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Judging Truth

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Abstract

Deceptive claims surround us, embedded in fake news, advertisements, political propaganda, and rumors. How do people know what to believe? Truth judgments reflect inferences drawn from three types of information: base rates, feelings, and consistency with information retrieved from memory. First, people exhibit a bias to accept incoming information, because most claims in our environments are true. Second, people interpret feelings, like ease of processing, as evidence of truth. And third, people can (but do not always) consider whether assertions match facts and source information stored in memory. This three-part framework predicts specific illusions (e.g., truthiness, illusory truth), offers ways to correct stubborn misconceptions, and suggests the importance of converging cues in a post-truth world in which falsehoods travel further and faster than the truth.

Contents

INTRODUCTION

How do we know what to believe? "A camel's hump stores water." "Albert Einstein failed math in school." "Suicide rates peak during the holidays." Most people believe these to be facts, though camel humps store fat, Einstein excelled at math, and suicide rates rise in the spring. Conversely, people also reject veridical information. "An octopus has three hearts." "Anne Frank and Martin Luther King, Jr. were born in the same year." "The unicorn is Scotland's national animal." Why do these facts feel false? This review describes the cognitive and affective cues that signal truth, how well these cues track reality, and the ways that they leave people vulnerable to specific and predictable illusions.

Public interest in the psychology of judging truth intensified after the 2016 US presidential election; post-truth, fake news, and misinformation have each appeared as the word of the year in prominent dictionaries. Many worry that we now live in a world where opinions outweigh facts (see Lewandowsky et al. 2017). Misconceptions spread rapidly in the digital age—falsehoods are 70% more likely to be retweeted than truths (Vosoughi et al. 2018)—but misleading headlines are as old as the printing press. In 1912, the *St. Louis Dispatch* reported that most Titanic passengers survived (in fact, over 1,500 died). In 1981, the *New York Times* described a "rare cancer" seen in gay men (a disease now known as AIDS). In 1990, the *New York Times* also predicted an epidemic of "crack-exposed children" (unlike fetal alcohol syndrome, no discernible "crack baby" phenotype exists). Fortunately, scientific interest in the spread of misinformation also predates the fake-news crisis, allowing the application of basic psychological science to contemporary controversies.

Decades of work from distinct research traditions describe basic processes that people use to distinguish true from false claims. By "true" and "false," we refer to people's judgments about objective truth, not attitudes, and thus we do not cover the persuasion literature (e.g., Albarracin & Shavitt 2018, Falk & Scholz 2018). Past reviews summarize how feelings, like fluency (Dechêne et al. 2010, Unkelbach et al. 2019) and affect (Forgas 2019), shape truth. Our synthesis offers a different level of analysis, cutting across social and cognitive psychology to consider the many ways in which people construct truth.

THE CONSTRUCTION OF TRUTH

Existing research reveals a common theme: Truth judgments are constructed. People draw inferences from relevant cues, some of which qualify as heuristics (i.e., cognitive shortcuts that save time and effort). We organize the literature into three main kinds of inference (see **Figure 1**). First, and most fundamentally, truth judgments reflect inferences from base rates. In line with Bayesian models of cognition (Tenenbaum et al. 2006), people do not start from a

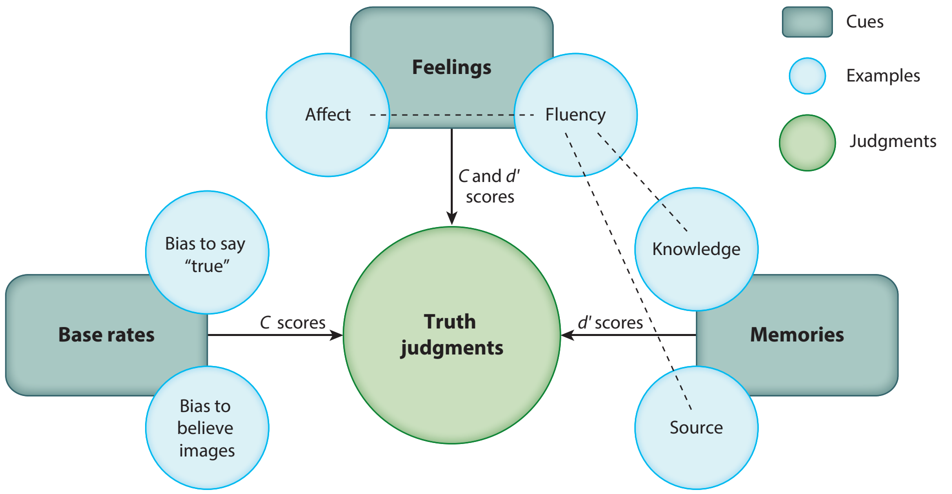

Figure 1

Truth judgments reflect inferences from base rates, feelings, and consistency with memories. *C* scores measure the general bias to say "true," while *d′* scores reflect the ability to distinguish true from false claims. Dashed lines indicate interactions described by previous research. Additional cues and connections may exist.

position of complete ignorance but instead begin with prior probabilities. Second, people draw inferences from feelings. Feelings-as-information theory suggests that people interpret their own subjective experiences as evidence of truth (Schwarz 2012). Finally, people draw inferences from consistency with existing knowledge and source information stored in memory, complementing a referential theory of truth (Unkelbach & Rom 2017).

Each of these three inferences increases accuracy in general. A Bayesian-like reliance on base rates (i.e., calling claims "true" more often than "false") is often effective, given that most information encountered in daily life is true. Statements accompanied by a feeling of ease are more likely to be true than those that feel strange or difficult to understand. And probabilistically, assertions consistent with information stored in memory tend to be more accurate than mismatches.

Specific kinds of errors follow from each class of inference. Assuming truth due to base rates can leave people credulous. Relying on feelings may predispose people to cognitive illusions, where statements that feel good are accepted irrespective of truth. And preferring consistency can make it difficult to update beliefs when the facts change (e.g., spicy foods ease, rather than exacerbate, digestive inflammation) or when learning something new (e.g., ink from tattoos migrates to the lymph nodes).

INFERRING TRUTH FROM BASE RATES

"To get divorced, Ghanaians have to wear their wedding clothes to court." Without any expertise about Ghana's legal system, how do readers judge this assertion? We might predict that people accept ambiguous claims as true as often as they reject them as false. Instead, people are more likely to assume a statement is true than to call it false, reflecting the base rates in daily life (where most references are mundane and true). From a Bayesian perspective, it is rational to assume that incoming information is true and then to revise in light of new evidence. Gilbert (1991) makes similar predictions but argues that, to be comprehended, a claim must first be represented as true. In a second, resource-demanding step, it can be rejected as false.

Unbelieving (i.e., revising or updating) requires cognitive effort, leaving people vulnerable to distraction. In one study, participants learned supposed translations of Hopi words (e.g., "A monishna is a star"), each followed by a "true" or "false" tag. A tone played just after some of these tags appeared. Asymmetrical errors emerged: Interruption led participants to misremember false claims as true, but the opposite did not occur (Gilbert et al. 1990). A similar effect occurred when participants read crime reports and then recommended prison terms for robberies (Gilbert et al. 1993). The reports contained true and false information, printed in black and red font, respectively. Half of the participants searched for digits while reading them. Distracted participants assigned terms consistent with details (e.g., "The robber had a gun") that they should have ignored (i.e., that appeared in red). Multitasking appears to disrupt the second, unbelieving stage.

Without explicit tags, people exhibit a modest bias to accept new claims. In our own experiments, participants rarely endorse ambiguous claims seen for the first time as "definitely true" (e.g., Brashier et al. 2017, 2019; Fazio et al. 2015). However, their judgments consistently skew toward "true" (across experiments, the mean deviation from the middle of a 6-point scale was 0.30). Signal detection analysis provides a more precise estimate, where bias scores indicate participants' general tendency to say "true" (Unkelbach 2007). A lenient criterion leaves listeners vulnerable to deceit, since people lie regularly (on average, 1.65 times a day) (Serota et al. 2010). Most people detect dishonesty at a rate barely better than chance (Bond & DePaulo 2006, Hartwig & Bond 2011), due to a bias to regard others' statements as truthful (Bond & DePaulo 2008).

People also observe and draw on base rates when considering images, as most things seen in daily life are real. Movies, virtual reality, and other visual media all take advantage of this reality principle. As a result, doctored photos can implant memories of childhood events (e.g., hot-air balloon rides) that never happened (Wade et al. 2002). The fiction about Ghanaian divorce law mentioned earlier went viral, perhaps due to the accompanying photoshopped picture of stressed couples in tuxedos and wedding gowns. The power of pictures extends to truth, as demonstrated by Newman and colleagues (2012). They presented people with claims like "The first windmills were built in Persia." Half appeared with a photo (e.g., of a windmill in a nondescript field) that provided no actual evidence about the veracity of the claim. Signal detection analysis revealed a bias to accept statements as true (i.e., lower C scores) when they appeared alongside a picture. Truthiness persists for days (Fenn et al. 2013) and occurs unconsciously: Most participants (90%) fail to notice that pictures boost perceptions of truth (Newman et al. 2018). In addition to making claims more believable, irrelevant photos increase people's desire to share both true and false information on social media (Fenn et al. 2019). Manipulated visuals exploit our reliance on images; at the extreme, deepfakes use artificial intelligence to depict events that never happened (e.g., speeches by world leaders) (Yang et al. 2018).

People can learn to disbelieve their eyes, such as in experiments in which people wear goggles that render the world upside down, but it takes extensive practice (Kohler 1962). The aphorism that seeing is believing captures the Bayesian notion that what people see is usually true. However, there are situations in which this contingency is broken. For example, only semantically related photos make statements seem truer; pairing "The liquid metal inside a thermometer is mercury" with a picture of a lizard actually encourages a bias to say "false" (Newman et al. 2015). Obvious mismatches (e.g., thermometer/lizard) override inferences from base rates.

INFERRING TRUTH FROM FEELINGS

"Vitamin C prevents common colds." Consumers continue to buy unnecessary supplements, partly because they hear this claim over and over. Repetition works because people behave like cognitive misers, using shortcuts to avoid computation (Fiske & Taylor 1991). Heuristics minimize time and effort, whether predicting where serial offenders live (Snook et al. 2004) or who will win tennis matches (Serwe & Frings 2006). Despite ignoring some information, they can match or exceed the accuracy of statistical methods (i.e., less-is-more effects) (Gigerenzer & Gaissmaier 2011). People draw on adaptive toolboxes suited to a given domain, not general algorithms (Gigerenzer 2002). For example, cooperating first and then imitating a social partner's last behavior (i.e., going tit for tat) (Axelrod 1984) facilitates cooperation, but this strategy cannot discriminate truths from falsehoods. So how do people make fast and frugal truth judgments? One well-documented shortcut involves ease of processing.

"Just do it." "Think different." "Eat fresh." These slogans immediately bring Nike, Apple, and Subway to mind. Marketers realize the power of repetition, a strategy that Hasher and colleagues (1977) corroborated. In their seminal experiment, participants judged the truth of claims like "Divorce is only found in technically advanced societies." Crucially, they saw some statements three times (repeated) and others for the first time at test (new). Repeated claims seemed truer than new ones, a phenomenon coined illusory truth. According to a meta-analysis of over 50 studies, illusory truth is a medium effect (Cohen's *d*s = 0.39–0.49) (Dechêne et al. 2010). Notably, this may be an underestimate, as most researchers instruct participants that they will encounter true and false information. Removing this simple warning, which rarely occurs in everyday life, doubles the effect of repetition (M. Jalbert, E.J. Newman & N. Schwarz, unpublished manuscript).

Even a single previous exposure to a claim proves powerful. Illusory truth persists over time, emerging months later (Brown & Nix 1996). Repetition boosts credibility of trivia (e.g., "House mice can run an average of four miles per hour") (Bacon 1979), product claims (e.g., "Crest toothpaste removes caffeine stains from teeth") (Johar & Roggeveen 2007), sociopolitical opinions (e.g., "Judges are far too lenient on criminals") (Arkes et al. 1989), rumors (e.g., "A professor was giving a student good grades because he found out the professor plagiarized") (DiFonzo et al. 2016), and fake headlines (e.g., "Mike Pence: Gay conversion therapy saved my marriage") (Pennycook et al. 2018). Merely seeing concepts (e.g., hen's body temperature) increases later belief in detailed claims about those topics (e.g., "The temperature of a hen's body is about 104°F") (Begg et al. 1985). Reading statements like "Crocodiles sleep with their eyes open" even leads people to believe the opposite: A week later, direct contradictions (e.g., "Crocodiles sleep with their eyes closed") seem more truthful than new items (Garcia-Marques et al. 2015). People forget the details of the initial claim, instead basing their judgments on how easy it feels to process key concepts (e.g., crocodiles, sleep).

Bolstering this fluency account, illusory truth occurs without repetition. Statements presented in high contrast (e.g., "**The capital of Madagascar is Toamasina**") seem truer than those presented in low contrast (e.g., "The capital of Madagascar is Toamasina") (Reber & Schwarz 1999). Aphorisms that rhyme (e.g., "What sobriety conceals, alcohol reveals") seem more apt than those that do not (e.g., "What sobriety conceals, alcohol unmasks") (McGlone & Tofighbakhsh 2000). Finally, claims (e.g., "A giraffe can go without water longer than a camel can") made by native speakers seem truer than those spoken with a foreign accent (Lev-Ari & Keysar 2010). Neuroimaging provides converging evidence; illusory truth reflects increased activity in the perirhinal cortex, a region implicated in other fluency effects like conceptual priming (Wang et al. 2016).

This illusion reflects a relative metacognitive experience. Illusory truth effects are largest when people judge mixed lists that include both new and repeated statements (Dechêne et al. 2009, Garcia-Marques et al. 2019). We might expect the opposite to be true, given that a within-subjects design gives participants the opportunity to explicitly notice differences between fluent and disfluent items. When judging liking (Bornstein & D'Agostino 1994) and frequency (Oppenheimer 2004), for example, people spontaneously explain away fluency when manipulations are too heavy handed. However, seeing repeated and new items side by side does not lead to discounting while evaluating truth. Participants do not simply forget claims seen earlier; they recognize statements from the exposure phase with accuracy exceeding 90% (Begg et al. 1992). Rather, the effect is so strong that they fail to discount even after explicit warnings describing illusory truth (Nadarevic & Aßfalg 2017).

How do people develop a heuristic this pernicious? In some ways, the term illusory truth is a misnomer—there can be "wisdom in feelings" (Schwarz 2002). Fluency naturally correlates with truth in our daily lives. On average, people hear the single true version of a statement (e.g., "The capital of Argentina is Buenos Aires") more often than any one of its many possible falsifications (e.g., "The capital of Argentina is La Paz," "The capital of Argentina is Lima," "The capital of Argentina is Montevideo"). With experience, people learn that fluency typically leads to the correct judgment in less time than other strategies (Unkelbach 2007), allowing them to judge repeated statements more quickly than new ones (e.g., Scholl et al. 2014, Unkelbach & Greifeneder 2018). Given that the fluency heuristic is learned, it can also be reversed. Participants update when feedback challenges the direction (Unkelbach 2007) or validity (Scholl et al. 2014) of the relationship between color contrast and truth.

Cognitive, social, and consumer psychology converge on fluency's potential to lead us astray (Unkelbach et al. 2019). This empirical spotlight implies that fluency serves as a single clever cue for truth. Indeed, some judgments reflect "one good reason" (Gigerenzer & Gaissmaier 2011, p. 463). Fluency is an appealing candidate: Easy processing informs many judgments (Alter & Oppenheimer 2009), including liking (Iyengar & Lepper 2000), beauty (Reber et al. 2004), and confidence (Schwartz & Metcalfe 1992). University professors even assign higher grades in later offerings of a course, and judges give higher ratings to professional dancers in later seasons of *Dancing with the Stars* (O'Connor & Cheema 2018). Fluency serves as a powerful cue, but other subjective feelings provide shortcuts to truth.

Most notably, emotion bleeds into many judgments (Greifeneder et al. 2011, Lerner et al. 2015), from risk estimates (Johnson & Tversky 1983) to judgments of learning (Hourihan & Bursey 2017). Affect can literally make mountains out of molehills: Sadness leads people to estimate that hills are steeper (Riener et al. 2011). Mood cued by weather correlates with real-world outcomes, such as medical school admissions (Redlmeier & Baxter 2009) and stock returns (Hirshleifer & Shumway 2003).

We ask ourselves "How do I feel about this?" and then attribute our feelings to the target (Schwarz 2012). Easy processing feels good according to both self-reports (Monahan et al. 2000) and facial myography over the zygomaticus "smiling" muscle (Carr et al. 2016, Winkielman & Cacioppo 2001). As a result, faces seen recently appear happier than new ones (Carr et al. 2017). The reverse is also true: Smiling faces feel more familiar (an interpretation of fluency) than neutral ones (Garcia-Marques et al. 2004). Happy, but not sad, people endorse attitudes based on easy-to-retrieve (i.e., fluent) arguments (Ruder & Bless 2003). Compared to a neutral mood, happiness leads people to falsely recognize words (Claypool et al. 2008). Moreover, people enjoy repeating activities (e.g., visiting a museum, watching a movie) more than expected (O'Brien 2019).

Given this warm glow of familiarity, Unkelbach and colleagues (2011) investigated whether illusory truth merely reflects positivity. Participants evaluated statistical claims with positive (e.g., "The divorce rate in Grenada is lower than in the rest of Spain") and negative (e.g., "The divorce rate in Grenada is higher than in the rest of Spain") framings. Illusory truth emerged for both types of statements, confirming that fluency drives the effect. But claims that elicited more positive feelings also seemed truer, hinting that positivity independently cues truth. Conversely, sadness wipes out illusory truth (Koch & Forgas 2012), which is an impressive finding given how robust the illusion is. After watching sad film clips, claims (e.g., "Instead of iron, horseshoe crabs have copper in their blood") printed in an easy-to-read font seem just as true as those in a hard-to-read font. Negative mood also reduces gullibility, allowing people to spot deception (Forgas & East 2008). In our own studies, people tend to judge claims as "truthful" when they appear beside a neutral, but not an angry or fearful, face (N.M. Brashier & E.J. Marsh, unpublished manuscript). In short, a bad mood may discourage people from going with their guts (Forgas 2019).

INFERRING TRUTH FROM CONSISTENCY WITH MEMORY

"Barack Obama was the first black president of the United States." Accepting this statement as true does not dictate whether you like Obama. Unlike subjective evaluations (e.g., confidence, liking), there is usually a right answer when making truth judgments; they exist "before the background of an objective value" (Dechêne et al. 2010, p. 254). A rational model conceives of truth judgments as evidence based: People should accept information as true when it matches content retrieved from memory, including relevant facts (semantic memories) or details about source (episodic memories).

Humans know a lot—on average, the meaning of 42,000 words (Brysbaert et al. 2016) and the faces of 5,000 people (Jenkins et al. 2018). We draw on knowledge to understand the world, whether resolving ambiguities (e.g., Bransford & Johnson 1972) or simulating events in the future (e.g., Benoit et al. 2014). Similarly, people retrieve what they know to evaluate whether a claim is true. They tend to accept claims that fit with facts stored in memory and to reject mismatches. For example, participants perceive "Ojos del Salado is the highest mountain in South America" to be truer than "The Nile is the longest river in South America" (e.g., Brashier et al. 2017, Fazio et al. 2015). Both statements are false, but people know less about the Aconcagua than the Amazon. Of course, people also hold misconceptions about the world (e.g., that the Great Wall of China is visible from space), confuse opinions and facts (Pew Res. Cent. 2018), and claim to know impossible things. This overclaiming predicts belief in fake news (Pennycook & Rand 2019d), and illusions of understanding (e.g., about genetics) co-occur with extreme beliefs (e.g., fear of genetically modified organisms) (Fernbach et al. 2019).

Even when knowledge is objective and accurate, people may neglect it (Marsh & Umanath 2014). Participants offer solutions to impossible problems (e.g., where to bury survivors of a plane crash) (Barton & Sanford 1993), overlook errors in stories (e.g., St. Petersburg as Russia's capital) (Marsh & Fazio 2006), and answer questions containing false premises (e.g., "How many animals of each kind did Moses take on the ark?") (Erickson & Mattson 1981). Listeners pass over falsehoods that resemble the truth (Hinze et al. 2014, van Oostendorp & de Mul 1990) because errors plague ordinary speech. Messages only need to be "good enough" (Ferreira et al. 2002), so people accept partial matches between statements and the contents of memory (Reder & Kusbit 1991).

Fluency further impairs our ability to catch inconsistencies. People notice fewer errors when questions like "How many animals of each kind did Moses take on the ark?" are easy to read (Song & Schwarz 2008). Moreover, repetition makes contradictions of well-learned facts seem more credible. Intuitively, repeating "Deer meat is called veal" should not increase belief; most people know that deer meat is called venison, not veal. The literature reflects this assumption that knowledge protects us; a meta-analysis of illusory truth notes that statements must be ambiguous for the illusion to occur (Dechêne et al. 2010). Similarly, Unkelbach & Stahl (2009) and others used obscure trivia (e.g., "Cactuses can procreate via pathogenesis"), assuming that knowledge would wipe out the effect of repetition. Our work demonstrates the opposite. Participants read statements that contradicted well-known (e.g., "Newton proposed the theory of relativity") and obscure facts (e.g., "Bell invented the wireless radio"), then they rated these and new statements' truthfulness. A final knowledge check determined which specific facts each participant knew. Repetition inflated judgments of falsehoods, regardless of whether or not they contradicted stored knowledge (Fazio et al. 2015).

Multinomial modeling confirmed that fluency supersedes knowledge (in agreement with a fluency-conditional model). The model assumed in the literature, where fluency only comes into play when people lack knowledge (knowledge-conditional model), fit poorly. In short, people sometimes rely on fluency when they know better (Fazio et al. 2015), to the point where repetition may even increase belief in implausible claims like "Smoking cigarettes is good for your lungs" and "The Earth is a perfect square" (Fazio et al. 2019). Thus, education only offers a partial solution to the misinformation crisis; people might learn new facts (e.g., waterboarding impairs memory) only to disregard them later (e.g., believe that torture works).

The picture looks just as dismal when we consider general intellect rather than knowledge of specific facts: Illusory truth is immune to individual differences in fluid intelligence and cognitive style (De Keersmaecker et al. 2019). Developmental evidence also refutes the idea that cognitive resources protect people: Fluid intelligence declines by late adulthood (Hartshorne & Germine 2015), yet older adults are equally or more discerning than their young counterparts. Repeating obscure claims like "The smallest insect species is the adelgid" misleads young and older adults to a similar extent. However, older adults spontaneously stick with what they know. They reject "Deer meat is called veal," even when it feels fluent (Brashier et al. 2017). Older adults take longer to judge truth, raising the possibility that simply slowing down benefits them.

Carefully considering claims helps in some situations and backfires in others. In a classic levels-of-processing experiment, participants reported whether statements appeared on the left or right side of the screen (shallow processing), indicated where verbs were missing (deep processing), or related statements to a personal event or feeling (deepest processing, associated with self-reference). Later, they judged the truth of these and new items. Surprisingly, illusory truth increased with depth of encoding (Unkelbach & Rom 2017). Elaborative processing not only failed to reverse the illusion, it actually enhanced it. A more useful approach prompts people to behave like fact-checkers. In our studies, participants initially judged how interesting or truthful claims were. An accuracy focus (initial truth ratings) eliminated illusory truth later, but only when participants had relevant knowledge stored in memory. Without knowledge, people fell back on fluency regardless of how they processed statements at exposure (Brashier et al. 2019).

Much like stored knowledge, episodic memories (of specific past experiences) provide a basis for comparison when judging truth. For example, recalling that a claim came from a low-credibility person or publication (i.e., source memory) is informative. Correspondingly, statements that participants remember hearing from an untrustworthy voice seem less true than new ones (i.e., reverse illusory truth effect) (Begg et al. 1992). This pattern complements a referential theory of truth, where believability reflects activation of nodes in an information network. When the perceived credibility of a statement matches the credibility of its source, these coherent references increase perceived truth (Unkelbach & Rom 2017). Occasionally, though, people neglect source information. As examples, participants exhibit illusory truth while receiving deterministic advice (from a person labeled as 100% accurate) (Unkelbach & Greifeneder 2018) and for statements they actually identify as coming from an unreliable source (Henkel & Mattson 2011).

Of course, sources rarely appear with clear labels in daily life. People struggle to assess the quality of sources (Mitchell & Johnson 2009), relying on shortcuts like the presence of in-text citations (Putnam & Phelps 2017), the pronounceability of a stranger's name (Newman et al. 2014), and repetition (with fluent claims misattributed to reputable publications) (Fragale & Heath 2004). We also tend to trust others, even complete strangers (Dunning et al. 2019). Our willingness to trust poses a problem when social partners have goals other than accuracy—for example, participants are willing to share fake news that they identify as false (Pennycook et al. 2018). Furthermore, even if people notice that a source is questionable, they often forget these episodic details. Without recollective encoding, supported by activity in the hippocampus and ventrolateral prefrontal cortex, claims initially tagged as "false" can appear credible later (Mitchell et al. 2005). Once people fail to recollect whether a statement came from a trustworthy source, they draw inferences from fluency (Unkelbach & Stahl 2009).

Disregarding knowledge or forgetting source information poses new dangers in the digital age (Marsh & Rajaram 2019). Typing keywords into the Google search bar is fast and easy; relying on the Internet becomes so habitual that people search for answers to easy questions instead of simply retrieving them from memory (e.g., "What is the center of a hurricane called?") (Storm et al. 2017). But search algorithms return content based on keywords, not truth. If you search "flat Earth," for example, Google dutifully returns photoshopped pictures of a 150-ft wall of ice that keeps us from slipping off the planet. To make matters worse, users rarely read articles before sharing: 59% of shared links on Twitter are not clicked on first (Gabielkov et al. 2016). When readers do make it to the actual article, subtle misinformation in the title shapes their impressions (Ecker et al. 2014). Even mainstream news outlets sometimes use clickbait headlines (e.g., "Power causes brain damage," published by *The Atlantic*) (Useem 2017) that mislead readers.

SUMMARY

We argue that the data patterns across very different literatures point to constructive processes in judging truth. People rely on base rates, which improves accuracy in general but can also increase gullibility. They interpret subjective experiences like fluent processing and affect—feelings that correlate with truth but can also prove illusory—as evidence. And they draw inferences from consistency with information stored in memory. Stored knowledge and source memories can be completely diagnostic of truth, but people often neglect, misremember, or forget them. These inferences bear on the real world, where misinformation causes disease (e.g., measles outbreaks due to vaccine hesitation), harms the environment (e.g., poaching due to myths about rhino horns curing cancer), and encourages violence (e.g., against rumored child abductors described on Whatsapp). Next, we consider the implications of our three-part constructive approach to truth for correcting stubborn misconceptions.

CORRECTING MISCONCEPTIONS

Ideally, we would prevent misconceptions from taking hold in the first place, as they are notoriously difficult to correct (Cohen's *d*s = 0.75–1.06) (Chan et al. 2017). Even when people successfully correct myths (e.g., "Playing Mozart can improve a baby's intelligence") in the short term, they struggle to do so after time passes (Swire et al. 2017). The trouble is that people concurrently store corrections and the original misinformation, as indicated by activity in the left angular gyrus and bilateral precuneus (Gordon et al. 2019); the newer correction is forgotten at a faster rate than the older misconception (according to Jost's law) (Wixted 2004). In addition, debunking messages reach fewer people than the original misinformation. For example, Snopes debunked the claim that Nancy Pelosi agreed to a border wall in exchange for a gun ban, but the fake news story received nearly 20 times more engagements on Facebook than the correction. This problem is a familiar one for psychologists: Original studies continue to be cited, despite high-profile failures to replicate them.

Given that correction is so tricky, what suggestions can our framework offer? First, we can appeal to people's experiences with base rates. Adding visuals to corrections may make them more compelling, inducing truthiness. Second, messages should avoid reinforcing feelings associated with myths. Simply negating misinformation (or presenting it alongside the truth in a myth/fact format) makes it fluent (Lewandowsky et al. 2012). In addition, people do not fully process negatives (e.g., "not"). In a classic example, an experimenter poured sugar into two jars, one labeled “sucrose” and the other labeled “not sodium cyanide.” Participants preferred not to drink Kool-Aid made with sugar from the “not sodium cyanide” jar (Rozin et al. 1990). Thus, the Centers for Disease Control and Prevention’s well-meaning message that vaccines do not cause autism may reinforce a vaccine–autism link. However, the advice to replace rather than repeat makes corrections less salient (Ecker et al. 2017) and poses a challenge when the jury is still out (e.g., advanced paternal age is only one possible cause of autism).

In these situations, we can leverage people’s desire for consistency with their knowledge and beliefs. Exposure to opposing viewpoints (e.g., about gay rights) can polarize, rather than moderate, views (Bail et al. 2018). To get around this concern, Gehlbach and colleagues (2019) manipulated whether or not participants answered questions like “How credible is the medical data that germs are a primary cause of disease?” before judging the credibility of climate science data. Belief in medicine exceeds belief in climate science; most people agree that germs cause disease. Once they acknowledged the value of other scientific fields, conservatives were more likely to endorse climate science.

Another intriguing possibility is to use disfluency to cue analytic thinking (Alter et al. 2007). People experience knee-jerk reactions when information favors their opinions (Gilead et al. 2019), and lazy thinking sometimes prevents them from rejecting intuitive, but incorrect, responses. In contrast, partisans who perform well on the cognitive reflection test (i.e., analytic thinkers) more accurately discern fake from real headlines, even when they align with their politics (Pennycook & Rand 2019b). So how do we encourage analytic thinking? In one study, participants read an essay favoring capital punishment in an easy- or hard-to-read font, then judged whether the message seemed reliable, intelligent, and believable. After easy reading, participants’ personal beliefs determined their impressions. This preference for consistency disappeared after difficult reading (Hernandez & Preston 2013). Thus, presenting myths in a disfluent format may help people to set aside their opinions.

Finally, the mainstream advice to consider the source misses the mark (Marsh & Yang 2017). Trust indicators piloted by Google, Facebook, and Twitter tell readers about the quality of publications, but these well-intentioned projects overestimate people’s ability to keep track of sources. Efforts by fact-checkers (e.g., Politifact, FactCheck.org) to flag viral claims (e.g., with a Truth-o-Meter) may even backfire; tagging some fake news stories as false boosts the perceived accuracy of untagged ones (i.e., implied truth effect) (Pennycook & Rand 2019c). A better solution uses crowdsourced judgments about source trustworthiness, which prove accurate (Pennycook & Rand 2019a) and could serve as inputs to social media ranking algorithms that determine what people see. Of course, censoring or manipulating content may anger users (see public outcry to Kramer et al. 2014).

CONCLUSION

Gartner, Inc. (2017) estimates that people will consume more false than true information by 2022, a frightening possibility that is consistent with trends on social media; falsehoods already outrace the truth on Twitter (Vosoughi et al. 2018). But if fluency no longer naturally correlates with truth, what other cues will people turn to? Psychologists know a lot about fluency: It shapes perceived truth over long delays, among intelligent people, despite contradictory knowledge, for claims coming from unreliable sources, and in the face of diagnostic advice. But fluency is only one way to infer truth; people also draw inferences from other feelings, base rates, and consistency with what they know, remember, and believe.

This broader framework suggests the need for more complete models of truth. Current multinomial models pit two cognitive processes against each other. In one influential model, Unkelbach

& Stahl (2009) demonstrated that people rely on fluency when they forget source information. We also focus on two processes in our fluency-conditional model, positing that people search memory for relevant knowledge when they experience disfluency (Fazio et al. 2015). While valuable, these models offer little insight into situations in which many cues converge. Inside a car dealership, for example, a buyer might encounter familiar slogans like "Engineered to move the human spirit" (fluency) accompanied by photos (base rate), retrieve facts about fuel economy (knowledge), note that the salesman wants to make commission (source), and feel excitement (affect). How do they evaluate whether claims about a car are true and ultimately decide whether to buy it? If researchers consider multiple, simultaneous cues, superordinate heuristics might appear. As examples, the customer could weigh all five cues equally or tally reasons that a claim seems true versus false (Bobadilla-Suarez & Love 2018); alternatively, they might "take the best" (Newell & Shanks 2003), falling back on one good reason (e.g., their own emotions) and ignoring other cues (e.g., the salesman's motives). Minimizing information may be especially tempting under distraction or for older adults, who consider less information (Meyer et al. 1995) and prefer fewer options (Reed et al. 2008) when making decisions. Moving forward, the field needs to consider the intersecting cognitive, affective, and social processes that make falsehoods believable in a post-truth world.

SUMMARY POINTS

1. In everyday life, accurate claims outnumber inaccurate ones. People exhibit a bias to accept incoming information (i.e., to judge claims to be true) that reflects these base rates.
2. Subjective feelings convey useful information about the world. Thus, we infer truth from feelings like easy processing and our own affect.
3. Relevant facts and memories about the source of a claim can be completely diagnostic of the truth. As a result, people believe statements that match information retrieved from memory and reject inconsistencies.
4. Considering these three classes of inference—from base rates, feelings, and consistency—can improve approaches to correcting misconceptions.

FUTURE ISSUES

1. Shortcuts other than fluency (e.g., affect), as well as reliance on external memory aids like Google, are understudied.
2. Interactions between cues (e.g., affect and source) also deserve more empirical attention (see **Figure 1**).
3. Cues for truth and falseness may not be simple inverses, existing on a continuum. Strategies analogous to recalling-to-reject, for example, lend themselves to labeling claims as false but not as true.
4. Few data speak to how older adults judge truth, and even fewer address childhood. A life-span perspective is crucial, as older adults shared the most fake news in the 2016 election (Grinberg et al. 2019, Guess et al. 2019).

5. Most existing studies use behavioral measures, but cognitive neuroscience can probe processes unavailable to conscious awareness.
6. Current multinomial models of truth pit two processes (e.g., fluency and knowledge) against each other. Modeling three or more simultaneous cues could reveal higher-order heuristics (e.g., tallying, take-the-best).

DISCLOSURE STATEMENT

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