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Antecedents to and Consequences of Claim Objectivity

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by

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ABSTRACT OF THE DISSERTATION

Antecedents to and Consequences of Claim Objectivity

by

Daniel Mirny

Doctor of Philosophy in Management

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Professor Stephen A. Spiller, Chair

Consumers constantly sift through information-rich environments, filtering out noise and classifying information in order to make sense of the broader world. The present body of research has focused on one key yet understudied construct of information: claim objectivity. Claim objectivity draws a distinction between claim that are verifiable, objective factual statements and claims that are not verifiable, subjective opinions. Whether people believe claims to be objective or subjective lies at the cornerstone of interpersonal conflict and collaboration, has important implications for the spread of misinformation, and is a key feature of advertising, persuasion, and communication. However, when asked to classify claims based on their objectivity, consumers disagree with one another and struggle to accurately classify claims as

facts or opinions. The present research finds that the perceived objectivity of a claim is malleable, subject to the manner in which information is presented. In Chapter I, consumers are found to classify repeatedly presented claims as more objective than novel claims, highlighting prior exposure as an antecedent to claim objectivity. Chapter II then considers the consequences of claim objectivity for consumer attitudes, beliefs, and behaviors. Across a variety of consumer contexts, we consistently find that claim objectivity affects how accurately consumers are able to identify the original source of a claim. We find that source memory is more accurate for opinions than for facts, deepening our understanding of associative memory processes and expanding the breadth of claim objectivity's influence on consumers. We find evidence to support a potential process underpinning this main effect as well as subsequent consequences for consumer behavior – integrating new information in order to form inferences about and seek advice from relevant sources. Across the present body of research, I focus on the understudied yet exceedingly important construct of claim objectivity, considering both how the perceived objectivity of a claim is affected by the manner in which it is presented, and the effect that claim objectivity has on cognitive processes and associated downstream consequences.

The dissertation of Daniel Mirny is approved.

Eugene M. Caruso

Hal E. Hershfield

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Stephen A. Spiller, Committee Chair

University of California, Los Angeles

2023

With gratitude to my advisor, who inspires with his endlessly kind and deeply thoughtful nature

With a raised glass to my friends, who facilitate a life of laughter and learning

With love to my family, who will always be my home

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Competitive Paper; **California School Conference** (Stanford, CA)

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INTRODUCTION

With increasingly broad access to complex digital tools, we are able to generate, share, and consume content from around the world at incredible speeds. The spread of information on such a scale can fuel uprisings that oust dictators (Stepanova, 2011), amplify social movements that shape government and corporate identities (Mundt et al., 2018) and inform the world of war atrocities as they happen in live time, prompting international political condemnation, economic sanctions, and strategic military mobilizations (Serafin, 2022). But such a large and fast-moving information landscape is not without risk, prone to miscommunication and malevolent interference. The spread of misinformation has become a difficult and multi-faceted challenge responsible for increasing political polarization (Freelon and Wells, 2020) and vast propaganda campaigns (Pavlik, 2022). Socially damaging trends are magnified (Suchert et al., 2016; Vandenbosch et al., 2022), consumer reactions to transgressions are sharp, swift, and impactful (Crockett, 2017; Grappi et al., 2013), and companies that don't adapt to ongoing events quickly enough are penalized (Nam et al., 2022). Consumers and companies alike are constantly navigating a noisy, fast-paced, information-rich world. As behavioral researchers, we strive to understand how people adapt in such an environment – with consumers continuously perceiving, processing, and communicating about the world around them.

As consumers, we constantly sift through information-rich environments, filtering out noise and classifying information in order to make sense of the broader world. One of the ways in which consumers sift through noisy environments is to form mental models about the world, classifying the information they encounter into concepts. The focus of this thesis is on one such concept – claim objectivity. Claim objectivity draws a distinction between objective claims and subjective claims. Objective claims are factual statements that can be verified as either true or

false (e.g., *"Pepsi has more sugar than does Coca-Cola"*). Subjective claims are opinions, they cannot be verified as true or false, reflecting an individual's attitudes or beliefs with which others may agree or disagree (e.g., *"Pepsi is too sweet"*). Originating in a linguistic distinction, claim objectivity is a cornerstone of communication, information processing, and interpersonal relationships. Claim objectivity plays a critical role in both our personal and our professional lives, responsible for interpersonal conflict (Ross and Ward, 1995), undermined collaboration (Liberman et al., 2012), political partisanship (Blatz and Mercier, 2018; Skitka and Morgan, 2014) and moral tribalism (Johnson et al., 2021). For instance, people are less likely to be receptive of an ideological adversary if they believe that the adversary's conflicting perspective is rooted in objective inaccuracy, rather than simply reflecting a difference in opinions (Heiphetz and Young, 2017; Liberman et al., 2012).

For marketing managers, perceived objectivity is of particular note in the context of brand competition and product attribute comparisons. Consumers are often exposed to advertisements and reviews that compare two brands, claiming one to be directly superior (e.g., "Coca-Cola is better than Pepsi"). Spiller and Belogolova (2017) find that consumers are willing to pay a greater premium for the superior product when they believe that the comparison reflects differences in objective quality rather than differences in subjective taste.

With far-reaching implications, claim objectivity marks the foundation of ongoing legal and policy discussions about the credibility of social and traditional media sources, the spread of misinformation, and the rise of partisan conflict. As a notable example, in 2020 a defamation lawsuit was brought against Tucker Carlson, who at the time was a conservative political commentator and Fox News television host. In the defense, Fox News' attorney argued that the comments Tucker Carlson made on his show "cannot reasonably be interpreted as facts" and as

such cannot be considered as factually inaccurate (*McDougal v. Fox News Network LLC* 2020). Following the precedent set by the case against Tucker Carlson, the defense for a defamation lawsuit brought against former federal prosecutor Sidney Powell in 2021 also relied on claim objectivity arguing that, "no reasonable person would conclude that the statements were truly statements of fact… Powell's claims were her opinions" (*US Dominion, Inc. v. Powell* 2021).

This distinction in claim objectivity, between whether claims are considered to be factual statements or opinions, has also had substantive effects on the spread of misinformation on Facebook. Facebook's policy of not fact-checking posts classified as opinions has stymied efforts from climate scientists to combat the spread of misinformation about climate change, resulting in the spread of climate change denialism posts on the platform when labeled as opinions (Penney, 2020). These incidents highlight the increasing importance of understanding how claim objectivity affects the ways in which people process, remember, and engage with content (Shane, 2017). I focus on one such consequence of claim objectivity in Chapter II.

Though an important construct, claim objectivity is both variable and malleable. The variability of claim objectivity is defined by disagreements between people. For instance, a recent Pew Research Center survey found that a majority of American respondents were unable to fully distinguish between factual statements and opinions in the news (Mitchell et al., 2018). Despite all participants viewing the same set of claims, the variability in their perception of a claim's objectivity suggests that the perceived objectivity of a claim is not solely based on the claim's content. This indication is supported by recent findings in linguistics – even when a claim's content is fixed, its linguistic structure can result in varying evaluations of its objectivity (Kaiser & Wang, 2020, 2021). Even when the linguistic framing remains the same, perceptions about a claim's objectivity differ across individual attitudes and beliefs. Prior research in naïve

realism finds that people are prone to mischaracterizing the subjective nature of their own views, more likely to believe that a particular claim is objective when it is aligned with their preferences (Griffin & Ross, 1991; Ross & Ward, 1995; Spiller & Belogolova, 2017; Toner et al., 2013) or reflects the perceived social and cultural consensus (Goodwin & Darley, 2008, 2012; Heiphetz & Young, 2017). As such, the perceived objectivity of a claim can vary not only across people but also across cultures (Sarkissian et al., 2011; Goodwin & Darley, 2012) and modes of argumentative interaction (Fisher et al., 2017). Such variability in claim objectivity, across people, contexts, and beliefs, suggests that claim objectivity may be malleable, subject to the manner in which a claim is presented. I explore the effect of presentation on perceived claim objectivity directly in Chapter I.

In this thesis, I focus on claim objectivity, with an interest in both (i) what affects perceived objectivity – the malleability of the construct, its antecedents and its processes, as well as (ii) how claim objectivity affects consumer beliefs, behaviors, and choices. Chapter I presents an investigation into one of the antecedents of claim objectivity – prior exposure. I find that the way in which information is presented can affect how objective consumers believe claims to be: *Creeping Objectivity: Prior Exposure Leads People to Believe Claims Are More Objective*. Chapter II explores one of the consequences of claim objectivity. I find that claim objectivity affects how accurately consumers can recall where information originated from: *Source Memory is More Accurate for Opinions Than for Facts*.

REFERENCES

Blatz, C. W., & Mercier, B. (2018). False polarization and false moderation: Political opponents overestimate the extremity of each other's ideologies but underestimate each other's certainty. *Social Psychological and Personality Science, 9*(5), 521-529.

Crockett, M. J. (2017). Moral outrage in the digital age. *Nature Human Behaviour*, 1(11), 769-771.

Fisher, M., Knobe, J., Strickland, B., & Keil, F. C. (2017). The influence of social interaction on intuitions of objectivity and subjectivity. *Cognitive science, 41*(4), 1119-1134.

Freelon, D., & Wells, C. (2020). Disinformation as political communication. *Political Communication*, 37(2), 145-156.

Goodwin, G. P., & Darley, J. M. (2008). The psychology of meta-ethics: Exploring objectivism. *Cognition, 106*(3), 1339-1366.

Goodwin, G. P., & Darley, J. M. (2012). Why are some moral beliefs perceived to be more objective than others?. *Journal of Experimental Social Psychology, 48*(1), 250-256.

Grappi, S., Romani, S., & Bagozzi, R. P. (2013). Consumer response to corporate irresponsible behavior: Moral emotions and virtues. *Journal of Business Research*, 66(10), 1814-1821.

Griffin, D. W., & Ross, L. (1991). Subjective construal, social inference, and human misunderstanding. In *Advances in Experimental Social Psychology* (Vol. 24, pp. 319-359). Academic Press.

Heiphetz, L., & Young, L. L. (2017). Can only one person be right? The development of objectivism and social preferences regarding widely shared and controversial moral beliefs. *Cognition, 167*, 78-90.

Johnson, S. G., Rodrigues, M., & Tuckett, D. (2021). Moral tribalism and its discontents: How

intuitive theories of ethics shape consumers' deference to experts. *Journal of Behavioral Decision Making*, *34*(1), 47-65.

Kaiser, E., & Wang, C. (2020). Distinguishing fact from opinion: Effects of linguistic packaging. In S. Denison, M. Mack, Y. Xu, & B. Armstrong (Eds.), *Proceedings of the 42nd Annual Conference of the Cognitive Science Society*, (pp. 116-122), Cognitive Science Society.

Kaiser, E., & Wang, C. (2021). Packaging information as fact versus opinion: Consequences of the (information-) structural position of subjective adjectives. *Discourse Processes*, *58*(7), 617-641.

Liberman, V., Minson, J. A., Bryan, C. J., & Ross, L. (2012). Naïve realism and capturing the "wisdom of dyads". *Journal of Experimental Social Psychology*, *48*(2), 507-512.

McDougal v. FOX NEWS NETWORK, LLC, 489 F. Supp. 3d 174 (S.D.N.Y. 2020).

Mitchell, A., Gottfried, J., & Weisel, R. (2018). Distinguishing Between Factual and Opinion Statements in the News. *Pew Research Center*.

Mundt, M., Ross, K., & Burnett, C. M. (2018). Scaling social movements through social media: The case of Black Lives Matter. *Social Media + Society*, 4(4), 2056305118807911.

Nam, Jimin, M. Balakrishnan, Julian De Freitas, and Alison Wood Brooks. "Speedy Activists: Firm Reaction Time to Sociopolitical Events Influences Consumer Behavior." Working Paper, 2022.

Pavlik, J. V. (2022). The Russian war in Ukraine and the implications for the news media. *Athens Journal of Mass Media and Communications*, 8, 1-17.

Penney, V. (2020, July 14). How Facebook Handles Climate Disinformation. Retrieved July 17, 2020, https://www.nytimes.com/2020/07/14/climate/climate-facebook-fact-checking.html

Ross, L., & Ward, A. (1995). Psychological barriers to dispute resolution. In *Advances in Experimental Social Psychology* (Vol. 27, pp. 255-304). Academic Press.

Sarkissian, H., Park, J., Tien, D., Wright, J. C., & Knobe, J. (2011). Folk moral relativism. *Mind & Language*, *26*(4), 482-505.

Serafin, T. (2022). Ukraine's President Zelensky Takes the Russia/Ukraine War Viral. *Orbis*, 66(4), 460-476.

Shane, S. (2017). From headline to photograph, a fake news masterpiece. *The New York Times*, *18*.

Skitka, L. J., & Morgan, G. S. (2014). The social and political implications of moral conviction. *Political Psychology*, *35*, 95-110.

Spiller, S. A., & Belogolova, L. (2017). On consumer beliefs about quality and taste. *Journal of Consumer Research*, *43*(6), 970-991.

Stepanova, E. (2011). The role of information communication technologies in the "Arab Spring". *Ponars Eurasia*, 15(1), 1-6.

Suchert, V., Hanewinkel, R., & Isensee, B. (2016). Screen time, weight status and the self-concept of physical attractiveness in adolescents. *Journal of Adolescence*, 48, 11-17.

Toner, K., Leary, M. R., Asher, M. W., & Jongman-Sereno, K. P. (2013). Feeling superior is a bipartisan issue: Extremity (not direction) of political views predicts perceived belief superiority. *Psychological Science*, *24*(12), 2454-2462.

US Dominion, Inc. v. Powell, Civil Action 1:21-cv-00040 (CJN) (D.D.C. Aug. 11, 2021).

Vandenbosch, L., Fardouly, J., & Tiggemann, M. (2022). Social media and body image: Recent trends and future directions. *Current Opinion in Psychology*, 45, 101289.

CHAPTER 1

Creeping Objectivity: Prior Exposure Leads People to Believe Claims Are More Objective

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All data, materials, pre-registrations, and supplementary materials are available here:

https://researchbox.org/44&PEER_REVIEW_passcode=AAOJXL.

Abstract: Whether people believe issues are matters of objective right and wrong or matters of subjective differences of opinion has important downstream consequences for judgment and interpersonal conflict. But perceived objectivity is a malleable construct, affected by how claims are presented. People can disagree about the same claims – one person will believe that a claim is objective (and can be fact-checked as either true or false) and another person will believe that the same claim is subjective (and not fact-checkable at all). Previous research has found that prior exposure increases the perceived veracity of objective claims (the illusory truth effect) as well as agreement with subjective claims (the mere exposure effect). The present research bridges these two literatures to investigate the novel question of whether prior exposure affects the perceived objectivity of claims. In a pre-registered experiment (N=1,000 online participants), we find that prior exposure to claims results in people believing them to be more objective, across three different measures of perceived objectivity. We discuss potential processes for this creeping objectivity effect, along with theoretical and practical implications.

Keywords: prior exposure, objectivity, naïve realism, fact-check, opinions

INTRODUCTION AND THEORY

People encounter a variety of claims about the world in social media posts, conversations, news briefings, work emails, product reviews, and many other aspects of their daily lives. Some claims are factual statements (e.g., "It is raining"): they are objective and can be fact-checked as either true or false. Other claims are opinions (e.g., "The weather is nice"): they are subjective assessments, cannot be fact-checked, and other people may either agree or disagree with them. When a claim is perceived as an opinion, there is room for disagreement: Jack and Jill may both be aware that it is 95F in Boston, but Jack may believe that 95F is nice weather, Jill may believe that 95F is not nice weather, and even though they have divergent preferences, neither one of them is right nor wrong. However, when a claim is perceived as a factual statement, it necessitates the existence of only one, single, objectively correct view: Jack may believe that Bergen is the capital of Norway, Jill may believe that Oslo is the capital of Norway, and only one of them is right. As a result, perceived objectivity often stifles receptiveness to conflicting perspectives which are believed to be incorrect rather than reflecting a different opinion (Liberman et al., 2012; Heiphetz & Young, 2017). The downstream consequences of perceived objectivity are severe, reaching into domains of our personal and professional lives, leading to interpersonal conflict (Ross & Ward, 1995), undermined collaboration (Liberman et al., 2012), political partisanship (Skitka & Morgan, 2014; Blatz & Mercier, 2018), and moral tribalism (Johnson et al., 2021).

As a particularly stark example, perceived objectivity lies at the foundation of important policy and legal debates regarding the role of social and traditional media as credible information sources. For instance, in a defamation lawsuit brought against Tucker Carlson, Fox News' attorney argued that Carlson was not liable due to the nature of his show being one of

commentary, such that his statements "cannot reasonably be interpreted as facts" (*McDougal v. Fox News Network LLC*, 2020). A more recent case against former federal prosecutor Sidney Powell followed a similar precedent, with attorneys claiming that, "no reasonable person would conclude that the statements were truly statements of fact… Powell's claims were her opinions" (*US Dominion, Inc. v. Powell*, 2021). The distinction between whether claims are classified as factual statements or as opinions also has substantive effects on the spread of misinformation. Facebook's policy of not fact-checking opinion posts has stymied climate scientists' attempts to combat the spread of misinformation throughout the platform when climate change denialism posts are labeled as opinions (Penney, 2020).

These incidents emphasize the importance of understanding how people process and understand claim objectivity (Shane, 2017). What affects such assessments? Prior research has explored perceived objectivity as a feature of individual differences between people across cultures (Sarkissian et al., 2011; Goodwin & Darley, 2012) and across modes of argumentative interaction (Fisher et al., 2017). In the current research, we consider the effect of information presentation on perceived objectivity. Across a broad set of contexts, people frequently encounter the same claim multiple times. Bridging research on the illusory truth effect for objective claims (Hasher et al., 1977) and the mere exposure effect for subjective claims (Cacioppo & Petty, 1979), the current research investigates the effect of prior exposure to a claim on the perceived objectivity of that claim. In a three-stage experiment with a variety of different types of claims, participants are shown some claims repeatedly and other claims once. Using three different measures of perceived objectivity, we find that prior exposure to a claim increases how objective it is perceived to be. We also find that the effect of prior exposure on agreement with claims is correlated with the effect of prior exposure on the perceived objectivity

of claims, but the effect of exposure on perceived objectivity does not represent a mere increase in agreement with claims.

There is Variability in the Perceived Objectivity of Claims

A recent Pew Research Center survey found that a majority of American respondents were unable to fully distinguish between factual statements and opinions in the news (Mitchell et al., 2018). Although respondents all saw the same set of claims, disagreement between respondents as to the objectivity of a given claim indicates that the perceived objectivity of a claim is not solely determined by the claim's content. This indication is supported by recent findings in linguistics, where even holding the content of a claim constant, a claim's linguistic structure can lead to different appraisals of whether the claim is more or less objective (Kaiser & Wang, 2020, 2021). But even holding the linguistic packaging constant, beliefs about a claim's objectivity vary with one's other beliefs. People are prone to mischaracterizing the subjective nature of their own views and are more likely to believe that a claim is objective when it favors their own preferences (Griffin & Ross, 1991; Ross & Ward, 1995; Spiller & Belogolova, 2017; Toner et al., 2013) or reflects the perceived social and cultural consensus (Goodwin & Darley, 2008, 2012; Heiphetz & Young, 2017). This variability in perceived objectivity across people, contexts, and beliefs, suggests that perceived objectivity may also be malleable, influenced by the manner in which a claim is presented.

Effects of Prior Exposure on Factual Statements and Opinions

What might affect whether a claim is believed to be more or less objective? One potential but heretofore unexamined feature is whether or not the claim has been previously encountered. People often encounter the same claims repeatedly, and researchers have devoted considerable attention to the effect of prior exposure on beliefs about the veracity of facts and agreement with

opinions. However, it may be the case that prior exposure can also affect higher-order beliefs, influencing how objective a claim is perceived to be.

Prior exposure increases the extent to which people believe factual statements to be true, deemed the illusory truth effect (Arkes et al., 1991; Begg et al., 1992; Dechêne et al., 2010; Hasher et al., 1977; Polage, 2012). This effect is robust and found across factual statements ranging from the mundane to the obscure (Bacon, 1970), from the self-evident to those contradicting existing knowledge (Fazio et al., 2015), and across consumer advertising, partisan political arguments, socio-political opinions, and fake news headlines (Arkes et al., 1989; Hawkins & Hock, 1992; Johar & Roggeveen, 2007; Pennycook et al., 2018). Moreover, Effron and Raj (2020) speculate that prior exposure may increase feelings of intuitive truthfulness, whereby information can feel true even when explicitly acknowledged as false (Shidlovski et al., 2014).

Prior exposure also increases the extent to which people agree with opinions and like different stimuli, deemed the mere exposure effect (Berryman, 1984; Bornstein, 1989; Crandall, 1985; Hill, 1978; Pliner, 1982; Zajonc, 1968). Prior exposure affects the attitudes associated with opinions. When people have been previously exposed to an opinion, they are more likely to agree with it and attitudes associated with the opinion are more quickly recalled, demonstrate greater clarity, and are perceived to be more correct (Cacioppo & Petty, 1979; Petrocelli et al., 2007).

Both the illusory truth and mere exposure effects have been attributed to processing fluency, or ease of processing. Different operationalizations of fluency have resulted in similar effects, suggesting a common underlying cognitive mechanism for these and related effects (Alter & Oppenheimer, 2009; Begg et al, 1992; Jacoby et al. 1989; Oppenheimer, 2006; Reber et

al, 1998; Shah & Oppenheimer, 2007; Thompson et al., 2013; Unkelbach, 2007; Unkelbach & Rom, 2017; Wang et al., 2016; Whittlesea, 1993).

Research on the effects of prior exposure has presented claims as either factual statements or as opinions, determined a priori, and has found that prior exposure increases (a) the belief that factual statements are accurate (illusory truth), and (b) agreement with opinions (mere exposure). Moreover, both effects can be at least partially explained by a shared mechanism of processing fluency. However, these results are focused on within-type malleability, that is, the malleable perceived accuracy of objective claims and the malleable agreement with subjective claims. As far as we are aware, research has not previously investigated whether the perceived objectivity of claims is *itself* affected by prior exposure.

We address this key unresolved question. While research on illusory truth and mere exposure has taken a claim's objectivity as given (objective in the illusory truth literature and subjective in the mere exposure literature), we bridge these findings to examine a cause of a claim's perceived objectivity. Research on naïve realism indicates that people sometimes treat their subjective assessments as though they are objective assessments (Griffin & Ross 1991; Ross & Ward 1995). Moral objectivity also varies across people, cultures, and modes of social interaction (Sarkissian et al., 2011; Goodwin & Darley, 2012; Fisher et al., 2017), suggesting that a claim's perceived objectivity is malleable, subject to the way in which it is presented. Given that (i) prior exposure is associated with increased agreement with claims (Hasher et al., 1977; Cacioppo and Petty, 1979), and (ii) strength of agreement is associated with believing that claims are objective (Goodwin & Darley 2008; Spiller & Belogolova 2017; Toner et al., 2013), we hypothesize that prior exposure to a claim increases its perceived objectivity. We test this novel hypothesis in a three-stage experiment.

METHOD

In this experiment (N = 1,000), we examine the effect of prior exposure on the perceived objectivity of claims. This research was certified exempt by the home institution IRB. All data, materials (including all claims), and pre-registrations are available in a supplementary web appendix at https://researchbox.org/44&PEER_REVIEW_passcode=AAOJXL. In an effort to avoid a 'file-drawer' problem, the web appendix also includes a complete record (including data, materials, and analyses) of all preliminary pre-registered experiments in which we manipulated prior exposure and measured beliefs about claim objectivity.

Participants

We recruited a convenience sample of 1,000 participants (49.7% female, M_{Age} = 40.4) from Amazon Mechanical Turk using CloudResearch's pool of "CloudResearch-Approved Participants" (Litman et al., 2020). Sample size was determined in advance and was large enough to provide greater than 85% power to detect a within-subject effect of at least 0.1 standard deviations in our target measure of perceived objectivity. This target effect size was based on preliminary studies reported in the supplemental materials.

Given the subtle manipulation, time delay, and an inability to control the experimental environment with remote participation, we were concerned about participant attention and engagement. We pre-registered an exclusion of participants who spend a total of at least 60 seconds off-task throughout the duration of the experiment. Participant engagement was tracked using TaskMaster, which provides measures of time spent on- and off-task (Permut et al., 2019). As per the pre-registration, 266 participants were excluded from the analysis for spending a total of at least 60 seconds off-task throughout the duration of the experiment, suggesting inattentiveness, resulting in 734 participants included in our preregistered analyses. We also

report results with both more and less stringent exclusion criteria.

Design and Procedure

The factor of primary interest was prior exposure (novel vs. exposed), but the full experimental design was a 2 (prior exposure: novel vs. exposed) x 2 (counterbalanced claim set: set A as novel and set B as exposed vs. set B as novel and set A as exposed) x 3 (dependent measure: objectivity vs. fact-checkability vs. existence of truth) x 2 (scale order: e.g., [1] Objective to [6] Subjective vs. [1] Subjective to [6] Objective), where the first factor (prior exposure) is within-participant and of substantive interest and the latter 3 factors (counterbalanced claim set, dependent measure, and scale order) were between-participant and nuisance factors.

The stimulus set consisted of 24 claims, including 8 factual statements (e.g., "President Barack Obama was born in the United States"), 8 opinions (e.g., "Democracy is the greatest form of government"), and 8 borderline claims (e.g., "The Supreme Court must base its rulings on its understanding of what the U.S. Constitution means in current times"), taken from and classified by the Pew Research Center (Mitchell et al., 2018; Doherty, 2018). All claims are given in Table 1-1. One factual claim was updated to reflect an updated partisan breakdown of members of congress circa April 2022.[1] These claims encompassed a broad range of topics concerning U.S. current events and political beliefs. The experimental design was drawn from the illusory truth literature (e.g., Fazio et al., 2015). The experiment consisted of three stages.

[1] The original claim was "Republicans currently hold a majority of the seats in both chambers of Congress." The revised claim was "Democrats currently hold a majority of seats in the House of Representatives."

Table 1-1. List of Claims Used as Stimuli Accompanied by Claim-Level Means and Standard Deviations for Ratings of Perceived Objectivity.

Classification	*Claim*	*Perceived Objectivity*	
		Mean	*SD*
Facts	*Health care costs per person in the U.S. are the highest in the developed world.*	*5.38*	*1.15*
	President Barack Obama was born in the United States.	*5.48*	*1.22*
	Immigrants who are in the U.S. illegally have some rights under the Constitution.	*4.72*	*1.60*
	ISIS lost a significant portion of its territory in Iraq and Syria in 2017.	*5.17*	*1.18*
	Spending on Social Security, Medicare, and Medicaid make up the largest portion of the U.S. federal budget.	*5.28*	*1.26*
	Democrats currently hold a majority of seats in the House of Representatives.[A]	*5.58*	*1.09*
	Most of the heroin that currently makes it into the U.S. comes across the southern border.	*4.75*	*1.39*
	In the aftermath of the war in Iraq, no active weapons of mass destruction were found.	*5.19*	*1.33*
Opinions	*Democracy is the greatest form of government.*	*2.42*	*1.67*
	Increasing the federal minimum wage to $15 an hour is essential for the health of the U.S. economy.	*3.30*	*1.64*
	Abortion should be legal in most cases.	*2.40*	*1.71*
	Immigrants who are in the U.S. illegally are a very big problem for the country today.	*2.95*	*1.70*
	Government is almost always wasteful and inefficient.	*2.87*	*1.66*
	In general, regardless of who is in power, politicians can't be trusted.	*2.45*	*1.62*
	The government must make a greater effort to reduce climate change.	*3.14*	*1.81*
	The courts have gone too far in restricting public expression of Christian beliefs.	*2.55*	*1.66*

Borderline Claims	*Applying additional scrutiny to Muslim Americans would not reduce terrorism in the U.S.*	*3.08*	*1.62*
	Voter fraud across the U.S. has undermined the results of our elections.	*3.68*	*1.88*
	Recent tax cuts have benefited the wealthiest of Americans more than others.	*4.66*	*1.49*
	Police around the country treat racial and ethnic minorities as fairly as they treat whites.	*3.31*	*1.75*
	In the United States, racial discrimination may make it harder for black people to get ahead.	*3.63*	*1.66*
	The Supreme Court must base its rulings on its understanding of what the U.S. Constitution means in current times.	*3.55*	*1.72*
	Sexual misconduct by Catholic priests and bishops reflects an ongoing problem.	*4.33*	*1.49*
	The affordability of a college education is a big problem for the United States.	*4.02*	*1.63*

[A] Claim was adjusted from Pew to reflect an updated partisan breakdown of members of congress circa April 2022.

NOTE: Classification refers to classification of claims in surveys by the Pew Research Center (Mitchell et al., 2018; Doherty, 2018).

The first stage was an initial exposure stage. Participants were presented with half of the claims in the stimulus set (4 factual statements, 4 opinions, and 4 borderline claims) in three sequential engagement tasks. Participants were asked to: (i) rate the claims for relevance to current events on a 4-item scale from “Not at all relevant” to “Very relevant”; (ii) rate the claims for interestingness on a 4-item scale from “Not at all interesting” to “Very interesting”; (iii) categorize the claims by topic as either “World Events”, “U.S. Events”, “Politics”, “Economics”, “Science”, or “Daily Life”. As a result, by the end of the first stage participants had seen and

engaged with each of the 12 presented claims three times. The particular subset of 12 claims presented in the initial exposure stage was counterbalanced across participants (set A as novel and set B as exposed *or* set B as novel and set A as exposed).

The second stage was a filler stage. The primary purpose of this stage was to separate the first (exposure) stage from the third (classification) stage. During this filler stage, participants completed measures of basic demographics, cognitive reflection using two versions of the cognitive reflection test (Frederick, 2005; Thomson & Oppenheimer, 2016), digital savviness, trust of national news organizations, and political affiliation, adapted from survey measures used by the Pew Research Center (Mitchell et al., 2018).

The third stage was a classification stage, providing our key measures of perceived objectivity. Participants were presented with the full set of 24 claims one at a time. 12 of the claims were repeated from the initial exposure stage and 12 of the claims were novel. Perceived objectivity was elicited using three measures. Participants were randomized to one of the three measures of perceived objectivity (i.e., each participant encountered a single operationalized measure, not all three measures). Using three different measures enabled us to test for robustness across alternative operationalizations of perceived objectivity; we did not anticipate any differences across measures. Each measure consisted of an instruction page with examples and an ascending 6-point scale. These are provided in Figure 1-1.

Figure 1-1. Participant Instructions for Measures of Perceived Objectivity

Measure	*Instructions*
Objectivity	*You will now be shown a series of 24 statements. We'd like you to provide a rating for each statement based on the following instructions:* *Some statements are completely objective, they are verifiable and can be proved or disproved by evidence. For instance "it is raining" is a completely objective statement that is either true or false.*

	Other statements are completely subjective, they are based on the values and beliefs of the source. For instance "the weather is nice" is a completely subjective statement that one may agree or disagree with but that cannot be definitely proved or disproved. *Many statements contain both objective and subjective information. For instance "it is raining, which is really nice" contains both information that is objective ("it is raining") and information that is subjective ("which is really nice").* *For each of the statements you will be shown, please rate it on a 6-point scale from [1 (subjective) to 6 (objective) / 1 (objective) to 6 (subjective)]. If you feel strongly that the statement primarily conveys [subjective/objective] information, you should rate it as a 1. If you feel strongly that the statement primarily conveys [objective/subjective] information, you should rate it as a 6.* *Please use the entire 6-point scale as feels appropriate.*
Fact-checkability	*You will now be shown a series of 24 statements. We'd like you to provide a rating for each statement based on the following instructions:* *Snopes is a fact-checking website that uses objective evidence to identify whether various claims are true or false.* *Fact-checking uses objective evidence to determine the accuracy of a statement. In deciding which claims they can check, Snopes considers whether or not a statement is rooted in a fact that is verifiably true or false. For instance, opinions can't be fact-checked.* *On the following pages, imagine that you work for Snopes and that you have been asked to help identify the next batch of claims for fact-checking.* *For each of the statements you will be shown, please rate it on a 6-point scale based on how possible it is to fact-check from [1 (Definitely cannot be fact-checked) to 6 (Definitely can be fact-checked) / 1 (Definitely can be fact-checked) to 6 (Definitely cannot be fact-checked)]* *Please use the entire 6-point scale as feels appropriate.*
Existence of truth	*You will now be shown a series of 24 statements. We'd like you to provide a rating for each statement based on the following instructions:* *When considering claims, we may ask, Is this claim true?* ***Sometimes there is a correct answer to this question.*** *For instance:* *"The 2028 Olympic Games will be held in Los Angeles"* *Is this claim true? <u>There is a correct answer to this question</u>, the answer is yes.* *"Dusseldorf is the capital of Germany"* *Is this claim true? <u>There is a correct answer to this question</u>, the answer is no.*

Other times there is no correct answer to this question. *For instance:*

"Vanilla is the best ice cream flavor"

Is this claim true? <u>There is no correct answer to this question</u> because the claim reflects an opinion.

"Rock music is better than Jazz music"

Is this claim true? <u>There is no correct answer to this question</u> because this claim reflects an opinion.

On the following pages you will be asked, does there exist a correct answer to the question Is this claim true? <u>Note, you are not being asked if the claim is true.</u> You are being asked: ***Does there exist a correct answer to the question, "Is this claim true?"*** *For each of the statements you will be shown, please rate it on a 6-point scale from [1 (No correct answer) to 6 (Definitely a correct answer) / 1 (Definitely a correct answer) to 6 (No correct answer)].*

Please use the entire 6-point scale as feels appropriate.

The first measure of perceived objectivity, encountered by one third of participants, provided instructions about the notion of objectivity as a construct, along with examples of objective and subjective claims. Participants were then asked to consider each claim and rate it on a numbered 6-point scale from [1] Subjective to [6] Objective. For all measures, scale order was randomized across participants (e.g., for this first measure of perceived objectivity, half of participant saw a scale from [1] Objective to [6] Subjective and half of participants saw a scale from [1] Subjective to [6] Objective). This measure of perceived objectivity was taken verbatim from linguistics research on objectivity (Kaiser & Wang, 2020).

A second measure of perceived objectivity, encountered by another third of participants, provided information about the existence of fact-checking organizations and informed participants that while some claims could be fact-checked, other claims could not be fact-checked, along with examples. Participants were then asked to consider whether it would be possible to have each statement fact-checked by Snopes, a fact-checking organization.

Participants were prompted, “Can this statement be fact-checked?” on a scale from [1] Definitely cannot be fact-checked to [6] Definitely can be fact-checked (scale order was randomized across participants).

A third measure of perceived objectivity instructed another third of participants to consider that when we encounter claims we sometimes wonder about their truthfulness, and so we might ask – is this claim true? While in some instances there is a correct answer to the question about a claim’s truthfulness (i.e., when the claim is true or when the claim is false), in other instances there is no correct answer to the question about a claim’s truthfulness (i.e., when the claim is an opinion). Following the instructions with examples, participants were presented with claims and asked, “Does there exist a correct answer to the question, ‘Is this statement true?’ for this statement?” on a scale from [1] No correct answer to [6] Definitely a correct answer (with scale order randomized across participants). This measure was adapted from Goodwin and Darley (2012) and based on similar measures used in prior work (e.g., Goodwin & Darley, 2008).

In addition to the primary measures of perceived objectivity, at the end of each experiment participants were asked about their agreement with each claim. Presented with the full set of 24 claims (the “exposed” half of which participants were seeing for a fifth time and the “novel” half of which they were seeing for a second time), participants were asked, “To what extent do you agree with the statement below?” on a scale from (1) Strongly disagree to (6) Strongly agree. This scale’s order was never reversed.

RESULTS

The key test of interest for this experiment was the effect of prior exposure on perceived objectivity. Results of analyses are presented as follows. First, we present main effect results

collapsed across the three measures of perceived objectivity (as pre-registered) as well as sources of variance for this effect. Second, we explore how the main effect changes based on participant attentiveness, introducing increasingly restrictive attentiveness filtering. Third, we discuss the frequency of the observed main effect across participants. Finally, we analyze the effect of prior exposure on agreement with claims, and discuss a correlation between the effect of exposure on agreement and the effect of exposure on perceived objectivity .

Main Effect of Prior Exposure on the Perceived Objectivity of Claims

In the experiment, participants were presented with claims and asked to provide ratings of perceived objectivity. Regardless of scale ordering, ratings of perceived objectivity were recorded such that greater values corresponded to greater perceived objectivity. For every individual, we calculate the average rating of perceived objectivity for exposed claims and the average rating of perceived objectivity for novel claims, and take their difference. This difference reflects the effect of exposure on perceived objectivity. We regressed that difference on a contrast coded variable representing the counterbalanced assignment of claim set (1 = set A as novel and set B as exposed, -1 = set B as novel and set A as exposed), two contrast coded variables representing the counterbalanced assignment of a dependent measure of perceived objectivity (-2 = objectivity, 1 = fact-checkability, 1 = existence of truth, and 0 = objectivity, 1 = fact-checkability, -1 = existence of truth, respectively), a contrast coded variable representing the counterbalanced assignment of scale order (1 = objectivity high, -1 = subjectivity high), and all two- and three-way interactions. This pre-registered analysis is equivalent to a mixed ANOVA in which we focus on the main effect of, and interactions with, prior exposure on perceived objectivity. In particular, the intercept represents the main effect of prior exposure, averaged across the 12 between-participant groups, and the various contrast coded variables represent the

interactions of those factors with prior exposure. We are most interested in the main effect of prior exposure (the intercept), and consider the other factors as nuisance variables.

Participants perceived exposed claims to be significantly more objective than novel claims ($b = 0.062$, $t(722) = 3.34$, $p < 0.001$, Cohen's d = 0.123). Participants' average rating of perceived objectivity was 3.94 for exposed claims and 3.88 for novel claims. This effect is roughly equivalent to that of prior exposure increasing perceived objectivity by one scale point for one of the exposed claims. Table 1-2 presents a breakdown of the main effect and includes differences in perceived objectivity for exposed vs. novel claims across different measures of perceived objectivity and different claim types.[2]

Table 1-2. Previously Exposed Claims Were Classified as More Objective Than Novel Claims

Measure	*Claims*	*Perceived Objectivity*		*b*	*SE*	*95% CI*		*df*	*t*	*p*	*Cohen's d*
		M_{novel}	$M_{exposed}$			*LL*	*UL*				
Across measures of perceived objectivity	*All Claims*	*3.88*	*3.94*	*0.062*	*0.019*	*0.026*	*0.099*	*722*	*3.34*	*<0.001*	*0.123*
	Facts	*5.16*	*5.22*	*0.064*	*0.026*	*0.013*	*0.115*	*722*	*2.46*	*0.014*	
	Opinions	*2.71*	*2.81*	*0.101*	*0.035*	*0.033*	*0.169*	*722*	*2.90*	*0.004*	
	Borderline	*3.77*	*3.79*	*0.021*	*0.037*	*-0.051*	*0.094*	*722*	*0.58*	*0.562*	
Existence of truth	*All Claims*	*3.98*	*4.05*	*0.067*	*0.034*	*<0.001*	*0.134*	*234*	*1.98*	*0.048*	*0.129*
	Facts	*5.19*	*5.26*	*0.065*	*0.047*	*-0.027*	*0.156*	*234*	*1.39*	*0.166*	
	Opinions	*2.85*	*2.94*	*0.097*	*0.065*	*-0.031*	*0.225*	*234*	*1.49*	*0.137*	
	Borderline	*3.91*	*3.95*	*0.041*	*0.065*	*-0.087*	*0.168*	*234*	*0.63*	*0.529*	
Objectivity	*All Claims*	*3.55*	*3.60*	*0.053*	*0.034*	*-0.014*	*0.119*	*237*	*1.57*	*0.118*	*0.101*
	Facts	*4.94*	*5.04*	*0.089*	*0.052*	*-0.012*	*0.192*	*237*	*1.74*	*0.083*	
	Opinions	*2.37*	*2.44*	*0.079*	*0.056*	*-0.032*	*0.190*	*237*	*1.40*	*0.162*	
	Borderline	*3.33*	*3.32*	*-0.011*	*0.069*	*-0.147*	*0.125*	*237*	*-0.15*	*0.878*	

[2] One might instead classify each response as "objective" or "subjective" by splitting the response scale at its midpoint. Using such an approach and aggregating across stimuli, we find that 60.3% of exposed claims are classified as objective and 58.9% of novel claims are classified as objective, a statistically significant difference ($b = 1.39$, $t(722) = 2.44$, $p = 0.015$).

Fact-checking	*All Claims*	*4.10*	*4.17*	*0.066*	*0.029*	*0.009*	*0.124*	*251*	*2.27*	*0.024*	*0.142*
	Facts	*5.33*	*5.37*	*0.038*	*0.037*	*-0.035*	*0.111*	*251*	*1.03*	*0.304*	
	Opinions	*2.91*	*3.03*	*0.127*	*0.060*	*0.010*	*0.244*	*251*	*2.13*	*0.034*	
	Borderline	*4.07*	*4.10*	*0.034*	*0.059*	*-0.082*	*0.150*	*251*	*0.58*	*0.561*	

The omnibus F test was not statistically significant ($F(11, 722) = 1.10$, $p = 0.356$), suggesting that, overall, the main effect did not vary across the 12 groups. More specifically, there was no interaction effect of prior exposure with the particular dependent measure of perceived objectivity that was used ($F(2, 722) = 0.06$, $p = 0.938$) nor with the direction of measurement scale order ($F(1, 722) = 0.09$, $p = 0.768$). The counterbalanced assignment of claim subset as exposed or as novel was statistically significant ($F(1, 722) = 4.88$, $p = 0.028$), indicating some potential evidence for heterogeneity of the effect across claims. None of the two- or three-way interactions among the three factors were significant (all ps > 0.120) The results above constitute our pre-registered analyses. Table 1-3 presents the complete ANOVA results. The main effect of prior exposure on perceived objectivity was not correlated with any of the measured individual differences such as performance on the cognitive reflection test, education, political liberalism, gender, etc.

Table 1-3. Complete ANOVA of Main Effect of Prior Exposure on Perceived Objectivity

	Df	*Sum Sq*	*Mean Sq*	*F*	*p*
Intercept (Main Effect of Prior Exposure)	*1*	*2.83*	*2.83*	*11.14*	*<0.001*
Claim Set	*1*	*1.24*	*1.24*	*4.88*	*0.028*
Scale Order	*1*	*0.02*	*0.02*	*0.09*	*0.768*
Perceived Objectivity Measure	*2*	*0.03*	*0.02*	*0.06*	*0.938*
Claim Set × Scale Order	*1*	*0.13*	*0.13*	*0.53*	*0.468*
Claim Set × Perceived Objectivity Measure	*2*	*1.08*	*0.54*	*2.12*	*0.120*

Scale Order × Perceived Objectivity Measure	*2*	*0.03*	*0.01*	*0.05*	*0.947*
Claim Set × Scale Order × Perceived Objectivity Measure	*2*	*0.51*	*0.26*	*1.00*	*0.368*
Residuals	*722*	*183.49*	*0.25*	-	-

Given that we are interested in the effect of prior exposure on the perceived objectivity of claims in general, rather than just on the specific claims used in this experiment, there is value in considering an analysis that generalizes across stimuli as well as individuals (e.g., Judd, Westfall, & Kenny, 2012). An additional exploratory analysis used a mixed-model regression with perceived objectivity ratings of each claim by each participant as the dependent variable and treated individual claims as random factors. Perceived objectivity was regressed on prior exposure (1 = exposed, -1 = novel), the counterbalanced assignment of a dependent measure of perceived objectivity (-2 = objectivity, 1 = fact-checkability, 1 = existence of truth, and 0 = objectivity, 1 = fact-checkability, -1 = existence of truth, respectively), the counterbalanced assignment of claim set (1 = set A as novel and set B as exposed, -1 = set B as novel and set A as exposed), the counterbalanced assignment of scale order (1 = objectivity high, -1 = subjectivity high), and all interactions among different factors. The main effect of exposure on perceived objectivity in the mixed-model analysis was consistent with the main effect observed using pre-registered analyses ($b = 0.062$, $t(17{,}616) = 2.63$, $p = 0.011$) with relatively little variance in the main effect size across claims ($SD = 0.023$) or people ($SD = 0.005$). This suggests that the magnitude of the effect is relatively consistent across the 24 claims, rather than being simply driven by a subset of unusual claims.

Exploring the Main Effect Across More/Less Attentive Participants

The integrated use of TaskMaster (Permut et al., 2019) throughout the experiment allowed for us to track participant attentiveness and engagement. For every page of the web

survey, TaskMaster tracks the amount of time (in seconds) that participants spend on-task (on the webpage) and off-task (off the webpage). The primary analysis of the main effect presented earlier followed the pre-registered exclusion of all participants who spent a total of at least 60 seconds off-task throughout the duration of the experiment. But it is also possible to consider what analyses look like when using other attention cutoffs, either more or less restrictive ones.

First, we consider the case of no attention filtering. When repeating primary analyses with the inclusion of all participants who completed the experiment, we find that perceived objectivity is greater for exposed claims than for novel claims ($b = 0.045$, $t(988) = 2.89$, $p = 0.004$, Cohen's d = 0.091).

Next, we consider more restrictive attention filters. Participants are divided into three groups: (i) participants who spent a total of at least 1 minute off-task throughout the duration of the experiment ($N = 266$); (ii) participants who spent a total of more than 0 but less than 1 minute off-task throughout the duration of the experiment ($N = 392$); (iii) participants who spent no time at all off-task throughout the duration of the experiment ($N = 342$). In the primary analyses, we pre-registered the exclusion of participants in group (i) and analyzed across participants in groups (ii) and (iii). Here, we consider the effect for each group separately. We do not find a main effect for participants in segment (i) who spent at least 1 minute off-task ($b = 0.002$, $t(254) = 0.07$, $p = 0.944$). For participants in segment (ii) who spent more than 0 but less than 1 minute off-task, we find a non-significant effect in the expected direction ($b = 0.040$, $t(380) = 1.57$, $p = 0.118$). Using the most restrictive attention filter, for participants in segment (iii) who did not spend any time at all off-task, we find a significant main effect that is directionally greater than the main effect from the primary analyses reported earlier ($b = 0.094$, $t(330) = 3.36$, $p < 0.001$, Cohen's d = 0.182). Taken together, analyses of attentiveness data suggest that more rigorously

filtering out inattentive participants who spend time off-task results in a greater effect of prior exposure on perceived objectivity.[3]

Frequency of the Creeping Objectivity Effect Among Participants

In addition to the magnitude of the effect size, we are interested in how frequently the observed effect occurs. In other words, what percentage of participants have higher ratings of perceived objectivity for exposed claims than for novel claims? We find that 51% of participants report greater perceived objectivity for exposed claims than for novel claims, 40% of participants report greater perceived objectivity for novel claims than for exposed claims, and 9% of participants report no difference in perceived objectivity between exposed claims and novel claims. If employing more restrictive filtration criteria and only including participants who were on-task for the duration of the experiment, more participants exhibit the effect, with 55%, 37%, and 8% exhibiting the expected effect, the reversed effect, and no effect, respectively.

Effect of Prior Exposure on Agreement with Claims

To assess the impact of exposure on agreement with claims, for every individual we calculate the average rating of agreement with exposed claims and the average rating of agreement with novel claims, and take their difference. This difference reflects the effect of perceived objectivity on agreement. We regressed that difference on the same set of contrast coded variables used for our primary preregistered analysis. This pre-registered analysis is equivalent to a mixed ANOVA in which we focus on the main effect of, and interactions with, prior exposure on agreement. In particular, the intercept represents the main effect of prior exposure, averaged across the 12 between-participant groups, and the various contrast coded

[3] If instead one classifies claims using the categorical measure described in footnote 2, the effect of prior exposure on the percentage of claims classified as objective for each segment would be (i) (b = -0.60, $t(254)$ = -0.68, p = 0.495); (ii) (b = 0.95, $t(380)$ = 1.22, p = 0.223); (iii) (b = 2.01, $t(330)$ = 2.40, p = 0.017).

variables represent the interactions of those factors with prior exposure. We are most interested in the main effect of prior exposure (the intercept), and consider the other factors as nuisance variables.

On average, agreement with exposed claims was 4.30 and with novel claims was 4.27. We find that there was no significant difference in agreement with exposed vs. novel claims (b = 0.025, $t(722) = 1.53$, $p = 0.126$), nor any significant variance in this null effect across counterbalanced groups ($F(11, 722) = 0.88$, $p = 0.562$). However, agreement was significantly greater with exposed opinions than with novel opinions ($b = 0.071$, $t(722) = 2.25$, $p = 0.025$).

Finally, we also consider the correlation between the effect of exposure on agreement and the effect of exposure on perceived objectivity. For every participant, there is a key measure reflecting the effect of exposure on perceived objectivity (the difference in perceived objectivity for exposed vs. novel claims) and a secondary measure reflecting the effect of exposure on agreement (the difference in agreement with exposed vs. novel claims). We regressed the key measure of perceived objectivity for exposed vs. novel claims on an intercept, a complete set of 11 contrast coded variables, and on the secondary measure of agreement with exposed vs. novel claims. We find that the difference in perceived objectivity of exposed vs. novel claims is significantly positively correlated with the difference in agreement with exposed vs. novel claims ($b = 0.269$, $t(721) = 6.49$, $p < 0.001$). This result reflects a significant positive correlation between the main effect of prior exposure on perceived objectivity and the effect of prior exposure on agreement.

GENERAL DISCUSSION

In a three-stage experiment, we explored the effect of prior exposure on perceived objectivity. Across a variety of claims and three different measures of perceived objectivity, we

find that previously exposed claims are rated as more objective than are novel claims. On average, across participants, claims, and measures, prior exposure increases perceived objectivity for a claim by approximately 0.06 scale points and by approximately 0.09 scale points among participants who show the least evidence of inattention. Moreover, the average rating of perceived objectivity was greater for exposed than for novel claims for 51% of participants, with only 40% showing an effect in the opposite direction.

When considering useful benchmarks to understand effect size, it is possible to look to the well-documented illusory truth effect, a related, albeit distinct paradigm documenting the effect of exposure on the perceived veracity of factual statements. For instance, in Fazio et al., (2019) on average 48% of novel facts were classified as true and 52% of exposed facts were classified as true. The magnitude of the illusory truth effect varied by claim plausibility, such that highly plausible and highly implausible claims had a reduced effect (Fazio et al., 2019). In the current research, the effect of prior exposure on perceived objectivity was studied using claims about political and social issues largely taken verbatim from Pew Research Center surveys (Mitchell et al., 2018; Doherty, 2018). In a meta-analysis of the illusory truth effect, Henderson et al. (2021) find that a majority of the prior research on the illusory truth effect used stimuli comprised of trivia claims, likely in order to ensure the true novelty of 'novel' claims, rather than using claims of high day-to-day visibility. Recent work on the illusory truth effect for news headlines used claims more central to ongoing social and political discourse, while also aiming to ensure claim novelty by asking participants whether or not they had seen the claims previously (e.g., Pennycook et al., 2018). De Keersmaecker et al. (2020), replicating the findings of Pennycook et al. (2018), found that repeated exposure of a new headline increases perceived accuracy on average by 0.09 scale points on a 4-point scale.

It is also likely that the magnitude of this creeping objectivity effect varies across contexts outside of the current experimental design. We find mixed evidence regarding variation across specific claims: the effect was larger for one set of 12 claims than the other, but a model treating claims as random effects indicated relatively little variability across claims. The stimulus set used in the current design is comprised of claims taken directly from Pew Research Center surveys (i.e., selected for downstream relevance and interest to participants but not cherry-picked for selectively larger effect sizes compared with other claims). These claims are central to a variety of public opinions for American respondents. People may have strong beliefs about the validity and objectivity of these claims, making it more difficult to detect shifts in beliefs than for other claims (e.g., for novel ideas or emerging topics of discussion). Relatedly, it is quite possible or even likely that many participants are not seeing these claims for the first time, even when presented in our experimental design as 'novel'. Hence, it may be that the detected effect of prior exposure on perceived objectivity is in fact the difference between an n^{th} and an $n+3^{rd}$ exposure rather than a 1^{st} vs. a 4^{th} exposure. Although we don't have a metric of how frequently participants had been exposed to particular claims outside of the experimental setting, if an attenuated effect of exposure on perceived objectivity was observed under such circumstances it would be in line with findings of attenuated strength for the illusory truth effect in instances of subsequent versus initial repetition (Hassan and Barber, 2021). These results, along with the finding that more attentive participants exhibit a bigger effect, imply that there likely exists variation across people, exposure contexts, and individual claims, for which an effect of exposure on perceived objectivity may be stronger than the modest effect observed in this particular setting.

Another question of interest is whether or not participants are accurately identifying facts

as objective claims and opinions as subjective claims. Although measures of perceived objectivity used 6-point scales, we can bisect these scales to categorize responses as either "subjective" or as "objective". Accurate claim classification can then be defined as the percentage of facts a participant classifies as "objective" and opinions as "subjective", based on the a-priori classification of claims by the Pew Research Center. On average, we find that 77% of exposed claims were accurately classified and 78% of novel claims were accurately classified, with no significant effect of prior exposure on accurate claim classification (b = -0.86, $t(722)$ = -1.38, p = 0.169). However, prior exposure did result in significantly decreased classification accuracy for opinions (b = -3.13, $t(722)$ = -3.14, p = 0.002), likely an outcome of the main effect of creeping objectivity. Accurate claim classification was also positively correlated with individual differences such as better performance on the cognitive reflection test (b = 3.46, $t(721)$ = 9.75, $p < 0.001$) and political liberalism (b = 2.49, $t(718)$ = 3.45, $p < 0.001$).

In addition to measures of perceived objectivity, participants were also asked to provide ratings of agreement with claims. As measures of agreement were collected following the third (classification) stage of the experiment, participants saw claims they were rating on agreement for either a 2nd or a 5th time. It is possible that diminishing marginal effects limited our ability to detect an effect of exposure on agreement with factual claims. The measure of agreement was intended to track general endorsement of claims regardless of how objective they were perceived, but it is possible that this language proved more jarring for endorsement of factual claims and prevented our ability to detect an exposure effect on agreement with factual claims. While we did not see an effect of prior exposure on overall agreement, we did find that prior exposure increases agreement with opinions, consistent with the mere exposure effect (Cacioppo & Petty, 1979).

Across claims and measures, the difference in agreement with exposed vs. novel claims was significantly correlated with the difference in perceived objectivity of exposed vs. novel claims. Both across claims, and when examining factual claims and opinions separately, we find that individuals who show a larger difference between exposed and novel claims in agreement also show a larger difference between exposed and novel claims in perceived objectivity. However, this correlation did not entirely account for the effect of exposure on perceived objectivity.

Process Evidence

Why does prior exposure affect beliefs about the objectivity of claims? It is possible that prior exposure enhances endorsement (agreement or perceived accuracy) of claims and, in turn, increased claim endorsement enhances the belief that a claim is more objective (in line with naïve realism). Our results are suggestive of this possible causal chain, though are not yet conclusive. In additional experiments, described in brief below with further details in supplemental materials, we explored processing fluency and perceived social consensus as potential mechanisms. However, these additional experiments do not allow us to make strong inferences regarding potential processes of the creeping objectivity effect.

Experiment C1 used a non-repetition-based visual manipulation to investigate processing fluency as a potential process for the observed effect of prior exposure on perceived objectivity, given prior findings that processing fluency at least partially explains the illusory truth and mere exposure effects (Oppenheimer, 2006; Shah and Oppenheimer, 2007; Alter and Oppenheimer, 2009). Participants were presented with a subset of the claims used in the three-stage experiment described above. Half of the claims were presented in a visually fluent manner (high text-to-background contrast) and half of the clams were presented in a visually disfluent manner (low

text-to-background contrast), randomized across participants. During that initial presentation, participants were asked to classify each claim as either fact-checkable or as not fact-checkable. We find that a greater percentage of fluent opinions were classified as fact-checkable (30%) than disfluent opinions were classified as fact-checkable (27%) representing a significant difference in the perceived objectivity for fluent vs. disfluent opinions (b = 3.31; t(330) = 2.55, p = 0.011). However, there is no such significant difference in perceived objectivity between fluent and disfluent factual claims (b = -0.38; t(330) = -0.33, p = 0.744). On average, 88% of factual claims were classified as fact-checkable, so it is possible that ceiling effects and the use of a binary measure of perceived objectivity prevented us from being able to detect an effect of visual fluency on perceived objectivity of factual claims. When collapsing across claim types, we do not find that visually fluent claims are any more likely to be classified as fact-checkable than visually disfluent claims (b = 0.813; t(330) = 0.91, p = 0.365). Although a substantial body of literature has demonstrated the importance of processing fluency for the illusory truth and mere exposure effects, and we find some suggestive evidence based on an effect of fluency for opinions, we are unable to conclude from the results of this experiment that processing fluency is a key mechanism of the observed effect of repeated exposure on perceived objectivity. Future investigations into the role of fluency on the observed creeping objectivity effect may merit alternative manipulations of processing fluency as well as other related processes such as answer fluency (Thompson et al., 2013).

However, the effects of repetition may not be limited to fluency. An illusory truth effect is observed even when people are simply *told* that a claim has been repeated, without being repeatedly exposed to it themselves, suggesting that people believe repetition is itself an informative cue about the nature of a claim (Mattavelli et al., 2022). Experiment C2 investigated

perceived social consensus as a potential process for the observed effect of prior exposure on perceived objectivity. More widely endorsed beliefs are perceived as more objective (Young & Heiphetz, 2007; Goodwin and Darley, 2008, 2012) and prior exposure to a claim increases its perceived social consensus (Weaver et al., 2007). Together, these findings raise the possibility that prior exposure may increase perceived objectivity by increasing the perceived social consensus around a claim. Experiment C2 used the same subset of claims as was used in experiment C1 and manipulated exposure to half of the claims using a three-stage experimental design similar to that described above. In the third stage, rather than collecting measures of perceived objectivity, participants were asked to report the percentage of U.S. citizens they think would agree with each claim. Half of the claims for which participants provided ratings of perceived social consensus had been exposed once in the first stage of the experiment and half of the claims were novel, randomized across participants. Across participants, the average perceived social consensus for exposed claims was 49.68% and the average perceived social consensus for novel claims was 49.54%. Whether or not claims had been previously exposed did not affect their perceived social consensus ($b = 0.141$, $t(386) = 0.31$, $p = 0.756$). Separating by claim type does not yield additional insight. Results from prior research notwithstanding, we fail to find an effect of prior exposure on perceived social consensus and hence are unable to conclude whether or not perceived social consensus may mediate the effect of prior exposure on perceived objectivity.

Future Directions and Limitations

The effect of prior exposure found in the current research highlights that the manner in which a claim is presented influences beliefs about the claim's objectivity. Two potentially insightful avenues for future research stem from possible changes to the current experimental

design. The first is to consider different exposure frequencies or intensities. The three-stage design outlined above manipulated prior exposure by presenting a subset of claims in the first stage, inducing a brief delay during the second (filler) stage, and measuring the perceived objectivity of the full set of claims in the third stage. During the first stage, exposed claims were each presented to participants three times in three different engagement tasks. The second direction is to experiment with varying filler stage delay periods. On average, participants spent 169 seconds on the questions in the filler stage, which included measures of basic demographics, an extended version of the cognitive reflection test, as well as measures of digital savviness, trust of national news organizations, political awareness, etc., each adapted from measures used in Pew Research Center surveys. Either of these directions could lend considerable insight into the creeping objectivity effect.

In the current research we found that, across a variety of claims and measures, prior exposure increases the perceived objectivity of a claim. This creeping objectivity effect was present for a majority of participants. While the observed effect was modest in magnitude, such pervasive effects can have substantial implications on large scales and for complex problems. The creeping objectivity effect is of note to and may merit further attention from researchers of the illusory truth and mere exposure effects as well as consumer behavior, conflict mediation, and misinformation more broadly.

Illusory Truth and Mere Exposure Research. One potential methodological contribution of the current findings may be of note for research on the illusory truth and mere exposure effects. Prior research on both the illusory truth and the mere exposure effects has often presented participants with claims that are a priori determined to be either factual statements or opinions. As a result, elicitations of manipulations intended to shift perceptions of accuracy or

agreement may be unable to detect shifts in perceived objectivity. For example, repeated exposure to an opinion may result in a fraction of participants starting to perceive it as a fact, but dependent measures (e.g., agreement) may not reflect such a shift in perceived objectivity. This methodological nuance is important for researchers, as it could affect how responses are coded and results are interpreted. The present findings indicate that not only does prior exposure affect whether individuals believe factual claims are true, or opinions are agreeable, but prior exposure can also affect whether claims are perceived as matters of objective fact or of subjective opinion. Future research using these paradigms may wish to consider including measures of perceived objectivity in addition to a-priori determined measures of agreement or accuracy.

Consumer Behavior. For consumer researchers and marketing managers, the current findings present implications in the use of claims comparing products or describing product attributes. For instance, comparisons between brands are often presented to consumers as direct superiority claims about product quality. Consumers are willing to pay more for the superior product in question when they believe that the comparison is being made along a dimension of objective quality rather than along a dimension of subjective taste (Spiller & Belogolova, 2017). The current research suggests that prior exposure to such claims may increase the likelihood that claims are perceived as reflecting objective dimensions such as quality, rather than subjective dimensions such as taste.

Conflict Management. Moral objectivism and naïve realism are focal issues in work on interpersonal conflict (Ross & Ward, 1995). The belief that one's views are reflective of an objective state where there is no room for disagreement limits people's receptiveness to alternative views (Liberman et al., 2012; Minson et al., 2020; Yeomans et al., 2020). This results in workplace inefficiencies through hindered collaboration as well as increased political

polarization through belief entrenchment and moral tribalism (Liberman et al., 2012; Skitka & Morgan, 2014). The present findings suggest that an increase in the perceived objectivity of repeatedly exposed claims may be associated with some of the divisive features of interpersonal conflict and with the downstream consequence of societal fractures. Future research would benefit from directly investigating these potential associations causally.

Misinformation. With respect to the rise of misinformation disseminated via social media, social media companies have come under pressure to not only fact-check factual statements but also to discern factual statements from opinions (Iannucci, 2017; Media Insight Project, 2018). For instance, Twitter added a notice reading "Get the facts about mail-in ballots" to two of President Trump's tweets, indicating that the tweets included fact-checkable claims that could be (and were) false (Conger & Isaac, 2020). Non-governmental organizations such as the International Research & Exchanges Board (IREX) have developed international programs dedicated to teaching both journalists and laypersons to discern fake news from real news (Murrock et al., 2018). Our findings suggest that initiatives targeted at improving the accuracy of information consumption could also benefit from teaching people to discern news from opinions.

CONCLUSION

As communicators, consumers, and colleagues, we encounter claims on a daily basis about issues in the world around us, some of which are objective and are either correct or incorrect, and others of which are subjective and reflect varying views and opinions. Such perceived objectivity has downstream consequences on collaboration, conflict, consumer behavior, political polarization, and misinformation. Moreover, we frequently encounter the same claims multiple times. Sometimes repeated exposure to claims is a result of issues becoming focal points of discussion, debate, or disagreement, and claims reflecting those issues

are repeated by our friends, coworkers, and media outlets. Other times repeated exposure to claims may be the result of marketing or political campaigns or popularized slogans. Whatever the source of initial exposure, repeated exposure to a claim affects the way in which it is processed and understood. Across a variety of claims and measures, we uncover a persistent effect: prior exposure to a claim increases the claim's perceived objectivity. The current research bridges prior findings in the illusory truth and mere exposure literatures, reinforcing the notion that whether a claim is perceived as objective or as subjective is itself a malleable construct.

REFERENCES

Alter, A. L., & Oppenheimer, D. M. (2009). Uniting the tribes of fluency to form a metacognitive nation. *Personality and Social Psychology Review*, *13*(3), 219-235.

Arkes, H. R., Hackett, C., & Boehm, L. (1989). The generality of the relation between familiarity and judged validity. *Journal of Behavioral Decision Making*, *2*(2), 81-94.

Arkes, H. R., Boehm, L. E., & Xu, G. (1991). Determinants of judged validity. *Journal of Experimental Social Psychology*, *27*(6), 576-605.

Bacon, F. T. (1979). Credibility of repeated statements: Memory for trivia. *Journal of Experimental Psychology: Human Learning and Memory*, *5*(3), 241.

Berryman, J. C. (1984). Interest and liking: Further sequential effects. *Current Psychological Research & Reviews*, *3*(4), 39-42.

Begg, I. M., Anas, A., & Farinacci, S. (1992). Dissociation of processes in belief: Source recollection, statement familiarity, and the illusion of truth. *Journal of Experimental Psychology: General*, *121*(4), 446.

Blatz, C. W., & Mercier, B. (2018). False polarization and false moderation: Political opponents overestimate the extremity of each other's ideologies but underestimate each other's certainty. *Social Psychological and Personality Science*, *9*(5), 521-529.

Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968–1987. *Psychological Bulletin*, 106(2), 265.

Cacioppo, J. T., & Petty, R. E. (1979). Effects of message repetition and position on cognitive response, recall, and persuasion. *Journal of Personality and Social Psychology*, 37(1), 97.

Crandall, C. S. (1985). The liking of foods as a result of exposure: Eating doughnuts in Alaska. *The Journal of Social Psychology*, *125*(2), 187-194.

De Keersmaecker, J., Dunning, D., Pennycook, G., Rand, D. G., Sanchez, C., Unkelbach, C., & Roets, A. (2020). Investigating the robustness of the illusory truth effect across individual differences in cognitive ability, need for cognitive closure, and cognitive style. *Personality and Social Psychology Bulletin*, *46*(2), 204-215.

Dechêne, A., Stahl, C., Hansen, J., & Wänke, M. (2010). The truth about the truth: A meta-analytic review of the truth effect. *Personality and Social Psychology Review*, *14*(2), 238-257.

Doherty, C. (2018). Key findings on Americans' views of the US political system and democracy. *Pew Research Center*.

Effron, D. A., & Raj, M. (2020). Misinformation and morality: encountering fake-news headlines makes them seem less unethical to publish and share. *Psychological Science*, *31*(1), 75-87.

Fazio, L. K., Brashier, N. M., Payne, B. K., & Marsh, E. J. (2015). Knowledge does not protect against illusory truth. *Journal of Experimental Psychology: General*, *144*(5), 993.

Fazio, L. K., Rand, D. G., & Pennycook, G. (2019). Repetition increases perceived truth equally for plausible and implausible statements. *Psychonomic Bulletin & Review*, 1-6.

Fisher, M., Knobe, J., Strickland, B., & Keil, F. C. (2017). The influence of social interaction on intuitions of objectivity and subjectivity. *Cognitive science*, *41*(4), 1119-1134.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, *19*(4), 25-42.

Goodwin, G. P., & Darley, J. M. (2008). The psychology of meta-ethics: Exploring objectivism. *Cognition*, *106*(3), 1339-1366.

Goodwin, G. P., & Darley, J. M. (2012). Why are some moral beliefs perceived to be more objective than others?. *Journal of Experimental Social Psychology*, *48*(1), 250-256.

Griffin, D. W., & Ross, L. (1991). Subjective construal, social inference, and human misunderstanding. In *Advances in Experimental Social Psychology* (Vol. 24, pp. 319-359). Academic Press.

Hasher, L., Goldstein, D., & Toppino, T. (1977). Frequency and the conference of referential validity. *Journal of Verbal Learning and Verbal Behavior*, *16*(1), 107-112.

Hassan, A., & Barber, S. J. (2021). The effects of repetition frequency on the illusory truth effect. *Cognitive research: principles and implications*, *6*(1), 1-12.

Hawkins, S. A., & Hoch, S. J. (1992). Low-involvement learning: Memory without evaluation. *Journal of Consumer Research*, *19*(2), 212-225.

Heiphetz, L., & Young, L. L. (2017). Can only one person be right? The development of objectivism and social preferences regarding widely shared and controversial moral beliefs. *Cognition*, *167*, 78-90.

Henderson, E. L., Westwood, S. J., & Simons, D. J. (2021). A reproducible systematic map of research on the illusory truth effect. *Psychonomic bulletin & review*, 1-24.

Hill, W. F. (1978). Effects of mere exposure on preferences in nonhuman mammals. *Psychological Bulletin*, *85*(6), 1177.

Iannucci, R. (2017, August 16). News or opinion? Online, it's hard to tell. Retrieved July 07, 2020, https://www.poynter.org/ethics-trust/2017/news-or-opinion-online-its-hard-to-tell/

Jacoby, L. L., Kelley, C., Brown, J., & Jasechko, J. (1989). Becoming famous overnight: Limits on the ability to avoid unconscious influences of the past. *Journal of Personality and Social Psychology*, *56*(3), 326.

Johar, G. V., & Roggeveen, A. L. (2007). Changing false beliefs from repeated advertising: The role of claim-refutation alignment. *Journal of Consumer Psychology, 17*(2), 118-127.

Johnson, S. G., Rodrigues, M., & Tuckett, D. (2021). Moral tribalism and its discontents: How intuitive theories of ethics shape consumers' deference to experts. *Journal of Behavioral Decision Making, 34*(1), 47-65.

Kaiser, E., & Wang, C. (2020). Distinguishing fact from opinion: Effects of linguistic packaging. In S. Denison, M. Mack, Y. Xu, & B. Armstrong (Eds.), *Proceedings of the 42nd Annual Conference of the Cognitive Science Society*, (pp. 116-122), Cognitive Science Society.

Kaiser, E., & Wang, C. (2021). Packaging information as fact versus opinion: Consequences of the (information-) structural position of subjective adjectives. *Discourse Processes, 58*(7), 617-641.

Liberman, V., Minson, J. A., Bryan, C. J., & Ross, L. (2012). Naïve realism and capturing the "wisdom of dyads". *Journal of Experimental Social Psychology, 48*(2), 507-512.

Litman, L., Rosenzweig, C., & Moss, A. (2020). New Solutions Dramatically Improve Research Data Quality on MTurk.

Mattavelli, Simone & Corneille, Olivier & Unkelbach, Christian. (2022). Truth by Repetition … without repetition: Testing the effect of instructed repetition on truth judgments. *Journal of Experimental Psychology Learning Memory and Cognition*.

McDougal v. Fox News Network LLC, No. 19-cv-11161-MKV, Docket no. 37 (SDNY June 25, 2020).

Media Insight Project. (2018). Americans and the news media: What they do—and don't—understand about each other. *American Press Institute*.

Minson, J. A., Chen, F. S., & Tinsley, C. H. (2020). Why won't you listen to me? Measuring receptiveness to opposing views. *Management Science, 66*(7), 3069-3094.

Mitchell, A., Gottfried, J., & Weisel, R. (2018). Distinguishing Between Factual and Opinion Statements in the News. *Pew Research Center*.

Murrock, E., Amulya, J., Druckman, M., & Liubyva, T. (2018). Winning the War on State-Sponsored Propaganda: Results from an Impact Study of a Ukrainian News Media and Information Literacy Program. *Journal of Media Literacy Education*, 10(2), 53-85.

Oppenheimer, D. M. (2006). Consequences of erudite vernacular utilized irrespective of necessity: Problems with using long words needlessly. *Applied Cognitive Psychology*, *20*(2), 139-156.

Penney, V. (2020, July 14). How Facebook Handles Climate Disinformation. Retrieved July 17, 2020, https://www.nytimes.com/2020/07/14/climate/climate-facebook-fact-checking.html

Pennycook, G., Cannon, T. D., & Rand, D. G. (2018). Prior exposure increases perceived accuracy of fake news. *Journal of Experimental Psychology: General*.

Permut, S., Fisher, M., & Oppenheimer, D. M. (2019). Taskmaster: A tool for determining when subjects are on task. *Advances in Methods and Practices in Psychological Science*, *2*(2), 188-196.

Petrocelli, J. V., Tormala, Z. L., & Rucker, D. D. (2007). Unpacking attitude certainty: Attitude clarity and attitude correctness. *Journal of Personality and Social Psychology*, 92(1), 30.

Pliner, P. (1982). The effects of mere exposure on liking for edible substances. *Appetite*, *3*(3), 283-290.

Reber, R., Winkielman, P., & Schwarz, N. (1998). Effects of perceptual fluency on affective judgments. *Psychological Science, 9*(1), 45-48.

Ross, L., & Ward, A. (1995). Psychological barriers to dispute resolution. In *Advances in experimental social psychology* (Vol. 27, pp. 255-304). Academic Press.

Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, *66*(1), 20-40.

Sarkissian, H., Park, J., Tien, D., Wright, J. C., & Knobe, J. (2011). Folk moral relativism. *Mind & Language*, *26*(4), 482-505.

Shah, A. K., & Oppenheimer, D. M. (2007). Easy does it: The role of fluency in cue weighting. *Judgment and Decision Making*, *2*(6), 371-379.

Shane, S. (2017). From headline to photograph, a fake news masterpiece. *The New York Times*, *18*.

Shidlovski, D., Schul, Y., & Mayo, R. (2014). If I imagine it, then it happened: The Implicit Truth Value of imaginary representations. *Cognition*, *133*(3), 517-529.

Skitka, L. J., & Morgan, G. S. (2014). The social and political implications of moral conviction. *Political Psychology*, *35*, 95-110.

Spiller, S. A., & Belogolova, L. (2017). On consumer beliefs about quality and taste. *Journal of Consumer Research*, *43*(6), 970-991.

Thomson, K. S., & Oppenheimer, D. M. (2016). Investigating an alternate form of the cognitive reflection test. *Judgment and Decision Making*, *11*(1), 99.

Thompson, V. A., Turner, J. A. P., Pennycook, G., Ball, L. J., Brack, H., Ophir, Y., & Ackerman, R. (2013). The role of answer fluency and perceptual fluency as metacognitive cues for initiating analytic thinking. *Cognition*, *128*(2), 237-251.

Toner, K., Leary, M. R., Asher, M. W., & Jongman-Sereno, K. P. (2013). Feeling superior is a bipartisan issue: Extremity (not direction) of political views predicts perceived belief superiority. *Psychological Science*, *24*(12), 2454-2462.

Unkelbach, C. (2007). Reversing the truth effect: Learning the interpretation of processing fluency in judgments of truth. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*(1), 219.

Unkelbach, C., & Rom, S. C. (2017). A referential theory of the repetition-induced truth effect. *Cognition*, *160*, 110-126.

US Dominion, Inc. v. Powell, Civil Action 1:21-cv-00040 (CJN) (D.D.C. Aug. 11, 2021)

Wang, W. C., Brashier, N. M., Wing, E. A., Marsh, E. J., & Cabeza, R. (2016). On known unknowns: Fluency and the neural mechanisms of illusory truth. *Journal of Cognitive Neuroscience*, *28*(5), 739-746.

Whittlesea, B. W. (1993). Illusions of familiarity. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*(6), 1235.

Yeomans, M., Minson, J., Collins, H., Chen, F., & Gino, F. (2020). Conversational receptiveness: Improving engagement with opposing views. *Organizational Behavior and Human Decision Processes*, *160*, 131-148.

Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology*, *9*(2p2), 1-27.

CHAPTER 2

Source Memory Is More Accurate for Opinions Than for Facts

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All data, materials, pre-registrations, and supplementary materials are available here: https://researchbox.org/501&PEER_REVIEW_passcode=ZNQBPW.

Abstract: Effective communication relies on consumers remembering, sharing, and applying relevant information. Source memory, the ability to link a claim to its original source, is an essential aspect of accurate recall, attitude formation, and decision making. We propose that claim objectivity, whether a claim is a fact or an opinion, affects memory for the claim's source. This proposal follows a two-step process: (i) opinions provide more information about sources than facts do; (ii) claims that provide more information about sources during information encoding are more likely to be accurately attributed to original sources during recall. Across twelve pre-registered experiments (N=7,008) and a variety of consumer domains, we investigate the effect of claim objectivity on source memory. We find that source memory is more accurate for opinions than for facts, with no consistent effect on claim recognition memory. We find support for the proposed process by manipulating facts to be more informative about sources and opinions to be less informative about sources. When forming inferences and seeking advice from sources, participants integrate new evidence more accurately based on sources' previously shared opinions than facts. Our results indicate that opinions are more likely to be accurately attributed to original sources than are facts.

Keywords: source memory, objectivity, memory, opinions, facts

INTRODUCTION AND THEORY

In an information-rich world, consumers continuously encounter claims originating from a variety of different sources. Media outlets publish headlines, online reviewers share experiences, friends offer recommendations, and politicians disseminate narratives. Billions of dollars are spent every year on advertisements, slogans, and marketing campaigns as companies compete with one another for consumers' time, attention, and memory. Effective communication relies heavily on memory processes, assuming that consumers will be able to accurately recall previously encountered information (Bettman, 1979; Johar and Pham, 1999; Lynch, Alba, and Hutchinson, 1991; Lynch and Srull, 1982). Source memory, the ability to link a claim to its original source, is an essential aspect of accurate recall, attitude formation, and subsequent decision making. For example, whether people believe news headlines to be real or fake, and criminal suspects to be guilty or innocent, depends on their source memory for presented claims (Fragale and Heath, 2004). Source memory has consequential implications for persuasion (Kumkale and Albarracín, 2004), consumer choice (Bettman, 1979), and public health behaviors (Morgan et al., 2021).

However, as with other types of memory, source memory failures are common. In a pilot test with 98 participants on Amazon's Mechanical Turk, 95% of participants (93 of 98) reported having experienced a source memory failure, 55% of whom were not able to eventually recall the source. For participants who had experienced a source memory failure, 49% reported that it had been at least 'moderately important' to recall the source and 27% reported that it had been 'very important' or 'extremely important'. 73% of participants were frustrated by their source memory failures, with 26% reporting that the experience was very frustrating. Such experiences are reflected in the very presence of online forums (e.g., the *'/r/tipofmytongue'* subreddit serves as a

resource for frustrated consumers to seek help with source memory failures) and entertainment platforms (e.g., *Sporcle* allow users to play and test their source memory on "Who Said It?" quizzes for movie and TV quotes) based around source memory failures. A constant in our daily lives, source memory failures can have important consequences for advertising efficacy. For instance, source memory misattributions resulted in consumers incorrectly identifying FedEx as the official sponsor of the 1998 Winter Olympics rather than the true sponsor UPS (Johar and Pham, 1999). After Energizer introduced commercials with their now-ubiquitous pink drumming bunny mascot in the late 1980s, reports claimed that up to 40% of consumers who praised the Energizer campaign inaccurately misattributed the pink drumming bunny mascot to competitor Duracell (Kent and Kellaris, 2001; Krishnan and Chakravarti, 2003).

Although source memory has received limited attention in consumer research, the causes of source memory failures have been a point of interest in cognitive science. Memory researchers have found that source memory accuracy is affected by the source of a claim (source effects), the recipient of a claim (individual differences), and by the context in which claims are encountered (context effects) (Bell, Mieth, and Buchner, 2021; Cansino et al., 2019; Kassam et al., 2009). However, to our knowledge, whether features of the claims *themselves* might affect source memory accuracy has not been considered in the memory literature. Claim effects are not just a novel focus for source memory research, they are also of first-order relevance to marketing managers. In order to craft successful marketing campaigns and understand how consumers communicate with one another, it's important to identify how features of a claim can affect the way in which the claim is perceived, processed, and engaged with.

In the present research, we investigate the effects on source memory accuracy of one such claim feature: *claim objectivity*. While some claims are objective (reflecting verifiable truth

or falsehood) other claims are subjective (reflecting opinions and beliefs). Claim objectivity has a wide range of implications for consumer beliefs about quality vs. taste (Spiller and Belogolova, 2017), workplace collaboration and negotiation (Liberman et al., 2012), political polarization (Skitka and Morgan, 2014), interpersonal conflict (Ross and Ward, 1995), and the spread of misinformation (Penney, 2020). Yet research on claim objectivity in consumer behavior has also been limited.

Importantly, claim objectivity has the potential to affect source memory accuracy. The objectivity of a claim provides consumers with informational value about the claim's source. Both young children (ages 8-10) and adults (ages 17-40) learn more about a source when the source shares an opinion (e.g., *"Oranges are the tastiest fruit of all"*) than when the source shares a factual claim about the world (including accurate claims e.g., *"George Washington was the first president of the United States"* and inaccurate claims e.g., *"There are dinosaurs alive right now"*) (Heiphetz et al., 2014).

The present research finds that a claim's objectivity affects how accurately consumers are able to recall its original source, offering key considerations for memory researchers, consumer researchers, and industry practitioners.

Claim Objectivity

The claims we encounter and share vary in their objectivity. Some claims are objective, they are factual statements which can be verified as either true or false (e.g., "Stockholm is the capital of Sweden"). Other claims are opinions, they are subjective assessments which cannot be verified as true or false but people may agree or disagree with them (e.g., "Stockholm is more beautiful than Copenhagen"). Because opinions are subjective, they allow for inconsistent assessments: Jack may believe that Stockholm is more beautiful than Copenhagen, Jill may

believe that Copenhagen is just as beautiful, and yet because neither one of them expresses a belief that can be considered objectively true or false, neither one is right nor wrong. Factual statements, on the other hand, generally necessitate the existence of an objectively correct view: someone is either right or they are wrong.

Perceived objectivity is often at the root of conflict. When people believe that the conflicting perspective of an adversary is defined by objective inaccuracy, rather than simply reflecting a divergent opinion, they are less likely to be receptive to the adversary's perspective (Heiphetz and Young, 2017; Liberman et al., 2012). Claim objectivity touches upon many aspects of our personal and professional lives, leading to interpersonal conflict (Ross and Ward, 1995), undermining collaboration (Liberman et al., 2012), and driving political partisanship (Blatz and Mercier, 2018; Skitka and Morgan, 2014) and moral tribalism (Johnson et al., 2021).

Claim objectivity marks the foundation of ongoing legal and policy discussions about the credibility of social and traditional media sources, the spread of misinformation, and the rise of partisan conflict. In defending against a 2020 defamation lawsuit, Fox News' attorney argued that comments Tucker Carlson made on his show, "cannot reasonably be interpreted as facts" and as such cannot be considered as factually inaccurate (*McDougal v. Fox News Network LLC* 2020). In responding to a 2021 defamation lawsuit, former federal prosecutor Sidney Powell's attorneys similarly claimed that "no reasonable person would conclude that the statements were truly statements of fact… Powell's claims were her opinions" (*US Dominion, Inc. v. Powell* 2021). Facebook's policy of not fact-checking posts classified as opinions has stymied efforts from climate scientists to combat the spread of misinformation about climate change, resulting in the spread of climate change denialism posts on the platform when labeled as opinions (Penney, 2020). These incidents highlight the increasing importance of understanding how claim

objectivity affects the ways in which people process, remember, and engage with content (Shane, 2017).

Perceived objectivity is of particular relevance for consumer researchers and marketing managers interested in product and attribute comparisons. Consumers are often exposed to advertisements or reviews that compare two brands, claiming one to be directly superior (e.g., "Coca-Cola is better than Pepsi"). Consumers are willing to pay more for the superior product in question when they believe that the comparison represents one of objective quality rather than one of subjective taste (Spiller and Belogolova, 2017).

Source Memory

Source memory is a form of associative memory, a critical function of human cognition that allows us to form, store, and remember associations between elements (Anderson, 1983; Johnson, Hashtroudi, and Lindsay, 1993). The formation and strength of these associative links (e.g., between a claim and its source) relies on the binding between an item and its surrounding features during the initial encoding of information (Johnson et al., 1993; Chalfonte and Johnson, 1996; Mitchell and Johnson 2009; Old and Naveh-Benjamin, 2008; Mitchell and MacPherson, 2017; Greene, Martin, and Naveh-Benjamin, 2021; Bell, Mieth, and Buchner, 2022). Remembering a situation involves both the encoding of the individual elements that make up the situation (e.g., what was said, who said it, in what context it was said, etc.) as well as the encoding of links binding these various individual elements to one another, forming a web of interconnected elements and relational constructs (Chalfonte and Johnson, 1996; Meiser and Bröder, 2002). Precisely *how* these links are formed, stored, and retrieved is a focus of ongoing research across a number of disciplines, aiming to identify the neural and cognitive mechanisms underpinning source memory processes (e.g., for a recent review see Kuhlmann et al., 2021).

Accurate item memory (memory for a previously seen focal item, e.g., what was learned) can be driven by episodic memory, a conscious process whereby a person can explicitly recall the focal item as well as the context in which it was learned. Accurate item memory can also be driven by familiarity-based memory, a process whereby the experience and context is not explicitly recalled but the focal item feels familiar (Yonelinas, 2002). Whether both processes can also drive accurate source memory (memory for features of the context in which a focal item was previously seen, e.g., when, how, and from whom something was learned) is an unresolved question with contradictory findings (Mitchell and Johnson, 2009; Mayes, Montaldi, and Migo, 2007; Staresina and Davachi, 2006). Kuhlmann et al. (2021) suggest that these seemingly contradictory findings can be resolved by considering distinctions in what is classified as the focal item for a task (i.e., when sources are the focal point of attention at encoding, 'source memory' may operate more like 'item memory'). The specific processes underpinning source memory are an active focus of investigation.

Source Memory Failures. Memory – including source memory – often fails us as consumers. Source memory is of particular relevance for aging consumers, who experience declines in associative memory performance (Law, Hawkins, and Craik, 1998; Hashtroudi, Johnson, and Chrosniak, 1989; Chalfonte and Johnson, 1996). Reduced source memory accuracy in older adults is attributed to weaker associative links formed during encoding between items and sources (Naveh-Benjamin, 2000; Old and Naveh-Benjamin, 2008). Strategies developed to assist older adults in source memory recall have targeted the encoding stage, aiming to strengthen the links formed between items and sources (Kuhlmann and Touron, 2012). For instance, Glisky, Rubin, and Davidson, (2001) ask participants to study the source-item relationship during encoding, finding that attributing greater attention to these relationships

improves source memory at recall. These findings highlight the importance of source-item links formed during encoding as a key driver of source memory accuracy during recall (Johnson et al., 1993; Chalfonte and Johnson, 1996).

When source memory recall is unsuccessful, consumers try to reconstruct associations based on existing information, heuristics, and stereotypes about source and information characteristics (Batchelder and Batchelder, 2008; Kuhlmann and Touron, 2011; Schaper, Kuhlmann, and Bayen, 2019; Mieth et al., 2021). Informed guessing helps consumers, for example to identify the source of a textbook recommendation as a colleague rather than a car mechanic, based on the likelihood of the respective source options (Batchelder and Batchelder, 2008; Bell, Mieth, and Buchner, 2020; Bell et al., 2021). However, consumers are also susceptible to limited experiences with and lay beliefs about rarely-encountered groups of people, increasing a reliance on stereotypes particularly amongst older adults (Sherman and Bessenoff, 1999; Klauer and Meiser, 2000; Mather, Johnson, and De Leonardis, 1999).

Source Memory in Consumer Contexts. Advertising efficacy relies in part on consumers making decisions at a later point in time, based on accurate recall of information that was presented to them earlier (Bettman, 1979; Biehal and Chakravarti, 1986; Keller, 1987; Lynch, Marmorstein, and Weigold, 1988). As a result, memory processes have long been of interest to both academic and industry researchers (e.g., Burke and Srull, 1988; Hutchinson and Moore, 1984; Keller, 1987; Lynch and Srull, 1982; Kent and Kellaris, 2001). As noted earlier, source memory failures can lead consumers to misattribute event sponsorships or advertising campaigns to competitors.

Research on competitive advertisement interference builds on the same associative network model used for source memory (Anderson, 1983; Hutchinson and Moore, 1984). When

consumers encounter competitive advertising, the strength of the associations between the target brand and its advertised claims is weakened, resulting in worse memory for the target brand as the source of the advertised claims (Keller, 1987; Burke and Srull, 1988; Kent and Allen, 1994; Kent and Kellaris, 2001; Lee and Lee, 2007). Competitive advertisement interference may also result in reduced evaluations of the target brand, as links between initially-formed attitudes and the target brand are weakened with the influx of information from competitors (Baumgardner et al., 1983; Burke and Srull, 1988).

Source memory also affects consumers' interpersonal interactions and adaptive social behaviors. For instance, participants in a dictator game rely on source memory for other players' past choices in order to inform and update their own future behaviors accordingly (Schaper, Mieth, and Bell, 2019).

Variability in Source Memory Accuracy. Source memory varies across people, contexts, and sources. Notably, accuracy declines with age and associated neurological deficits (Cansino et al., 2019; Hashtroudi et al., 1989; Janowsky, Shimamura, and Squire, 1989; Schacter et al., 1994; Simons et al., 2004). Informational salience also impacts source memory: source memory for claims is enhanced when people know beforehand that the information may be important later (Kassam et al., 2009) and factors such as source emotionality and source credibility can enhance source memory accuracy (Bell et al., 2021; Davidson, McFarland, and Glisky, 2006).

Yet to our knowledge, research on features of the claims themselves that may affect source memory has been limited. The role of emotional claims has been disputed as a source effect of emotional sources rather than as a claim effect of valence (Davidson, McFarland, and Glisky, 2006; Doerksen and Shimamura, 2001). Variability in source memory accuracy is subject to differences across people, contexts, sources, and claims, but prior research has focused

primarily on individual differences, context effects, and source effects, and has not substantially addressed claim effects. In the current research, we aim to address this gap by investigating a claim effect, specifically the role of claim objectivity, on source memory.

Source Memory and Claim Objectivity. As noted earlier, subjective claims provide more information about a source than do objective claims (Heiphetz et al., 2014), and source memory accuracy is affected by the strength of source-claim links formed during encoding (Greene et al., 2021; Mitchell and Johnson, 2009; Mitchell and MacPherson, 2017; Pham and Johar, 1997). Because opinions are more informative about a source than are facts, we predict that the associative links formed during encoding will be stronger between sources and opinions than between sources and facts. As a result, we expect that consumers will be more likely to correctly identify the original source of a claim when the claim is an opinion than when the claim is a fact.

OVERVIEW OF EXPERIMENTS

In twelve pre-registered experiments, we examine the effect of claim objectivity on source memory across different consumer environments. In experiments 1, 2a, 2b, and 2c we establish the main effect. In experiment 3, we examine whether source expertise moderates this effect, finding no such evidence. In experiments 4 and 5 we identify process evidence by making facts more informative about a source (experiment 4) or opinions less informative about a source (experiment 5). In experiments 6a and 6b we consider two downstream consequences of the observed main effect, finding that participants are better able to form inferences about sources (experiment 6a) and are more likely to seek relevant advice from sources (experiment 6b) based on sources' previously shared opinions than their previously shared facts. In the general discussion, we discuss three experiments in which we did not find an effect of claim objectivity on source memory. Together, these twelve experiments constitute all of the experiments we

conducted in which we varied claim objectivity and measured source memory accuracy.

Each experiment used a similar design and method, as pre-registered on AsPredicted, so we describe that overall approach first before describing each experiment in detail. This research was certified exempt by the home institution IRB. All anonymized data, code, materials (including a full list of sources and claims), and pre-registrations are available on Research Box (https://researchbox.org/501&PEER_REVIEW_passcode=ZNQBPW).

Method Across Experiments

For each experiment we recruited a convenience sample of participants from Amazon Mechanical Turk. Sample sizes were large enough to provide at least 80% power to detect a within-subject difference of 0.15 standard deviations in our target measure of source memory for opinions versus facts. The overall experimental design used in each experiment was based on the source memory literature (e.g., Kassam et al., 2009). Each experiment was composed of three stages.

First was the encoding stage. A set of sources, individuals with names and photographs, were shown sequentially to participants. Each source was accompanied by four claims: two factual statements and two opinions (experiment 4 used six claims per source, with four factual statements and two opinions). Participants were presented with an engagement task and asked to rate each source for likeability, knowledgeability, or usefulness; the specific prompt varied across experiments. To control for stimulus effects, the particular set of claims shown to each participant during the encoding stage was counterbalanced across participants. Source images were taken from a publicly available repository of artificial faces produced by a generative adversarial network (Karras, Laine, and Aila, 2019).

Second was the filler stage, during which participants reported basic demographics. The

primary purpose of this stage was to separate the encoding stage from the recall stage. Including a period of delay after encoding is commonplace in source memory research; subsequent memory tests are more likely to rely on recall processes rather than on information active in working memory (for a recent review of source memory procedures, see Kuhlmann et al., 2021).

Third was the recall stage, which tested participants' source memory and claim recognition memory. In each experiment, the memory tests in the recall stage provided our key dependent measures. Participants were tested on the information (claims and sources) that they had been previously presented during the encoding stage of each experiment. To test source memory, participants were sequentially presented with previously seen claims (half factual statements, half opinions) and asked to identify the original source that had accompanied each claim from a multiple-choice list of sources. The multiple-choice list of sources (including both photographs and names of each source) included all of the original sources seen in the encoding stage as well as an equal number of filler sources not previously seen. To test recognition memory, participants were sequentially presented with claims and asked to identify whether each claim had been shown to them earlier or not. In the recognition memory test, half of the claims participants were tested on had been previously presented to them (during the encoding stage of an experiment, with an equal number of previously seen opinions and previously seen facts tested). The other half of the claims participants were tested on had not been previously presented to them (with an equal number of opinions and facts tested). Participants' performance on the claim recognition memory task was used to identify inattentive participants, based on at or below-chance performance as pre-registered across experiments.

Across experiments, we also controlled for the particular subset of claims that was used to test for source memory vs. recognition memory. Each participant saw a set of claims during

the encoding stage. In the recall stage, half of the claims from the encoding stage was used to test source memory and the other half of the claims from the encoding stage was used to test recognition memory. Which half of the claims from the encoding stage was used to test source memory vs. recognition memory was counterbalanced across participants.

The primary measure of interest was the effect of claim objectivity on source memory. For each participant, the key dependent variable was the within-subject difference between the percentage of opinions that the participant correctly attributed to their original sources and the percentage of facts that the participant correctly attributed to their original sources. This within-subject difference reflected the effect of claim objectivity on source memory. In each experiment, we regressed the key dependent variable on an intercept (the key estimate) and a complete set of contrast coded variables (to account for baseline differences between different subsets of claims and sources that were counterbalanced between participants). The intercept represented the key estimate of interest: the difference in source memory for opinions vs. facts. The contrast coded variables allowed us to control for variations in the stimuli. We used a similar approach to analyze recognition memory as a control variable.

EXPERIMENT 1

Experiment 1 lays the groundwork for the 3-stage experimental design. Subsequent experiments followed this paradigm closely, extending the findings of experiment 1 across a variety of consumer contexts. Experiment 1 was pre-registered on AsPredicted. See Research Box for a complete list of stimuli and sources.

Method

In the encoding stage, participants (N = 399) were presented with 32 general claims about the world from 8 sources. Data were collected on Amazon MTurk using CloudResearch's "block

low quality participants" filter (Litman, Rosenzweig, and Moss 2020). Each source was accompanied by a name, a photograph, and four claims: two factual statements (e.g., "Aristotle was a Greek philosopher") and two opinions (e.g., "Chocolate ice cream tastes better than zucchini"), drawn from prior literature (Fazio et al. 2015; Goodwin and Darley 2008; Pennycook and Rand 2019). For each presented source, participants were asked to provide a rating for how much they like the source on a scale from (1) Dislike to (5) Like.

In the filler stage, participants were presented with a set of demographics questions. The primary purpose of the filler stage was to separate the encoding and recall stages.

In the recall stage, participants were presented with claims seen in the encoding stage. Claims from half of the sources were used to test source memory. Participants were asked to identify each claim's source from a panel of 16 sources (with names and photographs), including the 8 sources seen in the encoding stage and 8 novel sources not previously seen. Claims from the other half of the sources were used to test claim recognition memory. Using binary yes/no measures, participants were asked whether or not they had seen each of 32 claims (8 factual statements and 8 opinions from the encoding stage; 8 filler factual statements and 8 filler opinions not seen previously).

Results

The recall stage provided us with our measures of interest. Our within-subject dependent variable was the difference between the percentage of opinions that the participant correctly attributed to their original sources and the percentage of facts that the participant correctly attributed to their original sources. This within-subject difference reflected the effect of claim objectivity on source memory. This within-subject difference score was regressed on a contrast-coded variable (-1, +1) representing the between-subject counterbalancing of claims used to test

source memory vs. recognition memory.[4] This variable was intended to merely be a nuisance variable to account for differences in baseline tendencies between sets. The intercept was the key test of interest, representing the within-subject main effect of claim objectivity on source memory, averaged across counterbalanced groups. 76 participants were excluded from the analysis of experiment 1 for scoring at or below chance on the recognition memory task, suggesting inattentiveness.[5]

Participants correctly identified the source for 46.8% of opinions and for 34.3% of factual statements. Source memory accuracy was greater for opinions than for factual statements (b = 12.47, $t(321) = 10.54$, $p < .001$)[6]. See Figure 2-1 and Table 2-1. As a benchmark for source memory accuracy, because participants are presented with 16 sources during the source memory test, a naïve participant selecting sources purely at random would have correctly identified the sources for 6.3% of claims. If a more sophisticated participant selected at random from one of the eight non-filler sources, they would have correctly identified the sources for 12.5% of claims. Thus, participant performance on this task is substantially better than chance.

A secondary measure of interest was the effect of claim objectivity on claim recognition memory. They key dependent variable for this measure was the participant-level within-subject difference between the percentage of opinions that the participant correctly identified as having been presented earlier or not and the percentage of factual statements that the participant

[4]In experiment 1, all participants encoded the full stimulus set (32 claims across 8 sources), removing the need for contrast-coded variables to account for stimulus subset assignment.
[5]Although these exclusion criteria were not pre-registered for experiment 1, they are consistent with the exclusion criteria pre-registered for a majority of the following experiments. The results of analyses that do not exclude inattentive participants do not lead to qualitatively different inferences. See supplementary materials for robustness checks including inattentive participants.
[6]The difference between opinions and facts also varied across counterbalanced groups, as indicated by the test of the nuisance contrast code: b = 7.28, t(321) = 6.15, p < .001. We also reanalyzed the data allowing for random effects for claim (Judd, Westfall, and Kenny 2017). The coefficient on objectivity remained the same (b = 12.47); given this less powerful test, t = 4.53.

correctly identified as having been presented earlier or not. Participants correctly recognized whether 86.2% of opinions had been presented earlier and correctly recognized whether 82.5% of factual statements had been presented earlier. Although in experiment 1 recognition memory was more accurate for opinions than for factual statements ($b = 3.73$, $t(321) = 6.08$, $p < .001$), in the experiments that follow we do not find a systematic effect of claim objectivity on recognition memory. We discuss this further in the general discussion.

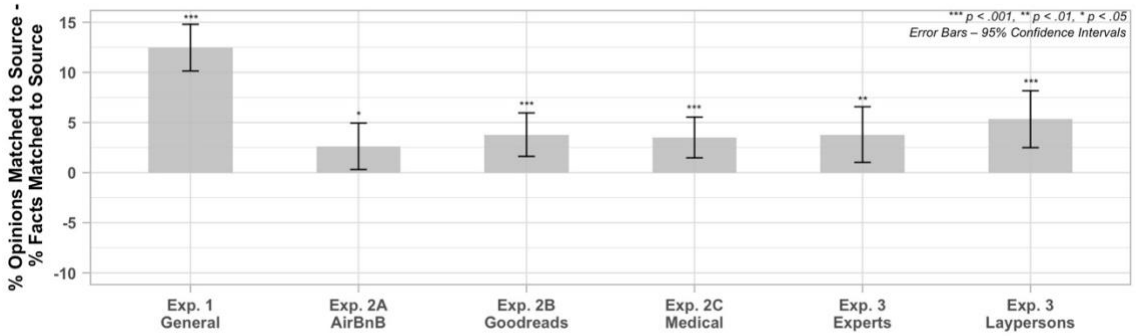
Table 2-1. Summary Statistics: All Experiments

		Source Memory			Recognition Memory		
Experiment	*N*	Opinions (%)	Facts (%)	Opinions – Facts *(95% CI)*	Opinions (%)	Facts (%)	Opinions – Facts *(95% CI)*
1	399	46.76	34.29	12.47 *(10.14, 14.80)*	86.20	82.46	3.73 *(2.52, 4.94)*
2A (AirBnB)	501	42.90	40.27	2.63 *(0.31, 4.94)*	80.64	85.17	-4.53 *(-5.93, -3.14)*
2B (Goodreads)	504	36.63	32.84	3.79 *(1.62, 5.96)*	77.66	77.64	0.03 *(-1.31, 1.36)*
2C (Medical)	501	36.44	32.93	3.51 *(1.48, 5.54)*	84.68	85.22	-0.54 *(-1.82, 0.74)*
3 (Layperson)	606	37.93	32.60	5.33 *(2.49, 8.17)*	80.82	77.63	3.19 *(0.65, 5.72)*
3 (Expert)	606	36.37	32.57	3.79 *(1.02, 6.57)*	81.83	80.05	1.78 *(-0.64, 4.20)*
4 (World facts)	403	41.11	38.18	2.93 *(0.66, 5.20)*	80.57	79.00	1.57 *(0.21, 2.93)*
4 (Source facts)*	403	41.11	42.18	3.99 *(1.74, 6.24)*	80.57	75.18	-3.83 *(-5.24, -2.42)*
5 (Authors)	1,213	36.76	33.50	3.26 *(1.40, 5.12)*	78.53	78.19	0.34 *(-0.95, 1.63)*
5 (Re-tellers)	1,213	27.55	26.55	1.00 *(-0.87, 2.87)*	77.33	78.17	-0.84 *(-2.14, 0.46)*

6a (Inferences)	640	40.65	36.58	4.06 *(2.07, 6.06)*	87.31	85.62	1.69 *(0.61, 2.77)*
6b (Advice seeking)	639	40.96	38.18	2.78 *(0.69, 4.88)*	87.89	85.75	2.13 *(1.10, 3.17)*
S1 (Metacritic)	499	20.38	21.06	-0.67 *(-2.04, 0.70)*	68.12	70.83	-2.71 *(-3.99, -1.44)*
S2 (Cued recall)	501	31.80	31.77	0.03 *(-2.15, 2.21)*	69.82	70.35	-0.53 *(-2.10, 1.05)*
S3 (Media sources)	601	26.84	27.73	-0.89 *(-2.93, 1.15)*	85.71	84.49	1.22 *(-0.04, 2.48)*

NOTE.—*Effect size estimates for *Experiment 4 (Source Facts)*, reflect the difference between facts about the source and facts about the world.

Figure 2-1. Source Memory in Experiments 1-3: Main Effect



NOTE.—Source memory is more accurate for opinions than for factual statements in the context of general claims (experiment 1), AirBnB reviews (experiment 2a), Goodreads reviews (experiment 2b), medical claims (experiments 2c and 3). In experiment 3, this effect holds for medical claims from expert sources as well as for medical claims from layperson sources.

EXPERIMENTS 2A, 2B, 2C

Experiment 2a, 2b, and 2c aimed to replicate the findings of experiment 1, expanding the observed main effect into the consumer domain of online reviews across three distinct contexts:

reviews for AirBnB rentals for apartments in New York (experiment 2a), book reviews from a popular online book review platform, Goodreads (experiment 2b), and medical guidance for a fake disease based on recent public health literature (experiment 2c). The methodology used for all three experiments was largely the same, building on the design of experiment 1 while employing considerably larger stimulus sets in order to increase power and robustness. Whereas experiment 1 presented all participants with a single fixed set of eight sources and 32 claims, experiment 2 expanded the stimulus set and decoupled claims from sources. In experiments 2a-c, the stimulus set for each experiment consisted of 24 sources and 96 claims divided into four between-subject groups, such that each participant was presented with one of four unique sets of 6 sources and 24 claims. The stimulus set of 96 claims for each experiment was selected from a larger set of claims, pretested using the same population on Amazon MTurk. Claim pretesting ensured that factual claims were perceived as objective and opinions were perceived as subjective. Pretesting also ensured that differences in claim objectivity were not confounded by differences in claim emotionality, valence, or arousal. A complete list of stimuli, sources, and pre-tested values for possible claim confounds are available on Research Box. Additionally, rather than asking participants to rate each source for likability during the encoding stage (as in experiment 1), in experiment 2a-c participants were instead asked to provide a rating for how useful the reviews from each source are. This change ensured that participants were not inadvertently directed to differentially attend to opinions over facts as a result of the likability engagement task. Experiments 2a, 2b, and 2c were each pre-registered on AsPredicted.

Method

Experiment 2a (N = 501) used a full set of 24 sources and 96 claims drawn from AirBnB reviews for apartment rentals in New York City, including 48 factual statements (e.g., “The room

had black curtains") and 48 opinions (e.g., "The room had tasteless curtains"). The stimulus set was randomly distributed across four between-subject groups such that each participant was exposed to one of four sets of six sources and 24 claims (12 factual statements, 12 opinions). Data were collected on Amazon MTurk using CloudResearch's "block low quality participants" filter. In the encoding stage, each participant was sequentially presented with six sources. Each source was accompanied by four claims (two factual statements, two opinions) and participants were asked to provide a rating for how useful the reviews from the source are on a scale from (1) Not at all useful to (5) Very useful. As pre-registered, 81 participants were excluded from the analysis of experiment 2a for scoring at or below chance on the recognition memory task, suggesting inattentiveness.

Experiment 2b (N = 504) used a full set of 24 sources and 96 claims drawn from public book reviews on Goodreads. Data were collected on Amazon MTurk using CloudResearch's "block low quality participants" filter. As in experiment 2a, the stimulus set was divided into four between-subject groups, with assignment of group counterbalanced across participants. Participants were presented with a set of six sources, each of which was accompanied by two factual statements (e.g., "*The Walmart Book of the Dead*, inspired by ancient Egyptian funerary texts, has shoplifters, greeters, and circuit court judges wander Walmart unknowingly consigned to their afterlives") and two opinions (e.g., "*The Walmart Book of the Dead* is a profoundly original look into an afterlife where people wander Walmart, it is full of profound character studies, glowing prose, and sweet sincerity"). As pre-registered, 56 participants were excluded from the analysis of experiment 2b for scoring at or below chance on the recognition memory task, suggesting inattentiveness.

Experiment 2c (N = 501) used a full set of 24 sources and 96 claims about a fictional

disease, NKV, drawn from a protocol developed for clinical research (Morgan et al. 2021). Just as in experiments 2a and 2b, the full stimulus set was divided into four between-subject groups, with participants randomly assigned to one of four claim subsets. Participants were presented with six sources each of which was accompanied by two factual statements (e.g., "NKV medications come in pill and liquid form") and two opinions (e.g., "NKV medications are more pleasant in pill than in liquid form"). Data were collected on Amazon MTurk using CloudResearch's "approved participants" filter (Litman et al., 2020). As pre-registered, 29 participants were excluded from the analysis of experiment 2c for scoring at or below chance on the recognition memory task, suggesting inattentiveness.

Of the 24 claims each participant saw in the encoding stage, 12 claims were used to test source memory (six factual statements, six opinions). To test source memory, participants were asked to identify each claim's source from a panel of 12 sources (with names and photographs), including all six sources that the participant saw in the encoding stage as well as six novel (filler) sources not previously seen. The remaining 12 claims not used to test source memory were instead used to test claim recognition memory. Participants were asked whether they had previously been shown each of the 12 claims (six factual statements, six opinions) along with 12 novel claims not previously seen (six filler factual statements, six filler opinions). The particular subsets of 12 claims used to test source memory vs. the subsets of 12 claims used to test recognition memory were counterbalanced across participants.

Results

As in experiment 1, the key test of interest in experiments 2a, 2b, and 2c was a within-subject participant-level difference in source memory accuracy for opinions and source memory accuracy for facts. In each experiment, the stimulus set was divided into four between-subject

groups, with assignment of group counterbalanced across participants, such that every participant saw one of four randomly-assigned sets of 24 claims and 6 sources. Of the 24 claims that each participant saw, the particular subset of 12 claims that was used to test source memory vs. claim recognition memory was also counterbalanced between-subjects. In each experiment, this 4x2 counterbalancing resulted in 8 between-subject groups.

For each experiment, the key dependent variable was regressed on the complete set of 7 contrast-coded variables (-1, +1) representing the 8 between-subject groups. These were intended to merely be nuisance variables. In each experiment, the intercept was the key test of interest, representing the main effect of claim objectivity on source memory.

In experiment 2a, participants accurately identified the source for 42.9% of opinions and for 40.3% of factual statements (b = 2.63, $t(412)$ = 2.23, p = .026). In experiment 2b, participants accurately identified the source for 36.6% of opinions and for 32.8% of factual statements (b = 3.79, $t(440)$ = 3.43, $p < .001$). In experiment 2c, participants accurately identified the source for 36.4% of opinions and for 32.9% of factual statements (b = 3.51, $t(464)$ = 3.40, $p < .001$).

In all three experiments, we find that source memory is more accurate for opinions than for factual statements.[7] See Figure 2-1. Selecting sources purely at random would have allowed participants to correctly identify the sources for 8.33% of claims (or, if they chose at random from previously seen sources, for 16.67% of claims). In experiments 2a-c, participants' source memory accuracy for both factual statements and for opinions is much better than would be expected by purely random chance performance.

[7]The magnitude of the main effect differed across stimuli sets in experiment 2a ($F(7, 412) = 3.23$, $p = .002$) and in experiment 2b ($F(7, 440) = 2.43$, $p = .019$). In experiment 2c, results did not significantly differ across stimuli sets ($F(7, 464) = 1.14$, $p = .338$). We also reanalyzed the data allowing for random effects for claim (Judd et al., 2017). The coefficients on objectivity remained the same; given these less powerful tests, experiment 2a $t = 1.22$, experiment 2b $t = 2.20$, and experiment 2c $t = 2.07$.

As in experiment 1, we analyzed recognition memory using the same analysis approach as for source memory. In experiment 2a, on average, participants correctly recognized 80.6% of opinions and 85.2% of factual statements (b = -4.53, $t(412)$ = -6.38, $p < .001$). In experiment 2b, on average, participants correctly recognized 77.7% of opinions statements and 77.6% of factual statements (b = .03, $t(440)$ = .04, p = .968). In experiment 2c, on average, participants correctly recognized 84.7% of opinions and 85.2% of factual statements (b = -.54, $t(464)$ = -1.02, p = .768). In contrast to the results of experiment 1, recognition memory in experiment 2a was less accurate for opinions than for factual statements in experiment 2a and no different in experiments 2b and 2c.

Experiments 2a-c expanded upon the main effect initially observed in experiment 1. Using nearly 200 claims from online review platforms AirBnB and Goodreads, experiments 2a and 2b find that participants are better able to accurately identify the original source of a review claim when it is an opinion than when it is a fact. Experiment 2c finds that this effect is robust across 96 claims of medical advice about a fake disease. Even in a medical context, source misattributions were more frequent for factual claims than they were for opinions. Given the importance of public health literacy, experiment 3 builds on the findings of experiment 2c with an additional focus on the role of source expertise.

EXPERIMENT 3

In experiment 3, we expand upon the finding of experiment 2c in a medical context to consider effects of source expertise. Source expertise plays an important role in effective communication, persuasion, and credibility, and so is of particular relevance in a medical context for promoting health literacy. Given prior findings that consumers pay closer attention to information when it comes from experts (Heesacker, Petty, and Cacioppo, 1983; Tobin and

Raymundo, 2009), it is important to assess whether the effects of claim objectivity on source memory are attenuated by source expertise. If the effect persists for expert sources, the consequences for source memory errors may be higher than if the effect only holds for lay sources. As with all experiments, experiment 3 was pre-registered on AsPredicted. Data were collected on Amazon MTurk using CloudResearch's "approved participants" filter.

Method

Experiment 3 used the same design and stimulus set as was used in experiment 2c, with an added element of varying source expertise. Source expertise was manipulated by presenting participants (N = 606) with two distinct types of sources: medical professionals (experts) and laypeople (non-experts). Source expertise was signaled to participants by sources' names (e.g., "Dr. Alan, MD" vs. "Alan") as well as by the presence or absence of a prominent red medical stethoscope logo on source photos, present during both encoding and recall stages; the subset of sources who were labeled as experts was counterbalanced across participants. In the encoding stage, each participant was presented with six sources (three medical experts, three laypersons), with each source accompanied by four claims (two factual statements, two opinions), as in experiment 2c. See Research Box for a complete list of stimuli and sources.

As in prior experiments, source memory was tested using a subset of half of the claims presented in the encoding stage (six factual statements, six opinions). Participants were asked to identify each claim's source from a panel of 12 sources (with names and photographs), including the three expert sources that were seen in the encoding stage, the three layperson sources that were seen in the encoding stage, and six filler sources (three layperson sources, three expert sources) not previously seen.

Results

Source expertise introduced an additional within-subject manipulation creating a 2 within-subject (fact vs. opinion claim) x 2 within-subject (expert vs. layperson source) x 4 between-subject (assignment of one of four stimulus sets) x 2 between-subject (subset of claims tested for source memory vs. recognition memory) x 2 between-subject (subset of sources as experts) design. The key tests of interest were the difference between the percentage of opinions vs. facts correctly attributed to their expert sources and the difference between the percentage of opinions vs. facts correctly attributed to their layperson sources. We regressed the key measures of interest on a complete set of 15 contrast-coded variables (-1, +1) representing the 16 between-subject groups. The intercepts were the key tests of interest, representing the simple effect of claim objectivity on source memory for expert sources and layperson sources, respectively. The contrast-coded variables representing the between-subject groups and their interactions were intended to merely be nuisance variables to account for differences in baseline tendencies between sets. As pre-registered, 30 participants were excluded from the analysis of experiment 3 for scoring at or below chance on the claim recognition memory task, suggesting inattentiveness.

Replicating the results of experiment 2c, we find that source memory is more accurate for opinions than for factual statements when claims originated from layperson sources (b = 5.33, $t(560) = 3.68$, $p < .001$). Participants accurately identified the source for 37.9% of opinions from layperson sources and for 32.6% of factual statements from layperson sources. Extending the replication, when sources are denoted as medical experts, source memory is also more accurate for opinions than for factual statements (b = 3.79, $t(560) = 2.69$, $p = .007$). See Figure 2-1. Participants accurately identified the source for 36.4% of opinions from expert sources and for 32.6% of factual statements from expert sources. The difference between these two differences was not significant (b = 1.53, $t(560) = .73$, $p = .465$), indicating there is no evidence that the

effect of claim objectivity on source memory is moderated by source expertise.[8] Prior work finds that consumers pay greater attention to information originating from sources with greater expertise (Heesacker, Petty, and Cacioppo, 1983; Tobin and Raymundo, 2009). It is possible that even with greater attention paid to expert sources, the effect of claim objectivity on source-claim binding during encoding, and the subsequently greater source memory accuracy for opinions during recall, is robust to changes in attention towards sources.

In addition to our main analysis of source memory, we also examined how accurately participants were able to correctly identify the *expertise* of a claim's source, whether or not they could correctly identify the specific source (e.g., in some cases participants were able to correctly identify that a given claim originated from a medical professional, even though they could not correctly identify the particular medical professional source). This broader definition of accuracy allowed for analyses of memory of the source's expertise. When claims originated from layperson sources, participants correctly identified the sources' expertise for 69.8% of opinions and for 66.1% of facts. This difference is statistically significant (b = 3.67, $t(560)$ = 2.60, p = .010). However, when claims originated from expert sources, participants correctly identified the sources' expertise for 74.6% of opinions and for 75.6% of facts. This difference is not statistically significant (b = -.94, $t(560)$ = -0.68, p = .499). The difference between these two differences is statistically significant, with a greater effect of claim objectivity on memory for sources' expertise for claims originating from layperson sources than for claims originating from expert sources (b = 4.61, $t(560)$ = 2.30, p = .022). Participants were more likely to misattribute facts than opinions originating from layperson sources to medical expert sources. This finding is

[8]The magnitude of the main effect differed across stimuli sets in experiment 3 both for layperson sources ($F(15, 560) = 2.25$, $p = .004$) and for expert sources ($F(15, 560) = 1.94$, $p = .018$). We also reanalyzed the data allowing for random effects for claim (Judd et al., 2017). The coefficient on objectivity remained the same; given a less powerful test, $t = 2.99$ for the overall main effect.

aligned with research on source memory failures, such that even when memory for the specific source is not accessible, certain associations may persist (Hutchinson and Moore 1984; Kumkale and Albarracín 2004). Moreover, during source memory failures, consumers form educated guesses based on the content of the claims and heuristics about the most probable source for such a claim (Batchelder and Batchelder, 2008; Bell et al., 2020; Bell et al., 2021).

As in prior experiments, in experiment 3 we also measured claim recognition memory. On average, participants correctly recognized 80.8% of opinions from layperson sources and 77.6% of factual statements from layperson sources. We find greater recognition memory for opinions than for factual statements when claims originate from layperson sources (b = 3.19, $t(560) = 2.47$, p = .014). However, when claims originated from expert sources, participants on average correctly recognized 81.8% of opinions and 80.1% of factual statements. There was no statistically significant effect of claim objectivity on recognition memory for claims originating from expert sources (b = 1.78, $t(560) = 1.45$, p = .149). Whereas the effect of claim objectivity on source memory remained remarkably robust across experiments 1-3, the effect of claim objectivity on claim recognition memory was inconsistent.

EXPERIMENT 4

Whereas experiments 1-3 demonstrated the main effect across a variety of claim types, consumer contexts, and levels of source expertise, experiments 4 and 5 aimed to investigate process for the observed difference in source memory accuracy between opinions and factual statements. We initially predicted that source memory would be more accurate for opinions than for facts because (1) source-claim binding during encoding affects source memory during recall, and (2) opinions provide more information about sources than do facts. Based on this prediction, the observed difference in source memory accuracy between opinions and facts may be affected

by how informative claims are about sources (and vice-versa; regardless of the directionality of this effect, a stronger source-claim association at encoding would be expected to result in more accurate source memory for the claim at recall).[9] In experiment 4, we test this process by making facts more informative about a source. In experiment 5, we test this process by making opinions less informative about a source.

Experiment 4 included a new type of claim – *facts about the source*. Facts about the source are objective claims that provide substantially more information about the source (on par with opinions) than do facts about the world. Thus, the introduction of facts about the source allowed for an investigation of whether the effect of claim objectivity on source memory accuracy may be driven by the extent to which claims provide information about their sources. Experiment 4 was pre-registered on AsPredicted. See Research Box for a complete stimulus set.

Method

Using a set of 48 claims and following the design used in experiment 1, participants in experiment 4 (N = 403) were exposed to a set of eight sources, each of which was accompanied by two facts about the world (e.g., "Canberra is the capital of Australia"), two opinions (e.g., "sunrises are prettier than sunsets"), and two facts about the source (e.g., "I play tennis every Monday"). As in prior experiments, source memory was assessed using a subset of half of the claims presented in the encoding stage (eight facts about the world, eight opinions, eight facts about the source). Participants were asked to identify each claim's source from a panel of 16 sources (with names and photographs), including the eight sources that were seen in the encoding stage, and eight novel sources not previously seen. When tested for recognition memory, we included a set of 24 filler claims (including all three types of claims) not previously

[9]We thank an anonymous reviewer for their insight on the bidirectionality of link formation.

seen in addition to the counterbalanced subset of 24 claims previously presented. Data were collected on Amazon MTurk using CloudResearch's "block low quality participants" filter.

Results

In experiment 4, our key dependent measures were (a) the difference between the percentage of opinions correctly matched to their initially presented sources and the percentage of factual statements about the world correctly matched to their initially presented sources (as in all experiments), and (b) the difference between the percentage of factual statements about the source correctly matched to their initially presented sources and the percentage of factual statements about the world correctly matched to their initially presented sources. These measures reflect the effect of claim objectivity on source memory, as well as the effect of information about the person vs. information about the world on source memory. We included a contrast-coded variable (1, -1) reflecting the counterbalanced assignment of stimulus subset used to test source memory and account for differences in baseline tendencies between tested stimulus subsets. The intercepts were the key tests of interest, representing (a) the main effect of claim objectivity on source memory and (b) the effect of a claim's information about a source on source memory for objective claims. 96 participants were excluded from the analysis of experiment 4 for scoring at or below chance on the recognition memory task, suggesting inattentiveness[10].

We replicated the findings of experiments 1-3. Participants accurately identified the source for 41.1% of opinions, for 38.2% of facts about the world, and for 42.2% of facts about the source. Source memory was significantly more accurate for opinions than for facts about the

[10]Although these exclusion criteria are pre-registered for most other experiments, experiments 1 and 4 were conducted prior to other experiments and as such did not yet include these exclusion criteria in their pre-registrations. See supplementary materials for robustness checks that do not exclude inattentive participants; the results are not qualitatively different from those presented.

world (b = 2.93, t(305) = 2.54, p = .012). Moreover, consistent with the proposed process, source memory was significantly more accurate for facts about the *source* than for facts about the *world* (b = 3.99, t(305) = 3.49, p < .001)[11]. Source memory for facts about the source was not significantly different from source memory for opinions (b = 1.06, t(305) = .99, p = .322). See Figure 2-2. In experiment 4, as a benchmark for source memory accuracy, a participant selecting sources purely at random would have correctly identified the sources for 6.25% of claims (or, if choosing at random from previously seen sources, for 12.5% of claims).

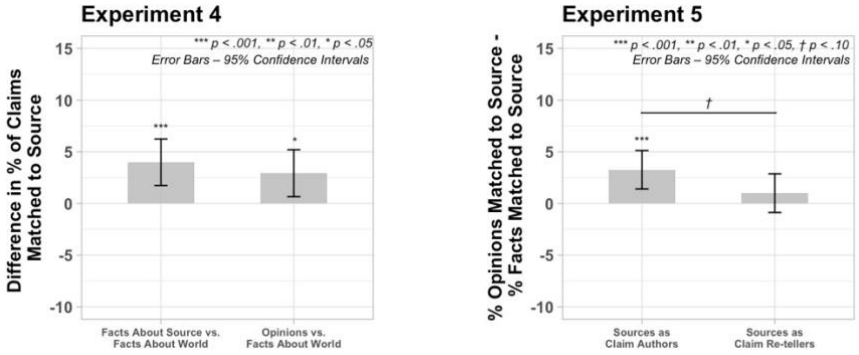
As in prior experiments, we included a claim recognition memory task. Participants accurately recognized 80.6% of opinions, 79.0% of facts about the world, and 75.2% of facts about the source. Recognition memory was more accurate for opinions than for facts about the world (b = 1.57, t(305) = 2.27, p = .024). However, recognition memory was more accurate for facts about the world than for facts about the source (b = 3.83, t(305) = 5.34, p < .001). This divergence between source memory and recognition memory again indicates that predicted differences in source memory are not simply tracking differences in recognition memory.

Experiment 4 provided initial evidence for the proposed process, finding that source memory is more accurate for claims which provide more information about a source. This offers insight into the observed difference in source memory accuracy between opinions and factual statements, given the baseline differences in informativeness about a source that claim objectivity often signals. In experiment 4, source memory was more accurate for factual statements when they were more informative about a source. In experiment 5, we instead

[11]In experiment 4, the results did not significantly differ across stimuli sets for both source memory for opinions vs. facts about the world (F(1, 305) = 2.06, p = .152) and for source memory for facts about the source vs. facts about the world (F(1, 305) = 2.32, p = .129). We also reanalyzed the data allowing for random effects for claim (Judd et al., 2017). The coefficients on claim type remained the same; given this less powerful test, t = 1.77 for facts about the self vs. facts about the world and t = 1.19 for opinions vs. facts about the world.

investigate the effect of source memory on opinions that are not informative about a source. When opinions do not provide information about a source, we would expect that the source-claim links formed during encoding between a source and an opinion are no stronger than the source-claim links formed during encoding between a source and a factual statement, reducing any differences we might have expected in source memory accuracy.

Figure 2-2. Source Memory in Experiments 4 and 5: Process Evidence



NOTE.—Source memory accuracy is affected by how much information claims provide about a source; source memory is more accurate when factual claims provide more information about a source (experiment 4) and source memory is not affected by claim objectivity when sources are re-tellers, rather than authors, of claims (experiment 5).

EXPERIMENT 5

In experiment 5, we use a between-subject design to manipulate how much information claims provide about their source, while holding constant the set of claims used. We then measure source memory and claim recognition memory. This use of a moderation design that holds constant the set of claims used between-subjects also serves to address any lingering concerns as to the role of stimulus sampling. If differences in source memory accuracy were due to the idiosyncratic memorability of a particular set of claims used, these differences would

persist across a design that differentially disrupts the source-relevance of a claim. In conjunction with the recognition memory findings throughout, the design in experiment 5 allows us to rule out the concern that our main effect is driven by enhanced memory overall for opinions versus facts. Experiment 5 was pre-registered on AsPredicted. Data were collected on Amazon MTurk using CloudResearch's "approved participants" filter.

Method

Experiment 5 used the same protocol, sources, and claims as in experiment 2b, with a full set of 24 sources and 96 claims drawn from public book reviews on Goodreads. See Research Box for a complete list of stimuli and sources. Participants (N=1,213; 121 excluded for low recognition memory scores) were presented with six sources, each of which was accompanied by four claims (2 factual statements, 2 opinions). In a between-subject manipulation of claim authorship, participants were told that the sources accompanying each set of claims were either (a) the authors of the claims (author condition, a direct replication of experiment 2b) or (b) the re-tellers of claims authored by others and randomly pulled out of a hat (re-teller condition). The manipulation of claim authorship created two contexts, one in which claims provide information about the sources (when the sources are authors of the claims), and one in which claims provide limited to no information about the sources (when the sources are simply re-telling claims that they did not write).

As in prior experiments, source memory was tested using a subset of half of the claims presented in the encoding stage (six factual statements, six opinions). Participants were asked to identify each claim's source from a panel of 12 sources (with names and photographs), including the six sources that were seen in the encoding stage and six (filler) sources not previously seen.

Results

In each of the claim authorship conditions (authors vs. re-tellers), a stimulus set of 96 claims and 24 sources was counterbalanced across four between-subject groups such that each participant saw a subset of 24 claims and 6 sources. Of the 24 claims participants saw, half were used to test source memory and half were used to test recognition memory, counterbalanced between-subjects. This 2x4x2 counterbalancing resulted in 16 between-subject groups and 15 contrast-coded variables. The key difference score of interest was regressed on the complete set of 15 contrast-coded variables (-1, +1) representing the 16 between-subject groups. The coefficient on the contrast code representing the between-subject manipulation of claim authorship (authors vs. re-tellers) was the key test of interest, representing the interaction between claim authorship and claim objectivity on source memory. The remaining coefficients were intended to merely be nuisance variables to account for differences in baseline tendencies between sets and the interaction of those baseline tendencies with claim authorship. As such, the primary results of interest were (i) the effect of claim objectivity on source memory for author sources, which was a direct replication of experiment 2b, (ii) the effect of claim objectivity on source memory for re-teller sources, and (iii) the interaction effect of claim authorship, representing the difference between (ii) and (i). 121 participants were excluded from the analysis of experiment 5, as pre-registered, for scoring at or below chance on the recognition memory task, suggesting inattentiveness.

The main effect, represented by the intercept, replicated the results of experiments 1-4. Source memory was more accurate for opinions than for facts (b = 2.13, t(1076) = 3.18, p = .002).[12] The interaction effect of claim authorship, represented by the coefficient on the contrast

[12]In experiment 5, the magnitude of the main effect varied across the 8 sets of stimuli F(7, 1076) = 7.70, p < .001. The magnitude of the interaction effect of claim authorship did not vary significantly across the 8 sets of stimuli F(7, 1076) = .52, p = .824.

code reflecting the between-subject manipulation of claim authorship (authors vs. re-tellers), indicated a marginally significant reduction in the main effect. The magnitude of the difference in source memory accuracy between opinions and facts was reduced for re-tellers compared with authors (b = -2.26, t(1076) = -1.69, p = .092).[13]

When sources were presented as authors of claims, our results replicated those of experiment 2b. Participants accurately identified the source for 36.8% of opinions and for 33.5% of facts. Source memory was more accurate for opinions than for facts (b = 3.26 t(1076) = 3.45, p < .001). When sources were presented as re-tellers of claims, participants accurately identified the source for 27.5% of opinions and for 26.5% of facts. This difference is not statistically significant; source memory was not more accurate for opinions than for facts when claims originated from re-teller sources (b = 1.00, t(1076) = 1.05, p = .293). See Figure 2-2.

When comparing across conditions, source memory accuracy was reduced by 9.2 percentage points for opinions and by 6.9 percentage points for factual claims in the re-tellers condition compared with the authors condition. Participants choosing at random would have correctly matched the sources for 8.33% of claims (or, if they chose at random from previously seen sources, for 16.67% of claims). Participants perform substantially better than chance at the source memory task in both conditions.

We also find that claim objectivity does not affect recognition memory, when aggregated

[13]This attenuation, though marginally significant, is a two-tailed test of a directional prediction, as specified in the pre-registration. We suspect that this may reflect an effect of participant inattention. When using a stricter exclusion of participants who scored at or below 75% accuracy on claim recognition memory, the simple effect in the authors condition (b = 4.51, t(571) = 3.39, p < .001) is fully attenuated by the authorship condition manipulation (b = 2.25, t(571) = 2.36, p = .018) resulting in no simple effect in the re-tellers condition (b = .01, t(571) = .01, p = .995). We also reanalyzed the data allowing for random effects for claim (Judd et al., 2017). The coefficient on the interaction between claim objectivity and source authorship remained the same; given this less powerful test, t = 1.31.

across authorship conditions (b = -.25, t(1076) = -.54, p = .592). We find no interaction effect of claim authorship on a difference in recognition memory between opinions and facts (b = .59, t(1076) = 1.26, p = .208). There was no simple effect of claim objectivity on recognition memory for sources as authors (b = .34, t(1076) = .51, p = .608) nor for sources as re-tellers (b = -.84, t(1076) = -1.27, p = .206). Average claim recognition memory collapsed across both facts and opinions was no different between authorship conditions (b = .301, t(1076) = .745, p = .456).

EXPERIMENTS 6A AND 6B

In experiments 6a and 6b we consider downstream consequences. In an information-rich landscape it is often necessary to update priors with additional context, integrating new evidence to form more accurate beliefs about the world. For instance, a colleague might mention their favorite restaurant. However, we may only learn afterwards that the restaurant is located in Helsinki. Integrating this new evidence, we update our beliefs about the colleague, learning that they have been to Finland.

Using the same three-stage design as in prior experiments, experiments 6a and 6b initially provide participants with claims taken out of context, later providing context for those claims during the recall task. At the recall stage, participants are asked to integrate the new information in relation to previously-seen claims, and form inferences about previously-seen sources (experiment 6a) or share intentions to seek advice from previously seen sources (experiment 6b).

Method

Experiments 6a and 6b used a stimulus set consisting of 12 sources and 48 claims (24 factual statements and 24 opinions). See Research Box for a complete list of stimuli and sources. Participants were presented with six sources, each of which was accompanied by four claims (2 factual statements, 2 opinions). The claims were presented as snippets of overheard conversation,

taken out of context (e.g., *"…variable-venturi carburetors weigh less than fixed-venturi carburetors…"*). The particular subset of claims presented was counterbalanced across participants, as was the subset of sources accompanying the claims. During the encoding stage, participants were asked to rate how interesting a conversation with each of the six presented sources would be on a scale from (1) Not at all interesting to (5) Very interesting.

Unlike in prior experiments, in experiments 6a and 6b participants were not asked to identify the source of a previously-seen claim. Instead, participants were presented with additional contextual evidence about previously-seen claims (e.g., *"On a daily basis, car mechanics work with and compare the two different types of carburetors found in cars (variable-venturi vs. fixed-venturi)"*). Based on the new contextual information about previously-seen claims, participants were asked to either make inferences about sources (experiment 6a) or to report advice-seeking intentions from relevant sources (experiment 6b).

In experiment 6a (N = 640), participants were asked to make an inference about the sources of 12 previously-seen claims to which each new piece of contextual information applied (e.g., *"To the best of your ability, please identify the person who you think is a car mechanic")*. Based on these instructions, participants selected the source about whom an inference might be made from a multiple-choice list of 12 sources (6 previously-seen sources, 6 filler sources not previously seen). Participants could make inferences about the sources by integrating the new contextual information with the previously-seen claims, and relying on the encoded associations between previously-seen claims and their respective sources. Pretest data indicated that when claims, sources, and context were all presented simultaneously, participants did not draw substantively different conclusions about sources based on differences in claim objectivity.

In experiment 6b (N = 639), participants were asked to indicate advice-seeking intentions

based on inferences that could be made about the sources of 12 previously-seen claims (6 factual statements, 6 opinions) to which each new piece of contextual information applied (e.g., *"To the best of your ability, please identify the person who you would most likely seek advice from about fixing your car")*. Based on these instructions, participants selected the source from whom they would seek relevant advice. By integrating the new contextual information about previously-seen claims with the sources that had initially accompanied those claims, participants could infer the relevance of a source's expertise.

Results

In experiment 6a, participants were asked to match attributes (e.g., *'is a car mechanic'*) to sources, based on inferences learned from novel contextual information about claims previously accompanied by the sources. The key measure of interest was the difference between the percentage of attributes accurately matched to sources previously accompanied by opinions and the percentage of attributes accurately matched to sources previously accompanied by factual statements. This measure reflects the effect of claim objectivity on the accuracy with which new information is integrated to form beliefs about sources.

In experiment 6b, participants were asked to select sources from whom they would seek relevant advice (e.g., *'about fixing your car'*), based on relevance learned from novel contextual information about claims previously accompanied by the sources. The key measure of interest was the difference between the percentage of relevant advice-seeking intentions accurately matched to sources previously accompanied by opinions and the percentage of relevant advice-seeking intentions accurately matched to sources previously accompanied by factual statements. This measure reflects the effect of claim objectivity on the accuracy with which new information is integrated to seek advice from sources learned to have topically relevant experience.

In both experiments 6a and 6b, the stimulus set of 48 claims and 12 sources was counterbalanced across 8 between-subject groups such that every participant was exposed to 24 claims accompanied by 6 sources. The particular subset of 24 claims presented to each participant was assigned randomly. Each participant was also randomly assigned to one of two subsets of 6 sources to accompany the claims. Of the 24 claims that each participant saw, half were used to test source memory and half were used to test recognition memory, counterbalanced between-subjects. This 2x2x2 counterbalancing resulted in 8 between-subject groups and 7 contrast-coded variables. The key measure of interest was regressed on the complete set of 7 contrast-coded variables (-1, +1) representing the 8 between-subject groups. In each experiment the intercept was the key test of interest, representing the main effect of claim objectivity on making accurate inferences about sources (experiment 6a) or seeking advice from matched sources (experiment 6b). 42 participants were excluded from the analysis of experiment 6a and 42 participants were excluded from the analysis of experiment 6b, as pre-registered, for scoring at or below chance on the recognition memory task, suggesting inattentiveness.

In experiment 6a, participants accurately matched context-based attributes to sources for 40.6% of opinions and for 36.6% of factual statements ($b = 4.07$, $t(590) = 4.00$, $p < .001$). Likewise in experiment 6b, participants accurately identified the source for 41.0% of opinions and for 38.2% of factual statements ($b = 2.78$, $t(589) = 2.61$, $p = .009$).

In both experiments, we find that participants are able to integrate new evidence about sources more accurately when the new evidence provides context for opinions that had previously accompanied the sources than when the new evidence provides context for factual statements that had previously accompanied the sources.[14] See Figure 2-3. Selecting sources

[14]The magnitude of the main effect differed across stimuli sets in experiment 6a ($F(7, 590) = 3.48$, $p = .001$) and in experiment 6b ($F(7, 589) = 4.64$, $p < .001$). We also reanalyzed the data

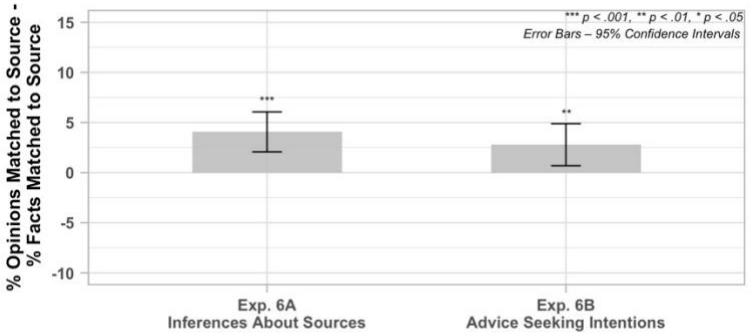
purely at random would have allowed participants to correctly identify the sources for 8.33% of claims (or, if they chose at random from previously seen sources, for 16.67% of claims).

A secondary measure of interest was the difference in recognition memory accuracy for opinions versus factual statements. In experiment 6a, participants correctly recognized 87.3% of opinions and 85.6% of factual statements (b = 1.69, t(590) = 3.08, p = .002). In experiment 6b, participants correctly recognized 87.9% of opinions statements and 85.8% of factual statements (b = 2.13, t(589) = 4.04, p < .001).

In experiments 6a and 6b, recognition memory is more accurate for opinions than for facts. Exploratory analyses help to distinguish recognition memory for previously seen claims from recognition memory for filler claims. In experiment 6a, claim recognition memory is more accurate for filler opinions than for filler facts (b = 3.34, t(590) = 5.60, p < .001). In contrast, claim recognition memory is no more accurate for previously seen opinions than for previously seen facts (b = 0.04, t(590) = 0.05, p = .961). Exploratory analyses find similar results for experiment 6b, with a significant effect of claim objectivity on recognition memory for filler claims (b = 4.39, t(589) = 7.17, p < .001), but not for previously seen claims (b = -0.12, t(589) = -0.14, p = .887). These results indicate that rather than claim objectivity differentially affecting memory for claims shown to participants during the encoding stage, the effect of claim objectivity on recognition memory in experiments 6a and 6b seem to be uniquely driven by participants' inability to identify filler facts (compared to filler opinions) as novel.

allowing for random effects for claim (Judd et al., 2017). The coefficients on objectivity remained the same; given these less-powerful tests, experiment 6a t = 2.25, experiment 6b t = 1.43.

Figure 2-3. Source Memory in Experiments 6a and 6b: Downstream Consequences



NOTE.—The effect of claim objectivity on source memory has notable implications; participants were better able to integrate new evidence, forming more accurate inferences about sources (experiment 6a) and reporting a greater likelihood of seeking advice from relevant sources (experiment 6b) when new evidence was based on sources' previously shared opinions than when new evidence was based on sources' previously shared facts.

Experiments 6a and 6b expand on the consequences of the effect of claim objectivity on source memory demonstrated in experiments 1-3. Better source memory for opinions than for factual statements affects how accurately consumers make inferences about others, integrating new information to update their beliefs about sources and seeking advice from sources learned to be relevant. These findings support the important implications of source memory, with varying accuracy affected by claim objectivity, for consumer attitudes, beliefs, and behaviors.

GENERAL DISCUSSION

Across nine experiments, we find that source memory is significantly more accurate for claims that are subjective opinions than for claims that are objective factual statements. This effect holds across a variety of consumer contexts, claims, and for both experts and lay sources. Two additional experiments consider the consequences of this effect for the integration of new

evidence to form beliefs and advice-seeking intentions. While claim objectivity affects source memory, it does not have a consistent effect on recognition memory. Two experiments shed light on the potential process at play. When claims provide more information about a source during encoding, people are more likely to remember the source associated with the claim during recall.

Claim Objectivity and Source Memory

The magnitude of the observed effect size across experiments 1-3 ranges from a 2.63% difference in experiment 2a to a 12.47% difference in experiment 1. In experiment 1, while source gender was balanced across participants, each individual participant was tested on source memory using either exclusively male or female sources, which may help explain why the magnitude of the observed effect in this experiment is less pronounced in subsequent experiments where source gender was heterogenous for each participant during source memory recall tasks. Nonetheless, the magnitude of the observed effect remains consistent across a variety of contexts and claims.

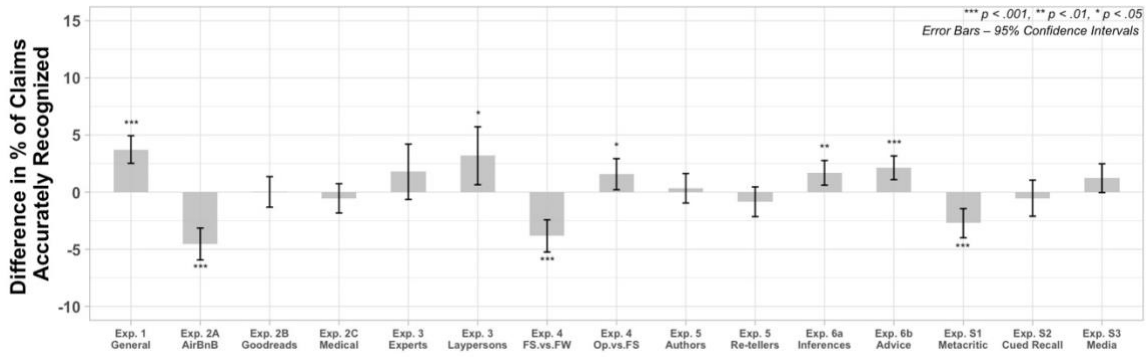
Experiments 2c and 3 introduce implications for medical decision making, finding that an increase in source memory accuracy for opinions over facts persists even for expert sources. Prior work on source expertise suggests that participants pay closer attention to information when it comes from experts (Tobin and Raymundo, 2009). This might suggest that the main effect would be attenuated by sources' expertise. However, claim objectivity still affects source memory even when claims are accompanied by expert sources. It is possible that the attentional benefits of source expertise may not be sufficient to attenuate the strength of the source-claim links formed during encoding between facts and sources, up to that of opinions.

Claim Objectivity and Recognition Memory

Across experiments, we also measured claim recognition memory. In experiment 1, for

layperson sources in experiment 3, and in experiments 6a and 6b, we find that recognition memory is greater for opinions than for facts. In experiment 2, we find the opposite, that recognition memory is greater for facts than for opinions; similarly in experiment 4 we find that recognition memory is greater for facts about the world than for facts about the source. In experiments 2b, 2c, 4, 5, and for expert sources in experiment 3, we find no difference in recognition memory accuracy between opinions and facts. See Figure 2-4. Exploratory analyses in experiments 6a and 6b find that the effect of claim objectivity on claim recognition memory was unique to filler claims, and not present for claims presented during the encoding stage. Analyzing data across experiments using a linear mixed model with experiment level random effects finds no significant difference in claim recognition memory for opinions versus facts (b = 0.14, t = 0.21).

Figure 2-4. Experiments 1-6 and S1-3: Claim Recognition Memory



These results suggest that the consistent effect of claim objectivity on source memory is unique to the processes underlying source memory (e.g., the strength of the source-claim links formed during encoding) rather than simply affecting claim encoding resulting in more accurate memory for one type of claim over another. This is further reinforced by the finding in experiment 5, where a manipulation that reduced the relevance of a source's link to its claims

attenuated the difference in source memory accuracy but had no effect on recognition memory accuracy even though the set of claims tested remained exactly the same.

Supplementary Experiments

We conducted three additional experiments throughout the course of data collection. These pre-registered experiments included substantial changes to the experimental design which resulted in attenuations of the main effect. We present them as supplements rather than boundary conditions because the null effects were unexpected. Whereas we anticipated extensions of the main effect, these experiments instead present either a set of potential post-hoc boundary conditions or possibly type II errors (80% power across 12 experiments would lead one to find significant results in 9.6 experiments in expectation). Additional testing is required to be able to explicitly identify each as a boundary condition. Together, these 12 experiments constitute all of the experiments we conducted in which we varied claim type and measured source memory.

In experiment S1 (N = 499; 170 excluded for inattentiveness as defined by low recognition memory scores), we deviated from the design used in experiments 1-6 by (i) using a larger stimulus set, presenting *each* participant with 12 sources for a total of 48 claims per person; (ii) presenting claims not as individually distinct statements but as single paragraph-style film reviews from Metacritic, where each review consisted of two factual statements and two opinions; and (iii) choosing longer, more nuanced claims for both factual statements (e.g., "*The Postman's White Nights* is shot in an isolated village in Northern Russia on and around Kenozero Lake, with a cast made up primarily of untrained locals playing versions of themselves") and opinions (e.g., "The setting itself is gorgeous, with its boxy cottages fringed by grassy clearings and woodlands, and the placid surface of the water stretching on for miles"). Source memory for factual statements (21.1%) and for opinions (20.4%) did not substantively differ based on claim

type (b = -.67, t(321) = -.96, p = .337). We suspect this result may be attributable to the increased cognitive load associated with a considerably larger and more complex stimulus set. Participants in experiment S1 were much more likely than in other experiments to have misattributed claims to sources not previously seen in this experiment (filler sources). Whereas in the other nine experiments, the average rate of misattribution of claims to filler sources ranged from 20.0% to 26.4%, in experiment S1 the average rate of misattribution of claims to filler sources was a substantial outlier at 35.5%. Notably, 170 inattentive participants (34%) were excluded from analyses of experiment S1 for scoring at or below chance on the recognition memory task.

Experiment S2 (N = 501; 92 excluded for inattentiveness as defined by low recognition memory scores) followed the same design and used the same stimulus set as in experiment 2b (with Goodreads book review claims) but tested cued recall rather than full claim recall during the recall stage. In the source memory stage of experiment S2, participants were sequentially shown only the book titles present in previously-seen claims and asked to identify the sources associated with the reviews about those books based solely on the book titles (e.g., "Who do you know who has read *The Walmart Book of the Dead*?"). Participants accurately identified the source for 31.8% of opinions and for 31.8% of facts, a difference that is not statistically significant (b = .03, t(401) = .03, p = .978). The results of experiment S2 suggest that, in the absence of any information about the substantive content of a claim, cued recall may be insufficient to accurately identify the claim's source. This may present a boundary condition for the main effect of claim objectivity on source memory, as successful source attribution can depend on how much information is provided during a recall task (Dodson and Johnson, 1993).

Experiment S3 (N = 601; 42 excluded for inattentiveness as defined by low recognition memory scores) extended the investigation of source effects by deviating from human sources to

consider media outlets. Using a stimulus set of 20 unique media sources and 80 claims in the form of news headlines, each participant was sequentially presented with five sources accompanied by two factual statements (e.g., "Biden Asks Congress to End Federal Moratorium on Evictions") and two opinions (e.g., "It Is Not Biden's Place to End Moratorium on Evictions"). As an engagement task during the encoding stage, participants were asked to indicate how interested they would be in visiting the media source's website on a scale from (1) Not at all interested to (5) Very interested. When tested on source memory, participants on average accurately identified the sources for 26.8% of opinions and for 27.7% of facts, a difference that is not statistically significant (b = -.89, $t(551)$ = -.85, p = .393). Whereas opinion claims provide information about the attitudes and beliefs of their sources, it is possible that opinion news headlines may be perceived as less indicative of the views of a periodical publication (rather than those of a specific author), and the claim may subsequently lose some of its informational potency. Similarly, a source may provide useful information about a claim, but the use of randomly generated periodical publications may not allow for a stronger association to form between sources and claims as might be expected for familiar sources. As the extent to which a claim provides information about its source (or a source provides information about the claim) is key for stronger source-claim associative links to form during encoding, it is possible that the use of randomly generated media sources (rather than e.g., individual journalists or familiar media sources) limited our ability to detect a main effect.

Support for Potential Process

Experiments 4 and 5 present evidence to support the theorized process underpinning the observed main effect. In experiment 4, when facts display the opinion-like property of being more informative about sources, source memory is subsequently more accurate for those facts,

on par with opinions. In experiment 5, when opinions are reduced in how informative they are about sources, source memory is subsequently reduced for opinions, on par with facts. The strength of source-claim links formed during encoding is affected by the strength of associations between sources and claims (Greene, Martin, and Naveh-Benjamin, 2021; Mitchell and Johnson, 2009). Opinions generally provide more information about sources than do facts (Heiphetz et al., 2014), subsequently resulting in differential source memory accuracy for opinions vs. facts.

Downstream Consequences and Consumer Implications

Experiments 1-3 find that consumers are better able to accurately identify the source of a claim when the claim is an opinion than when it is a fact. Put differently, consumers are more likely to make inaccurate source misattributions for facts than they are for opinions. Experiments 4 and 5 support a potential process underpinning this effect, emphasizing an inherent difference between opinions and facts, whereby consumers encoding information form stronger associations between sources and opinions than between sources and facts, with consequences for source memory. In experiments 6a and 6b, we extend the implications of differential source memory (in)accuracy, finding that it affects how well consumers are able to integrate new evidence about sources in order to make inferences about sources (experiment 6a) and demonstrate advice-seeking intentions for sources learned to be topically relevant (experiment 6b). The integration of new evidence for belief updating and attitude adjustment is an important aspect of behavior in an information-rich world where additional pieces of context are often learned over time rather than being presented all at once.

In designing campaigns to communicate to consumers, and to facilitate communication amongst consumers, marketing managers frequently rely on peers, experts, and celebrities as sources to share information about brands and products (Berger, 2014). The ability to put such

information to use depends on people accurately recalling the source. Source misattribution can negate the value of advice from experts, recommendations from trusted friends, and product endorsement effects. Moreover, source misattribution could lead to counter-productive results – products being misremembered as recommended by a disliked rather than by a supported endorser or spurious public health behaviors being misremembered as advised by medical professionals rather than by lay strangers. The current findings provide a potentially useful tool for marketing managers and consumers alike who wish to enhance (or attenuate) the extent to which consumers remember the particular source of a claim.

For instance, in designing campaigns reliant on influencer endorsements to target a particular group, marketing managers may consider using claims that are inherently tied to the source (i.e., opinions) rather than factual claims to increase the likelihood that consumers will recall the particular endorser during a purchase decision. Similarly, guidance on policy and public health that relies on source expertise (i.e., bulletins from the Director of the Centers for Disease Control and Prevention) could benefit from including claims that inform the intended audience of the experts' personal beliefs and attitudes in addition to providing the necessary factual claims to encourage uptake of public health behaviors contingent on source expertise.

In navigating a saturated competitive advertisement landscape, firms may attempt to combat competitive advertisement interference via purchasing category exclusivity (Kent and Kellaris, 2001; Danaher, Bonfrer, and Dahr, 2008), but that can be exceedingly expensive and incurs additional risks (Crow and Hoek, 2003). Instead, research on competitive advertisement interference has called for further work on changes in advertised messaging, which marketing managers can control, to strengthen associations between brands and advertisements and decrease vulnerability to competitive interference (Krishnan and Chakravarti, 2003; Kent and

Kellaris, 2001). Although the present research does not directly focus on competitive advertisement interference, results may offer insight into one such approach to strengthen source memory during encoding.

Advertised information consists of a variety of claims, some of which may have stronger associations with the brand than others. At recall, differential source memory may affect persuasion and consumer attitudes towards a brand. For instance, selectively cued recall can result in consumers recalling only a select subset of claims as associated with the target brand, rather than other claims, affecting brand attitudes (Hutchinson and Moore, 1984). Consumers find claims made by credible sources to be more persuasive than claims made by less credible sources. The role of source credibility on persuasion is affected by whether or not consumers can recall the source of the claim (Hutchinson and Moore, 1984; Fragale and Heath, 2004; Bell et al., 2021). This can present diverging strategies for firms depending on their perceived credibility. A high credibility source benefits from accurate source memory, whereas a low credibility source benefits from poor source memory, increasing the likelihood that consumers misattribute the claim to a credible source or are persuaded without recalling the source (Moore and Hutchinson, 1984; Fragale and Heath, 2004; Bell et al., 2021).

As associative memory tends to weaken over time, warnings presented to consumers at encoding may not persist to recall. Labels intended to safeguard consumers from suspected misinformation or promotional content are often forgotten by the time the information itself is recalled, and as a result are not nearly as effective as when the information was initially presented (Bell et al., 2021). Claim objectivity lies at the foundation of ongoing legal and policy debates about credible sources and the spread of misinformation on social media. Considerable attention has been devoted to combating fake news, helping consumers discern inaccurate factual

claims from accurate factual claims (Murrock et al., 2018). Efforts to combat misinformation and protect consumers from the influence of promotional content may benefit from strategies aimed at improving source memory (Fragale and Heath, 2004; Bell et al., 2021).

Limitations and Future Directions

Source memory is also affected by particularly salient claims and sources (Doerksen and Shimamura, 2001). Regardless of a claim's objectivity, claims of a particularly outstanding nature (e.g., highly unusual claims or claims that elicit an emotional response) may provide greater information about their sources regardless of their objectivity. As such, the main effect of a claim's objectivity on source memory may be attenuated in the case of extraordinary claims or high-attention sources. Similarly, we expect that claim credibility can provide additional information about a source. For instance, if someone claims that "the moon is made of cheese", that claim presumably provides more information about the source than it does about the state of the world. Even though the noncredible claim is objective, it may be linked to a source more strongly during encoding than a more credible, less outlandish objective claim would be. Such effects of claim salience and credibility provide additional avenues for future research.

Though not included in the current stimuli, moral judgments present an important set of claims on which to further test source memory. While inherently subjective, widely held moral beliefs are perceived to be just as, if not more objective than, objective claims (Goodwin and Darley, 2012; Heiphetz and Young, 2017; Heiphetz et al., 2018), and sources sharing moral beliefs that are widely held are not presenting claims with high informational value about the sources themselves. The present results and mechanism suggest that source memory for moral claims may be on par with factual claims, rather than with other subjective claims. Reduced source memory accuracy for widely held beliefs may serve to accentuate perceptions of popular

support. When consumers are less able to attribute claims to individual sources, they could instead believe that the beliefs are held by a wide majority. Thus, the reduced source memory accuracy for widely held moral beliefs may serve to perpetuate their perceived objectivity.

CONCLUSION

In the current work, we investigate the effect of claim objectivity on source memory, the ability to accurately identify the source of a claim. Across twelve experiments our findings indicate that opinions are more likely to be correctly attributed to their sources than are factual statements. Investigations of process evidence indicate that this effect is driven by differences in how much information a claim provides about a source, where opinions generally provide more information about sources than do facts. The formation of stronger associative links between sources and opinion (vs. facts) during encoding results in more accurate source memory for opinions (vs. facts) during recall. The finding is robust across a variety of consumer contexts, is not attenuated by source expertise, and has consequences for consumer inferences. When communicating information to consumers, it is important to consider how the objectivity of a claim will affect consumers' ability to accurately remember where it came from.

REFERENCES

Anderson, J. R. (1983). A spreading activation theory of memory. *Journal of Verbal Learning and Verbal Behavior*, 22(3), 261-295.

Batchelder, W. H., & Batchelder, E. (2008). Metacognitive guessing strategies in source monitoring. *Handbook of Metamemory and Memory*, 211-244.

Bell, R., Mieth, L., & Buchner, A. (2020). Source attributions for detected new items: Persistent evidence for schematic guessing. *Quarterly Journal of Experimental Psychology*, 73(9), 1407-1422.

Bell, R., Mieth, L., & Buchner, A. (2021). Source memory for advertisements: The role of advertising message credibility. *Memory & Cognition*, *49*(1), 32-45.

Bell, R., Mieth, L., & Buchner, A. (2022). Coping with high advertising exposure: a source-monitoring perspective. *Cognitive Research: Principles and Implications*, 7(1), 82.

Berger, J. (2014). Word of mouth and interpersonal communication: A review and directions for future research. *Journal of Consumer Psychology*, *24*(4), 586-607.

Bettman, J. R. (1979). Memory factors in consumer choice: A review. *Journal of Marketing*, *43*(2), 37-53.

Biehal, G., & Chakravarti, D. (1986). Consumers' use of memory and external information in choice: Macro and micro perspectives. *Journal of Consumer Research*, 12(4), 382-405.

Blatz, C. W., & Mercier, B. (2018). False polarization and false moderation: Political opponents overestimate the extremity of each other's ideologies but underestimate each other's certainty. *Social Psychological and Personality Science*, *9*(5), 521-529.

Burke, R. R., & Srull, T. K. (1988). Competitive interference and consumer memory for advertising. *Journal of Consumer Research*, 15(1), 55-68.

Cansino, S., Torres-Trejo, F., Estrada-Manilla, C., Ramírez-Barajas, L., Pérez-Loyda, M., Nava-Chaparro, A., ... & Ruiz-Velasco, S. (2019). Predictors of source memory success and failure in older adults. *Frontiers in Aging Neuroscience*, *11*, 17.

Chalfonte, B. L., & Johnson, M. K. (1996). Feature Memory and Binding in Young and Older Adults. *Memory & Cognition*, *24*(4), 403-416.

Davidson, P. S., McFarland, C. P., & Glisky, E. L. (2006). Effects of emotion on item and source memory in young and older adults. *Cognitive, Affective, & Behavioral Neuroscience*, *6*(4), 306-322.

Danaher, P. J., Bonfrer, A., & Dhar, S. (2008). The effect of competitive advertising interference on sales for packaged goods. *Journal of Marketing Research*, 45(2), 211-225.

Dodson, C. S., & Johnson, M. K. (1993). Rate of false source attributions depends on how questions are asked. *The American Journal of Psychology*, 541-557.

Doerksen, S., & Shimamura, A. P. (2001). Source memory enhancement for emotional words. *Emotion*, 1(1), 5.

Fazio, L. K., Brashier, N. M., Payne, B. K., & Marsh, E. J. (2015). Knowledge does not protect against illusory truth. *Journal of Experimental Psychology: General*, *144*(5), 993.

Fragale, A. R., & Heath, C. (2004). Evolving informational credentials: The (mis) attribution of believable facts to credible sources. *Personality and Social Psychology Bulletin*, *30*(2), 225-236.

Glisky, E. L., Rubin, S. R., & Davidson, P. S. (2001). Source memory in older adults: An encoding or retrieval problem?. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 27(5), 1131.

Goodwin, G. P., & Darley, J. M. (2008). The psychology of meta-ethics: Exploring

objectivism. *Cognition*, *106*(3), 1339-1366.

Greene, N. R., Martin, B. A., & Naveh-Benjamin, M. (2021). The effects of divided attention at encoding and at retrieval on multidimensional source memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*.

Hashtroudi, S., Johnson, M. K., & Chrosniak, L. D. (1989). Aging and source monitoring. *Psychology and Aging*, *4*(1), 106.

Heesacker, M., Petty, R. E., & Cacioppo, J. T. (1983). Field dependence and attitude change: Source credibility can alter persuasion by affecting message-relevant thinking. *Journal of Personality*, 51(4), 653-666.

Heiphetz, L., Spelke, E. S., Harris, P. L., & Banaji, M. R. (2014). What do different beliefs tell us? An examination of factual, opinion-based, and religious beliefs. *Cognitive Development*, *30*, 15-29.

Heiphetz, L., & Young, L. L. (2017). Can only one person be right? The development of objectivism and social preferences regarding widely shared and controversial moral beliefs. *Cognition*, *167*, 78-90.

Heiphetz, L., Lane, J. D., Waytz, A., & Young, L. L. (2018). My mind, your mind, and God's mind: How children and adults conceive of different agents' moral beliefs. *British Journal of Developmental Psychology*, *36*(3), 467-481.

Janowsky, J. S., Shimamura, A. P., & Squire, L. R. (1989). Source memory impairment in patients with frontal lobe lesions. *Neuropsychologia*, *27*(8), 1043-1056.

Johar, G. V., & Pham, M. T. (1999). Relatedness, prominence, and constructive sponsor identification. *Journal of Marketing Research*, *36*(3), 299-312.

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological*

Bulletin, 114(1), 3-28.

Johnson, S. G., Rodrigues, M., & Tuckett, D. (2021). Moral tribalism and its discontents: How intuitive theories of ethics shape consumers' deference to experts. *Journal of Behavioral Decision Making*, *34*(1), 47-65.

Judd, C. M., Westfall, J., & Kenny, D. A. (2017). Experiments with more than one random factor: Designs, analytic models, and statistical power. *Annual Review of Psychology*, 68, 601-625.

Karras, T., Laine, S., & Aila, T. (2019). A style-based generator architecture for generative adversarial networks. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (pp. 4401-4410).

Kassam, K. S., Gilbert, D. T., Swencionis, J. K., & Wilson, T. D. (2009). Misconceptions of memory: the Scooter Libby effect. *Psychological Science*.

Keller, K. L. (1987). Memory factors in advertising: The effect of advertising retrieval cues on brand evaluations. *Journal of Consumer Research*, 14(3), 316-333.

Kent, R. J., & Allen, C. T. (1994). Competitive interference effects in consumer memory for advertising: the role of brand familiarity. *Journal of Marketing*, 58(3), 97-105.

Kent, R. J., & Kellaris, J. J. (2001). Competitive interference effects in memory for advertising: are familiar brands exempt?. *Journal of Marketing Communications*, 7(3), 159-169.

Klauer, K. C., & Meiser, T. (2000). A source-monitoring analysis of illusory correlations. *Personality and Social Psychology Bulletin*, 26(9), 1074-1093.

Krishnan, H. S., & Chakravarti, D. (2003). A process analysis of the effects of humorous advertising executions on brand claims memory. *Journal of Consumer Psychology*, 13(3), 230-245.

Kuhlmann, B. G., Symeonidou, N., Tanyas, H., & Wulff, L. (2021). Remembering and reconstructing episodic context: An overview of source monitoring methods and behavioral findings. *Psychology of Learning and Motivation*, 75, 79-124.

Kuhlmann, B. G., & Touron, D. R. (2011). Older adults' use of metacognitive knowledge in source monitoring: Spared monitoring but impaired control. *Psychology and Aging*, 26(1), 143.

Kuhlmann, B. G., & Touron, D. R. (2012). Mediator-based encoding strategies in source monitoring in young and older adults. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 38(5), 1352.

Kumkale, G. T., & Albarracín, D. (2004). The sleeper effect in persuasion: a meta-analytic review. *Psychological Bulletin*, *130*(1), 143.

Law, S., Hawkins, S. A., & Craik, F. I. (1998). Repetition-induced belief in the elderly: Rehabilitating age-related memory deficits. *Journal of Consumer Research*, 25(2), 91-107.

Lee, B. K., & Lee, W. N. (2007). Decreasing advertising interference: The impact of comparable differences on consumer memory in competitive advertising environments. *Psychology & Marketing*, 24(11), 919-945.

Liberman, V., Minson, J. A., Bryan, C. J., & Ross, L. (2012). Naïve realism and capturing the "wisdom of dyads". *Journal of Experimental Social Psychology*, *48*(2), 507-512.

Litman, L., Rosenzweig, C., & Moss, A. (2020). New Solutions Dramatically Improve Research Data Quality on MTurk.

Lynch, J. G., Alba, J. W., & Hutchinson, J. W. (1991). Memory and decision making. *Handbook of Consumer Behavior*, 1-9.

Lynch Jr, J. G., Marmorstein, H., & Weigold, M. F. (1988). Choices from sets including remembered brands: Use of recalled attributes and prior overall evaluations. *Journal of Consumer Research*, 15(2), 169-184.

Lynch Jr, J. G., & Srull, T. K. (1982). Memory and attentional factors in consumer choice: Concepts and research methods. *Journal of Consumer Research*, *9*(1), 18-37.

Mather, M., Johnson, M. K., & De Leonardis, D. M. (1999). Stereotype reliance in source monitoring: Age differences and neuropsychological test correlates. *Cognitive Neuropsychology*, 16(3-5), 437-458.

Mayes, A., Montaldi, D., & Migo, E. (2007). Associative memory and the medial temporal lobes. *Trends in Cognitive Sciences*, 11(3), 126-135.

McDougal v. FOX NEWS NETWORK, LLC, 489 F. Supp. 3d 174 (S.D.N.Y. 2020).

Meiser, T., & Bröder, A. (2002). Memory for multidimensional source information. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 28(1), 116.

Mieth, L., Schaper, M. L., Kuhlmann, B. G., & Bell, R. (2021). Memory and metamemory for social interactions: Evidence for a metamemory expectancy illusion. *Memory & Cognition*, 49, 14-31.

Mitchell, K. J., & Johnson, M. K. (2009). Source monitoring 15 years later: what have we learned from fMRI about the neural mechanisms of source memory?. *Psychological Bulletin*, *135*(4), 638.

Mitchell, K. J., & MacPherson, S. E. (2017). The Cognitive Neuroscience of Source Memory: Moving the Ball Forward. *Cortex, 91*, 1-8.

Morgan, E. E., Watson, C. W. M., Woods, S. P., Gilbert, P. E., Villalobos, J., & Verduzco, M. (2021). Misattributions of the source of health-related information in HIV

disease. *Journal of Clinical and Experimental Neuropsychology*, *43*(1), 1-14.

Murrock, E., Amulya, J., Druckman, M., & Liubyva, T. (2018). Winning the war on state-sponsored propaganda: Results from an impact study of a Ukrainian news media and information literacy program. *Journal of Media Literacy Education*, *10*(2), 53-85.

Naveh-Benjamin, M. (2000). Adult age differences in memory performance: tests of an associative deficit hypothesis. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 26(5), 1170.

Old, S. R., & Naveh-Benjamin, M. (2008). Differential effects of age on item and associative measures of memory: a meta-analysis. *Psychology and Aging*, 23(1), 104.

Pham, M. T., & Johar, G. V. (1997). Contingent processes of source identification. *Journal of Consumer Research*, *24*(3), 249-265.

Penney, V. (2020, July 14). How Facebook Handles Climate Disinformation. Retrieved July 17, 2020, https://www.nytimes.com/2020/07/14/climate/climate-facebook-fact-checking.html

Pennycook, G., & Rand, D. G. (2019). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, *188*, 39-50.

Ross, L., & Ward, A. (1995). Psychological barriers to dispute resolution. In *Advances in Experimental Social Psychology* (Vol. 27, pp. 255-304). Academic Press.

Schacter, D. L., Osowiecki, D., Kaszniak, A. W., Kihlstrom, J. F., & Valdiserri, M. (1994). Source memory: Extending the boundaries of age-related deficits. *Psychology and Aging*, *9*(1), 81.

Schaper, M. L., Kuhlmann, B. G., & Bayen, U. J. (2019). Metamemory expectancy illusion and schema-consistent guessing in source monitoring. *Journal of Experimental Psychology:*

Learning, Memory, and Cognition, 45(3), 470.

Schaper, M. L., Mieth, L., & Bell, R. (2019). Adaptive memory: Source memory is positively associated with adaptive social decision making. *Cognition*, 186, 7-14.

Shane, S. (2017). From headline to photograph, a fake news masterpiece. *The New York Times*, *18*.

Sherman, J. W., & Bessenoff, G. R. (1999). Stereotypes as source-monitoring cues: On the interaction between episodic and semantic memory. *Psychological Science*, 10(2), 106-110.

Simons, J. S., Dodson, C. S., Bell, D., & Schacter, D. L. (2004). Specific-and partial-source memory: effects of aging. *Psychology and Aging*, *19*(4), 689.

Skitka, L. J., & Morgan, G. S. (2014). The social and political implications of moral conviction. *Political Psychology*, *35*, 95-110.

Spiller, S. A., & Belogolova, L. (2017). On consumer beliefs about quality and taste. *Journal of Consumer Research*, *43*(6), 970-991.

Staresina, B. P., & Davachi, L. (2006). Differential encoding mechanisms for subsequent associative recognition and free recall. *Journal of Neuroscience*, 26(36), 9162-9172.

Tobin, S. J., & Raymundo, M. M. (2009). Persuasion by causal arguments: The motivating role of perceived causal expertise. *Social Cognition*, *27*(1), 105-127.

US Dominion, Inc. v. Powell, Civil Action 1:21-cv-00040 (CJN) (D.D.C. Aug. 11, 2021)

Yonelinas, A. P. (2002). The nature of recollection and familiarity: A review of 30 years of research. *Journal of Memory and Language*, 46(3), 441-517.

CONCLUSION

As consumers identify and process relevant content, they form various structural concepts that help to define and classify information. One such concept is claim objectivity, which allows for a distinction between objective information (factual claims that can be true or false) and subjective information (opinions with which others can agree or disagree). Although there has been considerable research on both factual statements and on opinions, the existing research has largely siloed objective and subjective claims, a priori determining claims to be and treating them as either facts or opinions. But claim objectivity is itself an important construct, one that directly affects conflict and collaboration, has implications for the spread of misinformation, and can affect the efficacy of advertising, persuasion, and communication.

The present research has focused on two facets of claim objectivity in order to (i) expand our understanding of what affects the perceived objectivity of a claim, and (ii) identify how claim objectivity affects consumer processing of information and the subsequent formation of attitudes and beliefs. Chapter I identified repeated exposure to a claim as one of the antecedents to claim objectivity, finding that prior exposure to a claim increases how objective it is perceived to be. Chapter II focused on one of the consequences of claim objectivity, finding that consumers are better able to accurately remember the original source of an opinion than the original source of a fact. This superior source memory accuracy for opinions over facts also affected consumers' ability to accurately integrate new evidence when forming inferences and seeking advice from sources.

The present work has found that claim objectivity is malleable – subject to the way in which information is presented, and has notable consequences on information processing –

affecting source memory accuracy. In developing theories and designing methodological approaches, the present work has gleaned substantial insight from prior research across a range of different fields including developmental psychology, cognitive neuroscience, social psychology, political science, and linguistics. The two chapters of this thesis have shed light on both the antecedents and consequences of claim objectivity. Although the individual contribution of the present work to each respective field may be modest, I hope that it serves as another example of the value of bridging disciplinary siloes.

Claim objectivity is a far-reaching yet understudied construct, affecting numerous domains of consumer behavior and decision making. As I continue to work on the problems that define how consumers interact with information, I look forward to collaborating with colleagues from a variety of different disciplines and methodological backgrounds to expand our shared understanding of how consumers perceive, process, and engage with the world around them.