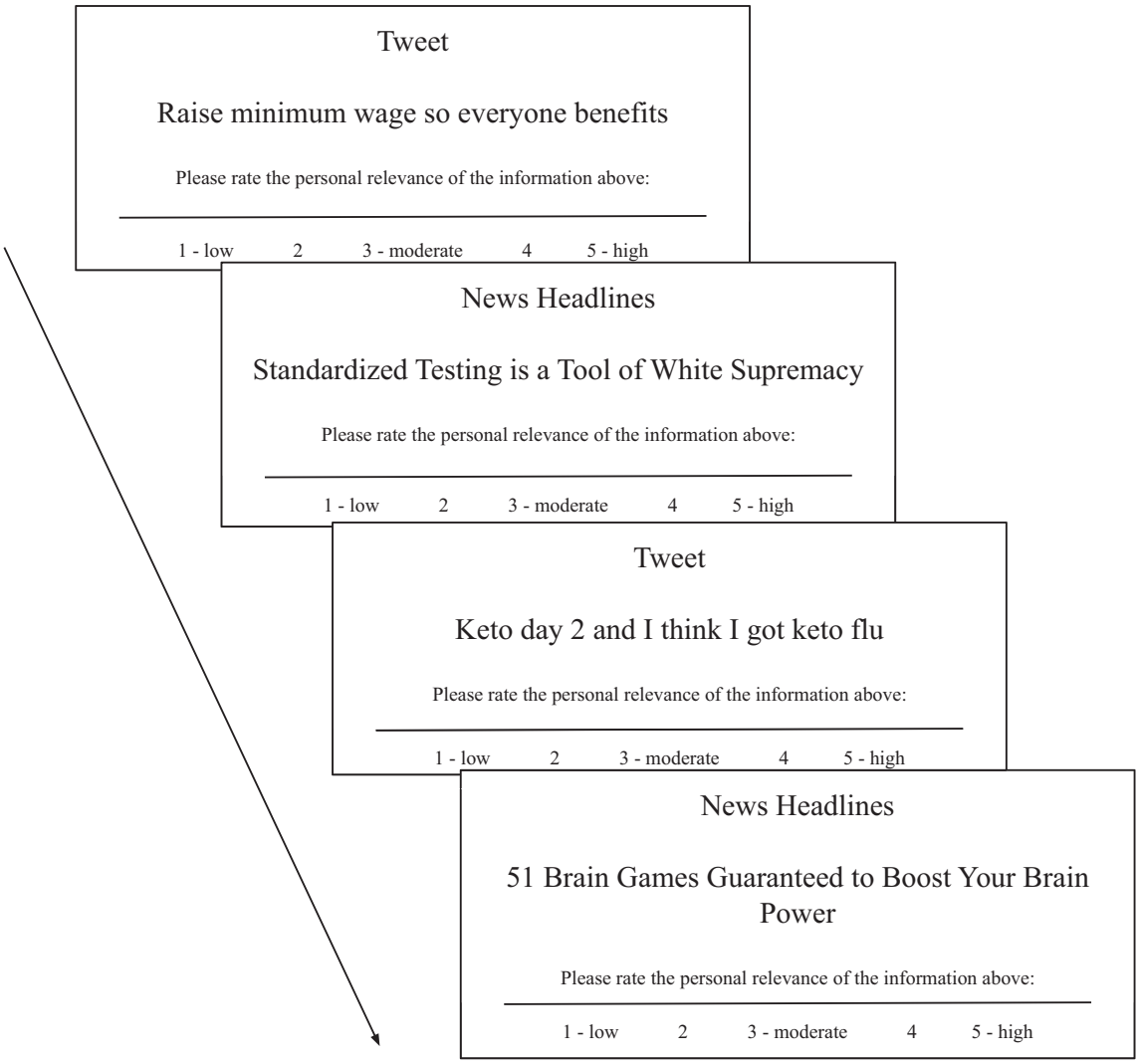

FIGURE 1 An illustration for the study phase presentation of news headlines and tweets. This is a visual depiction of how tweets and news headlines were presented in the current experiments. As mentioned in General Method, each item was presented for 15-s, and the order presentation was randomized for each participant with respect to the condition.

that item is to them) on a 5-point scale (1 = not at all; 3 = moderately; 5 = highly). They were also told that there is no right or wrong way to rate these items and were informed about some sort of memory tests later. Study items were presented individually on the screen for 15 seconds in a randomized order with respect to condition, with the Source label ("News Headline" or "Tweet") shown above each study item (see Figure 1 for a visual depiction). As noted, to ensure that items did not differ in terms of visual appearance or extraneous features, only the text content of the tweets and headlines was presented. The purpose of this standardization was to ensure participants focus on the source of the statement and its processing while reducing extraneous information that can differ unsystematically between these two sources. Participants could respond with their ratings any time during the 15-s period. Upon response, the rating scale disappeared but the item remained on the screen for the full 15 seconds. After study, participants played an unrelated game (described later).

2.4.2 | Recall phase

Next, participants completed a free recall task where they were instructed to recall as many study statements as possible and type each statement as close to the original wording as they could. Recalled items were on the screen for the duration of the recall period. Based on pilot testing, participants had 12 min to complete recall. As past research has mainly used the recognition task (Bourne et al., 2020; Mickes et al., 2013), inclusion of a recall task provided a measure of distortion in memory and a useful test of generalizability.

2.4.3 | Filled delay

After recall, participants again played an unrelated game (described later).

2.4.4 | Recognition phase

Participants saw 96 items (48 studied; 48 nonstudied) one at a time at their own pace and made Old/New responses as well as confidence judgments (1 = not at all confident; 3 = somewhat confident, 5 = very confident) on each. Finally, at the end of each experiment, participants responded to exploratory questions that were not related to the main research questions and will not be discussed.

3 | EXPERIMENT 1

Experiment 1 was conducted in an in-person laboratory setting.

3.1 | Participants

Seventy-eight participants completed this experiment, of whom we removed six for the following reasons: four participants were outliers in the recognition analyses (i.e., above 2.5 standard deviations above or below the mean), one participant recalled items from another study, and one participant did not complete the study. The final sample consisted of 72 participants of which 40 (55.6%) identified as women, 31 (43.1%) identified as men, and one person did not report their gender. Additionally, 39 (54.2%) of participants identified as Asian, 19 (26.4%) identified as White, five (6.94%) identified as "Other", four (5.56%) identified as Mixed, three (4.17%) identified as Black/African American, one (1.39%) participant identified as Native Hawaiian or Pacific Islander, and one (1.39%) person did not disclose their race.

3.2 | Procedure

Participants signed the consent form and then read the instructions for the study phase. Before beginning the study phase, participants first completed five practice trials (with practice stimuli similar to but not from the target stimulus set), to gain familiarity with the study task. After the study phase, participants played virtual Solitaire on the computer for 3 min before the recall task. After recall, participants played Solitaire again and additionally completed two sets of mazes. This delay period was about 50 min and was based on pilot testing to avoid ceiling effects in the recognition memory task that participants performed next. The experiment took about 2 h.

3.3 | Results and discussion

To assess how headlines versus tweets were retrieved across the consistent versus inconsistent conditions, we first report how recall and memory distortion were measured in both Experiments 1 and 2. Next, in both experiments, we analyzed (1) recall performance; (2) memory distortion in recall; (3) recognition memory and confidence judgments; and (4) self-relevance ratings from the encoding phase for headlines and tweets. All analyses were two-tailed, the alpha value was set at .05 a priori, and all effect sizes were calculated with partial eta-squared (η_p^2; Cohen, 1973) and Cohen's d (Cohen, 1988) in both experiments.[1] The analyses presented have outliers removed as per the registered decision to remove participants with low effort. The patterns remain the same with the inclusion of outliers.

3.3.1 | Measuring information recalled and memory distortion

As headlines and tweets were in sentence formats, the recalled versions of these items were coded to examine recall (Johnson et al., 2023). Each recalled item was traced to a single corresponding study item and scored for its level of distortion compared to the original study item (0 = not at all distorted – 10 = highly distorted). Items that could not be traced back to a single study item were categorized as one of four types – gist, if it summarized or generally referred to a topic; blend, if it included components of multiple study items; related intrusion to one of the studied topics; or unrelated intrusion. Taken together, such items were low in both conditions (inconsistent: $M = 3.75$, $SD = 2.77$; consistent: $M = 2.67$, $SD = 2.15$, $t(70) = 1.85$, $p = .068$, $d = .437$, 95% CI [−2.25, .08]), and will not be considered further.

A total of 1076 items were recalled across all participants. To establish interrater reliability, 20% of these items were coded by two independent raters who were masked to the condition to which the recalled item belonged. Cohen's kappa for interrater agreement was found to be substantial ($\kappa = .83$). From this subset, an equal number of items from each coder was included in the dataset. The remaining items were equally divided and assigned for each coder.

3.3.2 | Recall of tweets and news headlines

We conducted a 2 (Source: tweets, headlines) × 2 (Information Consistency: inconsistent, consistent) mixed analysis of variance (ANOVA) to compare recall performance. A main effect of source indicated that tweets were recalled significantly more than headlines, $F(1, 70) = 7.11$, $p = .009$, $\eta_p^2 = .092$. This pattern was observed both in the inconsistent and the consistent conditions such that tweets (inconsistent condition: $M = .265$, $SD = .109$; consistent condition: $M = .257$, $SD = .143$) were recalled more than headlines (inconsistent condition: $M = .212$, $SD = .108$; consistent condition: $M = .228$, $SD = .151$). Overall recall levels did not differ between the inconsistent and consistent conditions, $F(1, 70) = .024$, $p = .878$, $\eta_p^2 < .001$. The interaction between source and information consistency was not significant, $F(1, 70) = .62$, $p = .433$, $\eta_p^2 = .009$, indicating that the recall advantage for tweets over headlines was equivalent between the inconsistent and consistent conditions (Figure 2, Panel A).

A similar pattern emerged in the exploratory analyses of distortion levels in recall; tweets were less distorted in recall than the

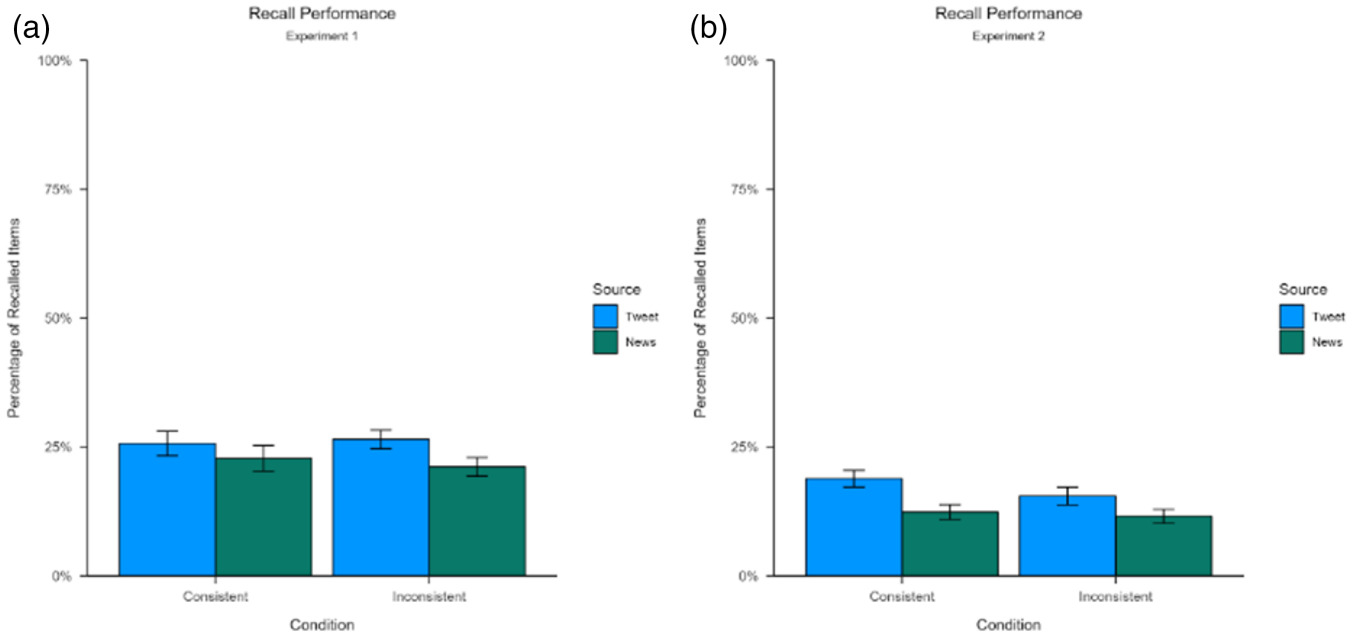

FIGURE 2 Recall performance across Experiment 1 (in person) and Experiment 2 (online). Percentage of tweets and news headlines recalled in the inconsistent and consistent conditions. Panel A depicts Experiment 1 and Panel B depicts Experiment 2. Error bars represent standard error.

headlines, $F(1, 66) = 18.36$, $p < .001$, $\eta_p^2 = .218$, in both the inconsistent (tweets: $M = 3.93$, $SD = 1.25$; headlines: $M = 4.49$, $SD = 1.54$) and consistent conditions (tweets: $M = 3.52$, $SD = 1.43$; headlines: $M = 4.51$, $SD = 1.45$). The distortion levels for recalled tweets and headlines did not differ between the inconsistent and consistent conditions, $F(1, 66) = 1.45$, $p = .233$, $\eta_p^2 = .022$, and there was no significant interaction between source and information consistency, $F(1, 66) = .929$, $p = .339$, $\eta_p^2 = .014$.

3.3.3 | Recognition memory for tweets and news headlines

To compare recognition performance, we examined the corrected recognition rate (hits minus false alarms), and the proportions of hits and false alarms, for both tweets and news headlines, using 2 (Source: tweets, headlines) × 2 (Information Consistency: inconsistent, consistent) mixed ANOVAs.

Like the recall patterns, tweets were recognized more accurately than headlines in corrected recognition, $F(1, 70) = 29.20$, $p < .001$, $\eta_p^2 = .294$, in both the inconsistent (tweets: $M = .77$, $SD = .14$; headlines: $M = .67$, $SD = .19$) and the consistent conditions (tweets: $M = .74$, $SD = .18$; headlines: $M = .65$, $SD = .19$). The inconsistent and consistent conditions did not differ in overall corrected recognition, $F(1, 70) = .52$, $p = .472$, $\eta_p^2 = .007$, and the interaction between source and information consistency variables was not significant, $F(1, 70) = .18$, $p = .672$, $\eta_p^2 = .003$ (Figure 3, Panel A).

Better corrected recognition for tweets compared to news headlines was driven by both higher hits and fewer false alarms (see Table 2). There was a main effect of source on hits, $F(1, 70) = 17.62$, $p < .001$, $\eta_p^2 = .201$, with studied tweets being recognized as studied more often than studied headlines in both the inconsistent condition and consistent condition. Additionally, there was a main effect of source on false alarms, $F(1, 70) = 12.02$, $p < .001$, $\eta_p^2 = .147$; tweets received fewer false alarms than news headlines. Again, there was no main effect of information consistency for hits, $F(1, 70) = .04$, $p = .852$, $\eta_p^2 < .001$, or false alarms, $F(1, 70) = 1.11$, $p = .297$, $\eta_p^2 = .016$, nor an interaction between source and information consistency for hits, $F(1, 70) = .01$, $p = .937$, $\eta_p^2 < .001$, and false alarms, $F(1, 70) = .78$, $p = .381$, $\eta_p^2 = .011$.

Analyses of confidence ratings in the recognition memory task were exploratory in nature and showed that recognition judgments for tweets received higher confidence ratings than did headlines, $F(1, 70) = 59.07$, $p < .001$, $\eta_p^2 = .458$, and in both the inconsistent (tweets: $M = 4.04$, $SD = .55$; headlines: $M = 3.87$, $SD = .49$) and consistent conditions (tweets: $M = 4.03$, $SD = .52$; headlines: $M = 3.80$, $SD = .53$) (see Figure 3, Panel A). These pattern of results for confidence did not differ between the inconsistent and consistent conditions as neither the main effect of information consistency, $F(1, 70) = .099$, $p = .755$, $\eta_p^2 = .001$, nor an interaction between source and information consistency, $F(1, 70) = 1.184$, $p = .280$, $\eta_p^2 = .017$, was significant. Confidence ratings were generally higher for tweets compared to headlines for both hits and false alarms (see Supplemental Materials for these exploratory analyses).

Taken together, across a variety of measures—recall, the extent of distortion in recall, recognition memory, and confidence judgments—the patterns of findings converged to show a striking memory advantage for microblog information in Experiment 1. First, we replicated an overall microblog advantage in memory (Mickes et al., 2013). Next, novel to our study, we observed a memory advantage for microblog information not only when the information was consistent across tweets and headlines but also when the information was inconsistent.

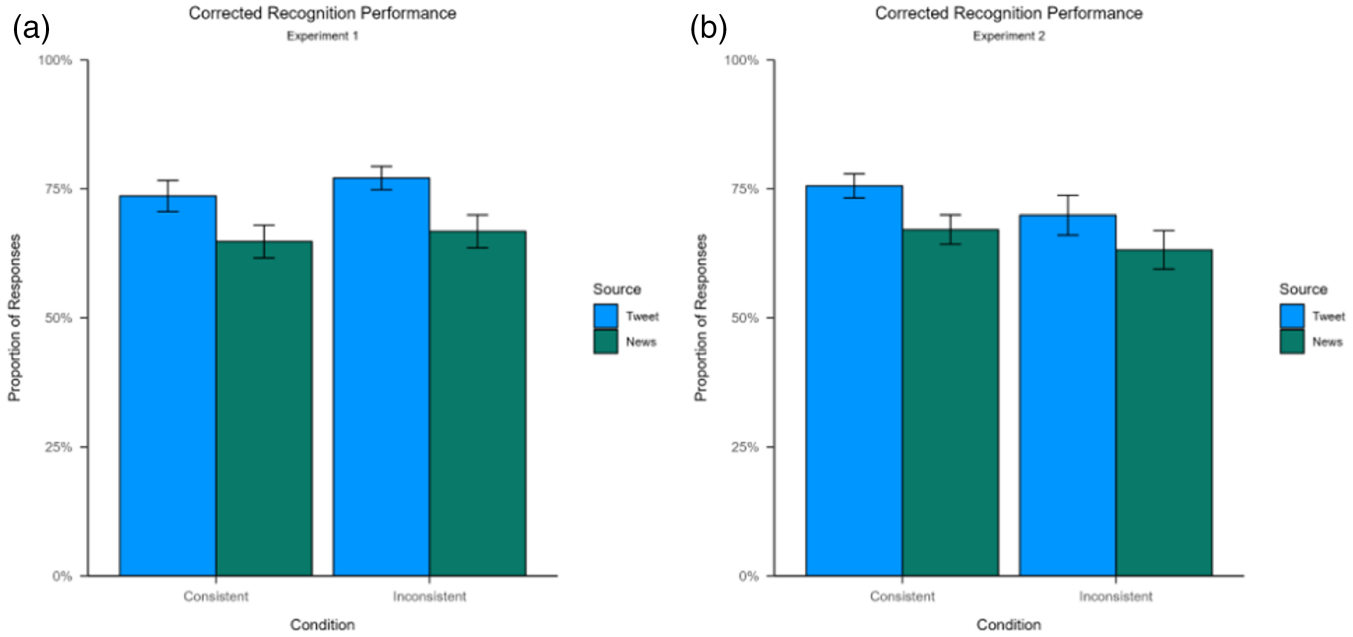

FIGURE 3 Corrected recognition performance across Experiment 1 (in person) and Experiment 2 (online). Proportion of corrected recognition (hits minus false alarms) for tweets and news headlines in the inconsistent and consistent conditions. Panel A depicts Experiment 1 and Panel B depicts Experiment 2. Error bars represent standard error.

TABLE 2 Hits and false alarm rates in Experiments 1 and 2.

	Experiment 1				Experiment 2			
	Hits		False alarms		Hits		False alarms	
	Tweets	Headlines	Tweets	Headlines	Tweets	Headlines	Tweets	Headlines
Inconsistent	.85 (.02)	.79 (.03)	.08 (.01)	.12 (.02)	.81 (.03)	.76 (.03)	.11 (.02)	.13 (.02)
	[.81, .88]	[.74, .84]	[.05, .10]	[.09, .15]	[.76, .86]	[.71, .86]	[.07, .15]	[.08, .17]
Consistent	.84 (.02)	.78 (.03)	.11 (.02)	.13 (.02)	.86 (.02)	.81 (.02)	.10 (.02)	.14 (.02)
	[.80, .89]	[.72, .84]	[.07, .14]	[.10, .17]	[.82, .90]	[.77, .85]	[.08, .13]	[.10, .17]

Note: Summary of hits and false alarms for tweets and news headlines in the inconsistent and consistent conditions. Standard errors are shown in parentheses and 95% confidence intervals for the mean values are presented in brackets below the means.

Finally, we examined the self-relevance ratings participants provided at encoding. We performed these exploratory analyses given that participants were informed for each study item whether it was a news headline or a tweet, and relevance ratings can index the extent to which participants relate to information. Interestingly, participants reported higher self-relevance ratings for headlines than tweets, $F(1, 70) = 16.58$, $p < .001$, $\eta_p^2 = .192$, in both the inconsistent (tweets: $M = 2.53$, $SD = 1.29$; headlines: $M = 2.79$, $SD = 1.25$) and the consistent conditions (tweets: $M = 2.71$, $SD = 1.33$; headlines: $M = 2.88$, $SD = 1.29$). The inconsistent and consistent conditions did not differ in self-relevance ratings, $F(1, 70) = 1.55$, $p = .218$, $\eta_p^2 = .022$, and the interaction between source and information consistency was not significant, $F(1, 70) = .73$, $p = .396$, $\eta_p^2 = .01$. These interesting findings suggest that people found news headlines more relatable than social media information, and yet their memory was better for tweets.

In sum, greater credibility attributed to news sources (Gottfried et al., 2018; Liedke & Gottfried, 2022), and higher self-relevance ratings given to these items, did not make information from these sources more memorable or even equivalently memorable compared to information from a presumably less credible source, that is, Twitter. Instead, even after being exposed to contradictory information across sources, participants remembered tweets better than news headlines.

4 | EXPERIMENT 2

We conducted Experiment 2 to examine our key questions in an online environment. Here, participants joined from remote locations and performed the study and test tasks fully online. The use of a completely virtual environment provides a unique window to examine

memory for tweets and headlines under conditions that are relevant to the questions at hand. This is because online access is not only necessary for gaining exposure to personal posts on social media, but it is also becoming increasingly common for consuming news headlines. This experiment thus created an opportunity to test whether our in-person findings extend to this prevalent and naturalistic environment for consuming information.

4.1 | Participants

We recruited a total of 129 volunteer undergraduate students at Stony Brook University. As is often the case in online experiments (Finley & Penningroth, 2015), we had to remove 53 participants for the following reasons: Thirty-six participants did not recall any correct statements in the recall task, and 14 participants left the study before completion. In addition, we removed four participants for outlier performance (i.e., below the first quartile or above the third quartile) in the recognition task, and three participants who were outliers in the recall task. We used these exclusion criteria in Experiment 2 because participants were not monitored during tasks which can encourage cheating or less effort (Greeley et al., 2022). As in Experiment 1, we report analyses without these outliers, and once again, performance patterns do not change with the outliers included. The final sample reported below comprised of 72 participants, of which 53 (73.60%) identified as women, 18 (25%) identified as men, and one (1.40%) participant identified as nonbinary. Additionally, 38 (52.8%) participants identified as Asian, 24 (33.33%) identified as White, six (8.33%) identified as Black/African American, three (4.17%) identified as mixed, and one (1.40%) participant did not report their race.

4.2 | Procedure

Given a lack of proctoring in fully online experiments which is standard in laboratory experiments, we made minor adjustments to implement this experiment relative to Experiment 1. These adjustments were designed to encourage the participants to complete the tasks to the best of their abilities without potentially leaving in the middle of the session or coasting through the experiment. Therefore, we distilled the procedure to keep all elements in the same order and reduce the total duration of the experiment to an hour. Participants accessed the experiment via a Qualtrics link at a time convenient to them (i.e., asynchronously) to begin. Participants first viewed and electronically signed the consent form. Next, they were told the experiment would last approximately 60 min and they should complete it in one sitting. Participants then read the study phase instructions and clicked a "continue" button to perform the study task. A short delay of 3 min followed where participants played Sudoku before proceeding to the recall task. After the recall phase, participants played Sudoku again for 10 min, and then moved onto the self-paced recognition memory task. The total experimental session lasted about an hour. The second, filled delay phase was reduced in length in this experiment based on pilot work showing that a shorter delay was sufficient to reduce ceiling effects in the online recognition memory task.

4.3 | Results and discussion

As in Experiment 1, we assessed memory for headlines versus tweets in the inconsistent versus consistent conditions using the same measurement and analytic approaches.

4.3.1 | Recall of tweets and news headlines

Once again, two masked coders scored a total of 504 items recalled across all participants from our final sample. As described earlier, higher scores represent more distorted recall. Cohen's kappa for inter-rater agreement was found to be substantial ($\kappa = .86$). A lower number of recalled items in this experiment reflect a reduction in memory performance seen when switching from in-person to online testing environments (Finley & Penningroth, 2015; Greeley et al., 2022).

We conducted a mixed 2 (Source: tweets, headlines) × 2 (Information Consistency: inconsistent, consistent) ANOVA which yielded a significant main effect of source on recall, $F(1, 70) = 18.99$, $p < .001$, $\eta_p^2 = .21$. Tweets (inconsistent: $M = .155$, $SD = .104$; consistent: $M = .189$, $SD = .097$) were recalled significantly more than headlines in both the inconsistent and the consistent conditions (inconsistent: $M = .115$, $SD = .081$; consistent: $M = .124$, $SD = .087$). These findings parallel Experiment 1 patterns and extend the memory advantage for tweets to a completely virtual environment. Additionally, once again we did not observe a main effect of information consistency, $F(1, 70) = 1.38$, $p = .244$, $\eta_p^2 = .02$, or an interaction between source and information consistency, $F(1, 70) = 1.01$, $p = .318$, $\eta_p^2 = .01$.

To test differences in memory distortion, as before, we conducted a mixed 2 (Source: tweets, headlines) × 2 (Information Consistency: inconsistent, consistent) ANOVA. Unlike Experiment 1, we did not observe a main effect of source on memory distortion, $F(1, 58) = .05$, $p = .82$, $\eta_p^2 = .0008$. The main effect of information consistency was also not significant, $F(1, 58) = .37$, $p = .546$, $\eta_p^2 = .006$, and the interaction was not significant, $F(1, 58) = 2.72$, $p = .104$, $\eta_p^2 = .045$. This absence of differences in memory distortion across experimental conditions likely reflects lower recall levels in Experiment 2 given the online testing conditions (Greeley et al., 2022) relative to the in-person Experiment 1. We return to this point in the General Discussion.

4.3.2 | Recognition memory for tweets and news headlines

We compared recognition performance across experimental conditions with a mixed 2 (Source: tweets, headlines) × 2 (Information Consistency: inconsistent, consistent) ANOVA for corrected recognition, and hits and false alarms separately (see Table 2).

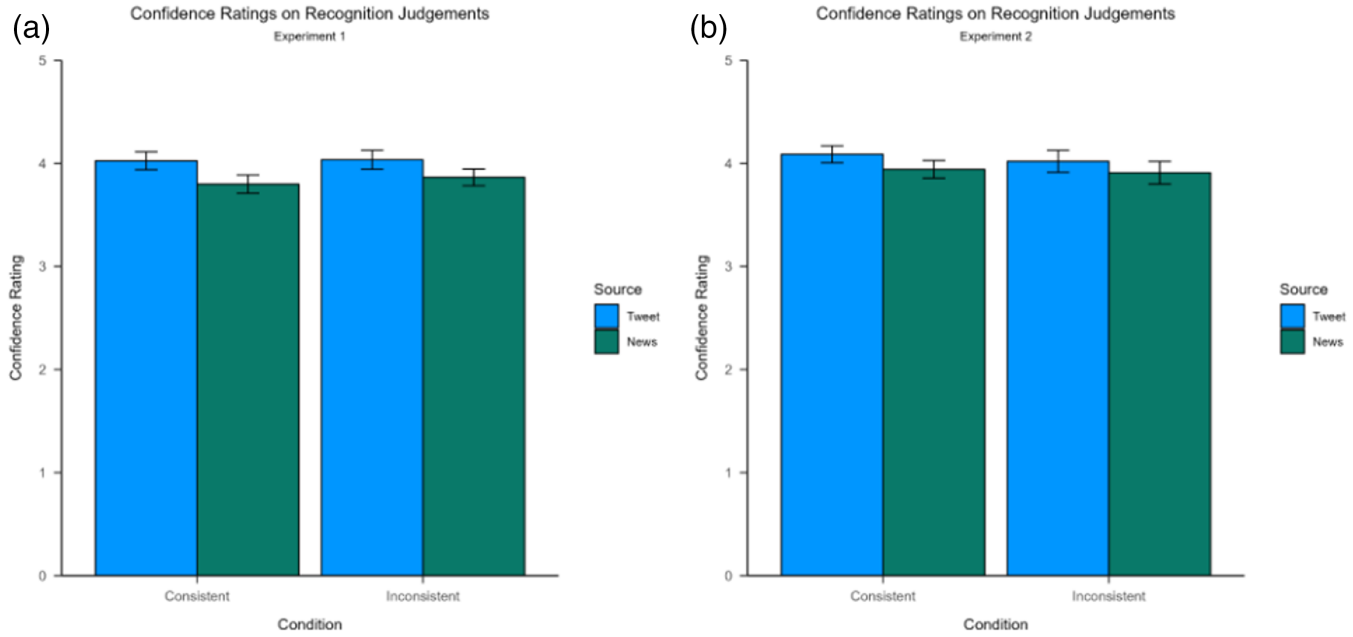

FIGURE 4 Recognition confidence judgments across Experiment 1 (in person) and Experiment 2 (online). Recognition confidence ratings for tweets and news headlines in the inconsistent and consistent conditions with higher values representing more confidence. Panel A depicts Experiment 1 and Panel B depicts Experiment 2. Error bars represent standard error.

For corrected recognition, we observed a significant main effect of source, $F(1, 70) = 15.69$, $p < .001$, $\eta_p^2 = .18$, with tweets being more accurately recognized than headlines. This microblog memory advantage once again occurred in both the consistent (tweets: $M = .76$, $SD = .14$; headlines: $M = .67$, $SD = .17$) and inconsistent (tweets: $M = .70$, $SD = .23$; headlines: $M = .63$, $SD = .22$) conditions. There was no significant main effect of information consistency, $F(1, 70) = 1.32$, $p = .254$, $\eta_p^2 = .02$, or an interaction, $F(1, 70) = .21$, $p = .65$, $\eta_p^2 = .003$. These results match the patterns from Experiment 1 (see Figure 3, Panel B).

Like Experiment 1, there was a significant main effect of source for recognition hits, $F(1, 70) = 12.75$, $p < .001$, $\eta_p^2 = .15$; participants recognized studied tweets more accurately than studied headlines in both the inconsistent condition and the consistent condition. There was no main effect of information consistency, $F(1, 70) = 2.83$, $p = .10$, $\eta_p^2 = .04$, or an interaction, $F(1, 70) = .006$, $p = .937$, $\eta_p^2 < .001$.

The general pattern for false alarm rates across conditions was in the same direction as Experiment 1. The main effect of source was significant overall, $F(1, 70) = 5.57$, $p = .021$, $\eta_p^2 = .074$; with patterns of lower false alarms for tweets than headlines in both the inconsistent condition and consistent condition. The main effect of information consistency was not significant, $F(1, 70) = .0006$, $p = .98$, $\eta_p^2 < .001$, nor was the interaction, $F(1, 70) = .56$, $p = .46$, $\eta_p^2 = .008$.

For recognition confidence ratings, we observed a main effect of source, $F(1, 70) = 35.29$, $p < .001$, $\eta_p^2 = .34$, with participants reporting more confidence when making judgments on tweets (inconsistent: $M = 4.02$, $SD = 1.12$; consistent: $M = 4.09$, $SD = 1.11$) than headlines (inconsistent: $M = 3.91$, $SD = 1.16$; consistent: $M = 3.94$, $SD = 1.15$) in both the inconsistent and consistent conditions. Once again, we did not observe a main effect of information consistency, $F(1, 70) = .14$, $p = .709$, $\eta_p^2 = .002$, nor an interaction, $F(1, 70) = .67$, $p = .42$, $\eta_p^2 = .009$. These patterns also parallel the Experiment 1 findings (see Figure 4, Panel B). Confidence ratings were higher for tweets than news headlines for hits as in Experiment 1, but not for false alarms (for details, see our Supplemental Materials).

As in Experiment 1, we once again explored the self-relevance ratings that participants gave at encoding and observed parallel patterns of results. A 2 (Source: tweets, headlines) × 2 (Information Consistency: inconsistent, consistent) mixed ANOVA showed that participants reported higher self-relevance ratings for headlines than tweets, $F(1, 70) = 11.44$, $p = .001$, $\eta_p^2 = .14$, in both the inconsistent (tweets: $M = 2.57$, $SD = 1.33$; headlines: $M = 2.68$, $SD = 1.31$) and the consistent conditions (tweets: $M = 2.76$, $SD = 1.38$; headlines: $M = 2.97$, $SD = 1.35$). The inconsistent and consistent conditions did not statistically differ in self-relevance ratings, $F(1, 70) = 2.76$, $p = .10$, $\eta_p^2 = .038$, and the interaction between source and information consistency variables was not significant, $F(1, 70) = .93$, $p = .34$, $\eta_p^2 = .013$. In sum, the range of findings in Experiment 2 by and large showed the same patterns as Experiment 1.

5 | GENERAL DISCUSSION

The internet has expanded the availability, abundance, and sources of information to which we now have access (e.g., Pew Research Center, 2019). This vast increase in access, in turn, is increasing the worrisome potential for us to receive contrasting messages from different sources. Inconsistent messages are particularly common across

information from news media and social media platforms. To understand the impact of mixed messaging across sources on memory, this study was designed to assess the memorability of contradictory information across news sources and social tweets.

Novel to our study, better memory for tweets over headlines emerged not only when these two sources conveyed consistent messages but also when they conveyed inconsistent messages. This striking pattern of a memory advantage for tweets occurred across experiments and across memory measures. In Experiment 1, participants' recall was higher and less distorted for tweets, their recognition memory for tweets was more accurate (with more hits and fewer false alarms), and they reported greater confidence in recognition memory for tweets than headlines.

In Experiment 2, we examined our key novel findings from Experiment 1 in a completely virtual environment, where participants studied, recalled, and recognized the headlines and tweets asynchronously from their personal devices. Similar patterns of memory performance emerged; participants recalled tweets more often, recognized tweets more accurately, and reported higher confidence in recognition memory for tweets than news headlines.

One finding diverged from Experiment 1 to Experiment 2 such that memory distortion between news headlines and tweets did not differ in Experiment 2. However, as noted earlier, participants working in the remote, online format exhibited lower recall overall. In fact, these participants collectively recalled approximately half as many items as our in-person participants (504 vs. 1076 items, respectively). This drop suggests that our online participants put forth less effort in recall than our in-person participants, a pattern we have observed in other online experiments (Greeley et al., 2022). This possibility and other potential explanations should be explored in future research to understand how data quality may change in online studies (Pozzar et al., 2020). Otherwise, the overall patterns of findings between the two experiments mapped onto each other, and showed that a memory advantage for tweets over headlines occurs regardless of whether people consume and recall information in-person or online, and notably, regardless of whether the messaging is consistent or inconsistent across information sources. Finally, across both experiments, exploratory analyses showed that participants gave higher self-relevance ratings to news headlines than tweets, yet headlines were not as memorable.

An additional novel contribution of our study was to extend a test of the mnemonic advantage for microblog information to recall performance. Previous work has reported the microblog memory advantage in recognition memory (Bourne et al., 2020; Mickes et al., 2013), whereas we tested this phenomenon, both in-person and online, using both the recall and recognition tasks. Our findings showed that the microblog advantage appears in free recall as well. In our study, recall intentionally preceded the recognition memory task and thus might have had some influence on recognition memory performance. However, this procedural detail cannot fully explain the mnemonic advantage we observed in recognition memory given relatively low recall performance and the substantially higher recognition memory performance, in conjunction with previous work reporting the same pattern of microblog advantage in recognition memory without a preceding recall task.

5.1 | Inconsistent information and memory for news and social media

When considering how people might retain inconsistent information from news versus social media, prior literature suggested two competing predictions, one based on the effects of source credibility on memory (Davis & Meade, 2013; Dodd & Bradshaw, 1980; Fenn et al., 2014; Kwong See et al., 2001; Skagerberg & Wright, 2009; Underwood & Pezdek, 1998) and another based on a memory advantage for microblog information (Bourne et al., 2020; Mickes et al., 2013). The source credibility account suggests that people are likely to discount social media information due to its lower credibility relative to news (e.g., Masta & Shearer, 2018), and thus have better memory for news. By contrast, past reports of a microblog advantage (e.g., Mickes et al., 2013) suggest that people may exhibit better memory for social media information because of its gossipy nature, despite its lower source credibility, than for news items. The present study tested these competing predictions.

When both headlines and social tweets conveyed the same (i.e., consistent) message in our study, we expected better memory for tweets than headlines, because source credibility did not compete with the microblog memory advantage. Past research tested memory for microblogs under conditions where information was unrelated within and across sources (Bourne et al., 2020; Mickes et al., 2013). The implementation of the consistent condition in our study (where tweets and headlines within a given topic were "paired" for providing similar messaging) provided a new way to test the memory advantage for microblog information. Our findings provide further support that the gossipy way in which information is written can make it more memorable than similar information written otherwise.

Our key, novel question focused on how the competing influences of source credibility and microblog advantage would play out when news headlines and social tweets conveyed conflicting messages. Here, our findings across two experiments and multiple measures showed that participants retained tweets better than news headlines and exhibited more confidence in their recognition memory for tweets than headlines, even when these sources provided inconsistent messages.

In the context of other findings that people are sensitive to the credibility of the source when incorporating post-event information into memory (Davis & Meade, 2013; Kwong See et al., 2001; Skagerberg & Wright, 2009; Underwood & Pezdek, 1998), our findings point to circumstances where people are not likely to consider source credibility when consuming information. In our experiments, we aimed to simulate everyday experiences, where people encounter information continually across sources online, by presenting the tweets and headlines in a randomly intermixed fashion. We did not find evidence that inconsistencies under these conditions influence memory. Other studies find effects of higher credible sources when

differences between sources are salient and easy to detect, for example, when information is presented from less reliable sources immediately after the original studied information (e.g., Davis & Meade, 2013; Fenn et al., 2014; Kwong See et al., 2001; Skagerberg & Wright, 2009). However, detection of such differences may not occur across other circumstances, and as a result, the extent to which source credibility is considered can vary (Ecker et al., 2014). As such, detection can depend on the volume of information one consumes as well as the order in which they see information from sources. The findings from our study advance this body of work to show that when there is continual information load in everyday life, differences in information or source credibility can go undetected. In line with this reasoning, recent research shows that individuals may need nudges and directives to consider accuracy of information (Brashier et al., 2020; Fazio et al., 2015).

Another possibility is that the aforementioned mechanisms—the memory advantage for processing the particular way in which microblogs are expressed versus assessment of source credibility—might operate independently and not influence each other.[2] That is, judging source credibility might be more meta-cognitive in nature whereas processing microblogs may call for more basic-level cognitive processing, and therefore, the types of operations may not occur at the same level to influence each other. As noted in the Introduction, assessing credibility may also entail basic cognitive processing associated with increased attention and effort (Bourne et al., 2020), and it is also possible that metacognitive processing can override or influence basic cognitive processes. Nonetheless, these distinct theoretical considerations provide avenues for future research in exploring the conditions that influence the microblog memory advantage.

Finally, our findings also suggest that Twitter feeds may serve as a low credibility source only when people evaluate confidence in their memory for misinformation, that is, when their memories are not reliable (Fenn et al., 2014), and not for information that was clearly seen (or clearly not seen) before. In our study, where no misinformation was presented, participants' responses were based on information seen before (or not seen) regardless of whether they saw consistent or inconsistent statements across tweets and headlines. Our findings of better recall and recognition for tweets over headlines as well as higher confidence in recognizing tweets demonstrate the robustness of the memory advantage for microblog information under these conditions. These findings also point to the potentially concerning implications for situations where tweets may provide incorrect information relative to headlines, but their higher memorability may override considerations of accuracy. Together, our findings point to conditions where the impact of social media communications on memory and cognition can be considerable.

5.2 | Microblog information and memory

The present study advances our understanding of a memory advantage for social media information by showing that a microblog memory advantage occurs even when information from social media conflicts with news information on a given topic. Our experiments show that people exhibit better memory for tweets than headlines under a range of conditions.

This robustness of the memory advantage for social media discourse provides support for the explanations about the importance of self-expression, that is, the personal and conversational qualities of expressing views on social media, in guiding memory. Mickes et al. (2013) have attributed the memory advantage for microblog information to the informal language, spontaneous tone, and the gossipy and social content of microblog information that facilitates information processing and retrieval. As Mickes et al. (2013) also noted, the syntax typically used in microblogs contributes to its memorability. Microblog communication is often shorthand, informal, and conversational.

Another property of microblogs that may enhance memory is the sociality of this information. Microblogs may also serve as an adaptive medium through which people share personal information to form social connections (Bietti et al., 2019). Social media platforms and profiles are often used to express oneself in the context of communicating with others (e.g., provide status updates), and information people share online often involves social comparison (Vogel et al., 2015) such as gossip. Such practices may promote memory benefits associated with the processing of socially relevant information (e.g., Reysen & Adair, 2008). In this context, tweets can serve as social sources containing interpersonal information and these features may improve memory performance compared to information presented by nonsocial sources such as news headlines. Previous work on this possibility shows that when non-microblog information was processed in a socially oriented manner (e.g., thinking of an individual who could be the source of the information), participants did exhibit better memory for it (Mickes et al., 2013, Experiment 2). However, this improvement was also observed for microblog information, indicating that whether one believes information came from a social source cannot by itself explain the memory advantage for microblog information as tested under these conditions (Mickes et al., 2013).

In the current study, the mnemonic advantage for microblog information persisted under conditions when microblogs conveyed messages that were either consistent or inconsistent with the messages in the news sources. This pattern lends further support to the explanation that the way microblog messages are written, that is, their social and gossipy content and informal wording, drives the microblog memory advantage rather than the content itself. The inconsistent condition in our experiments provides a particularly useful test of this explanation as the inconsistency in messaging captures a frequent feature of the more naturalistic conditions where readers may need to consider the credibility of the sources when consuming the message. Yet, participants' memory was better for tweets than new headlines in our study. This finding is also in line with previous work showing a mnemonic advantage for tweets over news headlines even when the tweets were presented in a CNN format (Bourne et al., 2020). We observed this memory advantage even when participants did not have additional visual information at study (e.g., emojis) that is often found in tweets, and were given only the source of the statement (i.e., "tweet" or "news headline").

More broadly, memorability of tweets over headlines also aligns with an extensive literature showing that stories are better remembered than exposition text (e.g., essays; Mar et al., 2021). Beyond better structure in stories that promotes memory compared to the more complex and formal structure in expository texts, stories resemble everyday experiences and pertain to social relationships (also see Mesoudi et al., 2006), factors that may also contribute to the way tweets are written. In this vein, content analysis has shown commonality between tweets and diaries for the need to reflect and share with others (Humphreys et al., 2013). Taken together, the interpersonal, gossipy nature in which tweets are written serves as a good explanation for better memory for tweets than headlines regardless of the content message itself.

5.3 | Limitations and future directions

The present study demonstrated a mnemonic advantage for microblog information under novel conditions where the microblog information contrasted in the messaging provided by news sources. This outcome shows that under the conditions of the present study, we could not detect the influence of source credibility on changes in information memorability. We acknowledge that although the participants rated news headlines as more personally relevant than tweets, we did not directly measure the credibility of the items that participants studied. Thus, it remains a possibility that participants did not perceive news headlines as more credible than tweets during the study phase even though, in general, people consider official news sources as more credible than social media, and report that they trust social media sources less than news sources (e.g., Liedke & Gottfried, 2022; Lucassen & Schraagen, 2013; Miller & Kurpius, 2010).

Furthermore, while people in general do not trust social media sources over and above news sources, it is worth considering that, "in the wild", perceived source credibility could depend on a variety of factors. Such factors include who is sharing the microblog post and with whom, the author's "verified" status, the leadership or "influencer" status of the person posting the microblog, and whether the social media platform flagged a post as misinformation.[3] People are likely to follow sources they find trustworthy on their social media accounts and, therefore, might be more likely to believe such information, thus further reducing the impact of source credibility that official news may carry. Similarly, the functional aspects of social media platforms can change over time which might influence the way in which source credibility is perceived. For example, Elon Musk bought Twitter in October 2022 (we note that this happened after data collection was completed in the current study), and he subsequently changed how users earn their "verified" status. In our study, we specifically controlled for the influence of such factors that may change the perceived credibility of individual sources, as we presented a statement along with only its broad source (i.e., tweets vs. headlines; see Figure 1) and eliminated other details. Finally, better memory for microblogs is not specific to tweets, and to that extent, may not be specific to the vagaries of this platform. As Mickes et al. (2013) showed, the microblog memory advantage occurs for Facebook posts and comments posted online. At the same time, our findings, together with past studies on microblog memory, provide the framework for testing the influence of these aforementioned factors on the memorial consequences of everyday scrolling and other social media practices.

5.4 | Concluding thoughts

In our increasingly digital world, we consume information from a variety of sources where information feed is abundant and continual. Combined with the impact of this format of information feed that can reduce the opportunity to evaluate relevance and credibility, tweets contain several properties such as informal language, less complex formats, and social comparisons (e.g., gossip), making them especially memorable. Our discovery that a microblog memory advantage emerges even when tweets convey messages that contradict news headlines, and the emergence of this pattern under distinctly different environments – in person and online, demonstrate the robustness and the scope of this memory phenomenon. This demonstration of superior memorability for tweets, even when tweets are incompatible with news, also points to the sobering consequences of social media use on the spread of misinformation.

AUTHOR CONTRIBUTIONS

Raeya Maswood initially conceived the research question and design in substantive discussions with Suparna Rajaram. Raeya Maswood then developed the study materials and program, and collected the in-person data for Experiment 1 as a part of her dissertation research. Melissa Chen who at that time was masked to the hypotheses, experimental manipulations, and stimuli, collected the in-person data and later joined to code data for Experiment 1 as a coder. Tori Peña later joined the project and developed Experiment 2 with the four authors based on extensive discussions. Tori Peña developed the program and collected the data together with Melissa Chen, and then analyzed the data for Experiment 2, and conducted re-analyses in R for Experiment 1. Raeya Maswood drafted the initial version of the manuscript in collaboration with Suparna Rajaram. Afterwards, Tori Peña led the revision of the manuscript in collaboration with Melissa Chen and Suparna Rajaram. All the authors approved the final draft of the manuscript.

ACKNOWLEDGMENTS

We thank Mili Shah, Sara Yousef, and Jiajun "Jacob" Li for their research assistance. We also thank Teresa Bajo, Anne Moyer, and Lauren Richmond for helpful feedback on earlier versions of this manuscript.

FUNDING INFORMATION

Preparation of this manuscript was supported by the National Science Foundation Grant 1456928 and the National Science Foundation Graduate Research Fellowship 1839287.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data and study materials reported in the current manuscript will be made available upon request.

CONSENT TO PARTICIPATE

All participants provided their consent before participating in our study.

CONSENT FOR PUBLICATION

Participants also consented to publishing their deidentified data to a journal.

CODE AVAILABILITY

Analyses were conducted in R (R Team, 2020). All code will be made available upon request.

OPEN PRACTICES STATEMENT

We preregistered Experiment 1 on AsPredicted (The Memorability of News and Social Media Information). Processed data and code for the analyses are available upon request.

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ENDNOTES

[1] Experiment 1 data were originally analyzed using SPSS and those results are publicly available on ProQuest (Maswood, 2020). The analyses reported here were conducted in *R* using the *rstatix* package for both experiments. All analysis outcomes across the statistical programs and their interpretations remain consistent in Experiment 1, with the values varying only slightly (.01 or less) in four cases.

[2] We thank an anonymous reviewer for this point.

[3] We thank an anonymous reviewer for this point.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Peña, T., Maswood, R., Chen, M., & Rajaram, S. (2023). Memory for tweets versus headlines: Does message consistency matter? *Applied Cognitive Psychology*, 1–17. https://doi.org/10.1002/acp.4068