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BRIEF REPORT

Prior exposure increases judged truth even during periods of mind wandering

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Abstract

Much of our day is spent mind-wandering—periods of inattention characterized by a lack of awareness of external stimuli and information. Whether we are paying attention or not, information surrounds us constantly—some true and some false. The proliferation of false information in news and social media highlights the critical need to understand the psychological mechanisms underlying our beliefs about what is true. People often rely on heuristics to judge the truth of information. For example, repeated information is more likely to be judged as true than new information (i.e., the *illusory truth effect*). However, despite the prevalence of mind wandering in our daily lives, current research on the contributing factors to the illusory truth effect have largely ignored periods of inattention as experimentally informative. Here, we aim to address this gap in our knowledge, investigating whether mind wandering during initial exposure to information has an effect on later belief in the truth of that information. That is, does the illusory truth effect occur even when people report not paying attention to the information at hand. Across three studies we demonstrate that even during periods of mind wandering, the repetition of information increases truth judgments. Further, our results suggest that the severity of mind wandering moderated truth ratings, such that greater levels of mind wandering decreased truth judgements for previously presented information.

Keywords Mind wandering · Attention · Truth · Belief

Imagine you are listening to a news radio show but start thinking about an upcoming presentation rather than focusing on the anchor's voice—you are mind wandering. At what level is information from the radio show processed, if at all? Answering this question is important, given that as much as half of each day is spent in periods of inattention, without awareness of much of the outside world (Killingsworth & Gilbert, 2010; see also McVay et al., 2009; Seli et al., 2018). Here, we examine people's later perceptions of information encountered during mind wandering. This question takes on new urgency in today's world, where much of the information we come across is not to be trusted. Misinformation and disinformation have proliferated over the course of the past decade, and falsehoods propagate more widely than truths on social media (Vosoughi et al., 2018). The frequency of mind wandering in daily life entails that many of the falsehoods we encounter likely occur during periods of inattention. But most studies examining truth judgments take a lack of attention to a laboratory task to be unwanted noise. In contrast we investigate whether exposure to claims during periods of mind wandering can still influence later judgments of the veracity of those claims.

What psychological factors influence people's beliefs about the veracity of claims they encounter in the world?

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Converging lines of research indicate that people rely on heuristics when judging truth (Brashier & Marsh, 2020). For example, people often interpret easy processing, or fluency, as a cue for truth (Alter & Oppenheimer, 2009; Boehm, 1994; Unkelbach, 2007). As a result, statements that are easier to read (e.g., large, high-contrast text) are judged as more likely to be true than statements that are harder to read (e.g., blurred, low-contrast text; Parks & Toth, 2006; Reber & Schwarz, 1999), and rhyming statements are judged as more likely to be true than are nonrhyming ones (McGlone & Tofighbakhsh, 2000). Moreover, dozens of studies have now shown that people are more likely to believe that a previously presented statement is true compared with a novel statement (*illusory truth effect*; Brashier & Marsh, 2020; Dechêne et al., 2010; Hasher et al., 1977). More recently, boundaries of the illusory truth effect have been explored: Fazio et al. (2015) found increases in judged truth for claims most people believe to be false (e.g., *A sari is the short pleated skirt worn by Scotsmen*). Related research shows that the plausibility of the repeated statements does not reduce the size of the illusory truth effect (once floor and ceiling effects are taken into account; Fazio et al., 2019).

Experimental studies on heuristics for judging truth (including the illusory truth effect) normally have participants complete a task when they are initially exposed to statements. While these experimental tasks differ in how much they explicitly focus participants' attention on truth per se, as opposed to other information (Brashier et al., 2020), they typically require participants to make some kind of response indicating that a statement has been processed (e.g., an interest judgment; Dechêne et al., 2010). However, when we engage in tasks—in the laboratory and in the real world—attention often drifts to self-generated mental content; our minds often wander. We rarely remain singularly focused on a particular target or task for extended periods of time. In fact, one study utilizing ecological momentary assessment revealed that participants reported mind wandering nearly 50% of the times they were probed in their daily lives (Killingsworth & Gilbert, 2010; see also McVay et al., 200; Seli et al., 2018), and rates of mind wandering in laboratory settings are likewise strikingly high (Smallwood & Schooler, 2015).

Mind wandering is thought to influence performance on laboratory tasks through the *decoupling* of attention from the external environment (Schooler et al., 2011). That is, as attention turns inward, less attention is directed toward the external task, degrading stimulus processing and task performance (Baird et al., 2014; D'Mello & Mills, 2021; Schooler et al., 2011). For example, mind wandering during reading results in lower comprehension because attention is directed inward rather than toward the text—in effect, decoupling attention from the external environment (Smallwood, McSpadden, et al., 2008). This reduced sensitivity to external information in the environment during mind wandering is associated with concomitant reductions in physiological and neurological responses to that information (Franklin et al., 2013; Schooler et al., 2011; Smallwood, Beach, et al., 2008; Smallwood et al., 2011).

How might mind wandering influence the illusory truth effect? On the one hand, the illusory truth effect might be eliminated during periods of mind wandering if attention is indeed decoupled from the external environment. In this way, mind wandering would not render information easier to process, simply because the information would not be processed upon initial exposure (it would be as if the information were never repeated). Such a result would be consistent with the just-described findings that mind-wandering interferes with reading comprehension (D'Mello & Mills, 2021) as well as demonstrations that reducing mind wandering increases learning from a lecture (Szpunar et al., 2013a, b). On the other hand, an illusory truth effect might persist (at least to some extent) even when people are mind wandering. The decoupling of attention from the external environment may not be an all-or-none process. Although the processing of an external stimulus may be degraded during mind wandering, some low-level processing may persist (Smallwood, 2011). This low-level processing may be sufficient to create a fluency signal, thereby boosting subsequent truth judgments, even if comprehension suffers. Convergent support for this alternative hypothesis comes from classic work in social psychology showing that people's judgments, decisions, and behaviors are often influenced by factors outside of their immediate awareness (Bargh & Chartrand, 1999; Destrebecqz & Cleeremans, 2001; Mandler, 1975; Miller, 1962; Zajonc, 1980). Consider work from Wilson (1979); using a dichotic listening task, participants were tasked with tracking a human voice in the attended channel while tone sequences were played in the unattended channel. After completing the task, participants reported having heard nothing in the unattended channel, and correspondingly were unable to discriminate between old and new tones significantly above chance. In contrast, exposure to the tones exerted a liking effect: participants preferred tone sequences previously presented in the unattended channel during the dichotic listening task, as compared to new tone sequences (Wilson, 1979). Analogously, it is possible that even when the mind wanders away from an external stimulus, some shallow processing of that external stimulus could still influence truth judgments. In this way, prior exposure to information might still boost judged truth later on, even when people report that they were mind wandering during that exposure. Such an effect would offer new insights into the role of nonconscious processes in judging truth, with clear implications for education, marketing, and public health.

Across three complementary studies, our primary objective was to investigate whether prior exposure to information increases the judged truth of that information (an illusory truth effect), even when people report mind wandering during the initial exposure. In each of these studies, participants were presented with a stream of general knowledge statements, one at a time and in a random order. Every once in a while, the presentation of these statements stopped, and participants were asked to report whether they were focused on the task or on something else. This "thought-sampling" procedure is widely used in the mind-wandering literature (Seli et al., 2016; Smallwood & Schooler, 2015; Weinstein, 2018). In the second phase of each study, the truth rating phase, participants made truth judgments about previously-presented statements (i.e., repeated statements) and new statements.

As a secondary, exploratory objective, in Studies 1 and 2, we tested whether prior exposure to statements increases their judged truth differently for intentional (or deliberate) *versus* unintentional (or spontaneous) mind wandering. Mind-wandering researchers largely assumed that observed mind wandering was unintentional (Seli et al., 2016). However, people often report mind wandering intentionally, and intentional and unintentional mind wandering can be dissociable, yielding different effects on beliefs and behavior (for a review, see Seli et al., 2016). Intentional mind wandering may reflect a deeper kind of mind wandering than unintentional mind wandering. That is, if someone intentionally goes off task (relative to unintentionally), this might lead to more disruptions in processing. Indirectly supporting this contention, intentional mind wandering more severely disrupts task performance than unintentional mind wandering (Forrin et al., 2021; Phillips et al., 2016). So, during periods of intentional mind wandering, external information may exert no influence on participants' judgments. But during unintentional mind wandering, enough information might "get through" to boost subsequent truth judgments.

Study 1

In this first study, our primary objective was to test whether prior exposure to statements increases their judged truth even when participants report mind wandering during that prior exposure. As a secondary, exploratory objective, we tested whether prior exposure to statements increases their judged truth differently for intentional relative to unintentional mind-wandering trial types.

Method and materials

Participants Eighty-six American residents who had completed more than 1,000 HITs with an approval rating above 95% completed this study on Amazon's Mechanical Turk (AMT) for monetary compensation (M_{age} = 38 years, SD = 10, $range_{age}$: 23–71, 40 females, 46 males). Four participants failed more than 50% of the attention checks in the truth rating phase of the experiment (see below for details), so data were analyzed with the remaining 82 individuals. No participants were permitted to complete more than one of our studies. All studies were approved by the university Institutional Review Board.

Materials Stimuli consisted of 240 *true* declarative statements, which were previously validated and used in published research (Stanley et al., 2019; Wang et al., 2016). These statements were validated to ensure that people tend to be unfamiliar with them and unsure of their veracity. These statements include, for example, "The body of a rotten tree is called a daddock," "The study of snakes is termed ophiology," and "Japan is divided into 47 prefectures." Participants received no information in the instructions about the veracity of the statements.

Procedure In the initial exposure phase of the experiment, participants were presented with 160 of the 240 statements, one at a time and in a random order. For each participant, the 160 statements presented in this phase were randomly selected from the full set of 240. Participants were instructed that, after reading each statement, they were to press the "N" key to move on to the next statement. But participants were only able to move on to the next statement after 4 seconds had passed. Participants read the following:

> "Please do your best to pay attention for the full duration of the study. If, however, at some points throughout the task, you find that you are not paying attention to the task, please know that this is completely normal. Thus, when asked if you were paying attention, please answer honestly. No matter how you respond, you will still be paid in full and still be eligible for any future studies from our lab."

Participants were then introduced to the thought-sampling component of the initial exposure phase. Thought-sampling is a kind of experience sampling (Kahneman et al., 2004) widely used in the mind-wandering literature (Seli et al., 2016; Smallwood & Schooler, 2015). Participants were instructed that every once in a while the task would temporarily stop, and they would be asked to report whether they were focused on the task or focused on something else. For each thought-sampling probe—"Just prior to the onset of this screen, I was:"—participants were to respond by selecting one of three options: (1) Focused on the task; (2) Not focused on the task, but I WAS trying to focus on it; or (3) Not focused on the task, and I WASN'T trying to focus on it. Option (2) is indicative of unintentional mind wandering;

Option (3) is indicative of intentional mind wandering. These thought-sampling probes were presented approximately once per minute (±20 seconds to ensure that participants could not predict when exactly they would occur).

After completing the initial exposure phase of the experiment and a subsequent brief, unrelated distractor task, participants were presented with instructions for the truth rating phase of the experiment. In this phase, participants were presented with all 160 statements seen in the initial exposure phase along with 80 new statements, one at a time and in a random order. This phase of the experiment was self-paced. For each statement presented, participants were instructed to judge its veracity on a 6-pt scale, from 1 (*definitely false*) to 6 (*definitely true*). Participants were explicitly instructed not to use any outside resources (e.g., the internet, a friend) to help them with the task. Ten attention check trials were randomly embedded within this truth rating phase of the experiment. These attention check trials asked participants to select a particular number on the 6-pt scale. Participants who failed more than 50% of these attention check trials were removed from the analyses (see above). Upon completion, participants were monetarily compensated for their efforts.

Statistical analyses Data were fit to linear mixed-effects models (LMEMs) using R with the lme4 software package (Bates et al., 2015). Significance for fixed effects was assessed using Satterthwaite approximations to degrees of freedom with the lmerTest software package (Kuznetsova et al., 2017), and 95% confidence intervals around beta values were computed using parametric bootstrapping (*n* simulations = 1,000). On our view, 95% CIs around beta values offer the best indication of effect size for LMEMs with crossed random effects. Participant and statement were included as crossed random effects in all models (random intercepts only). See Baayen et al. (2008) for a discussion of the benefits of using this statistical approach, and see Boisgontier and Cheval (2016) for discussion of the movement toward mixed-effects modeling in the social and neural sciences.

Results

First, we tested whether exposure to the statements increased truth judgments even when participants were mind wandering. There were five different types of trials, including the baseline trials that were not presented at initial exposure (i.e., novel, unrepeated statements). Repeated statements were categorized into four different types. To start, there were three possible responses for each thought-sampling probe: (1) on task, (2) unintentional mind wandering, and (3) intentional mind wandering. The two statements immediately prior to each thought-sampling probe were categorized in accordance with participants' responses to the probe (Whitehead et al., 2021).[1] All other statements presented in the initial exposure phase were categorized as unprobed statements. Counts for each trial type are presented in Table 1, and descriptive statistics are presented in Table 2. Figure 1 depicts truth ratings for each trial type.

Table 1 Counts for each trial type in Studies 1 and 2

Trial type	Study 1	Study 2
On task	1,450	1,582
Unintentional MW	586	462
Intentional MW	96	88
Unprobed	10,988	10,988
New statements	6,560	6,560

Study 1 $N = 82$; Study 2 $N = 82$. MW = mind wandering.

Table 2 Means and pseudo 95% CIs for each trial type in Studies 1 and 2

Trial Type	Study 1		Study 2	
	M	95% CI	*M*	95% CI
On task	4.56	[4.35, 4.77]	4.11	[3.96, 4.26]
Unintentional MW	4.32	[4.09, 4.56]	4.00	[3.77, 4.24]
Intentional MW	4.05	[3.47, 4.63]	3.78	[3.27, 4.29]
Unprobed	4.46	[4.28, 4.65]	4.08	[3.93, 4.23]
New statements	3.69	[3.51, 3.87]	3.85	[3.70, 4.00]

Study 1 $N = 82$; Study 2 $N = 82$. MW = mind wandering

We first computed a LMEM with trial type (on task, unintentional mind wandering, intentional mind wandering, unprobed, new) as the fixed-effects term, and with judged truth as the outcome variable. Participant and statement were included as crossed random effects (random intercepts only) in the model. Relative to the new statements, participants were significantly more likely to believe that statements in each of the four trial types from the initial exposure phase were true (see Table 3). So, even when participants reported that they were mind wandering (intentionally or unintentionally), they still rated the statements immediately before the thought-sampling probe as higher on the truth scale.

To directly and statistically compare on-task trials to intentional and unintentional mind-wandering trials, respectively, we computed two additional LMEMs. In the first LMEM, we included on-task trials and intentional

[1] Note that, in all three studies, we obtained the same pattern of results when only selecting the one statement immediately prior to each thought-sampling probe and when selecting the three statements prior to each thought-sampling probe, as opposed to the two statements prior to each thought-sampling probe.

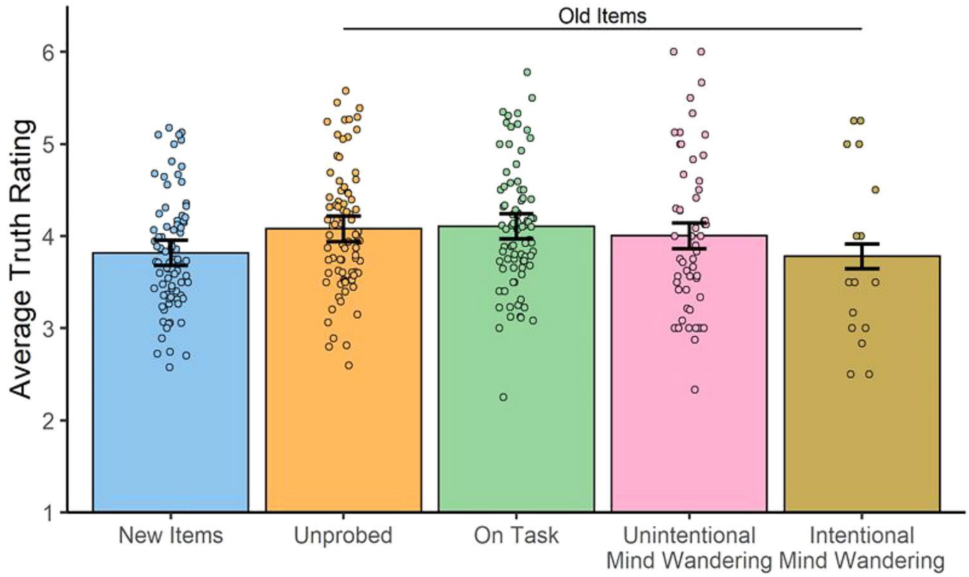

Fig. 1 Average truth ratings and pseudo 95% CIs around subject means for each trial type in Study 1

Table 3 Full results from the linear mixed-effects model in Study 1

Variable	*b*	*SE*	*t*	*p*	95% CI
Intercept	3.69	.08	44.64	<.001	[3.52, 3.86]
On-task	.86	.04	24.54	<.001	[.79, .93]
Unintentional MW	.69	.05	13.09	<.001	[.59, .79]
Intentional MW	.55	.13	4.42	<.001	[.31, .80]
Unprobed	.77	.02	41.23	<.001	[.74, .81]

The outcome variable is judged truth. All 95% CIs are for the beta estimates. The intercept corresponds to new statements. MW = mind wandering.

mind-wandering trials (fixed effect), and participant and statement were included as crossed random effects (random intercepts only). In the second LMEM, we included on-task trials and unintentional mind-wandering trials (fixed effect), and participant and statement were included as crossed random effects (random intercepts only). These LMEMs revealed that on-task trials during the initial exposure phased resulted in higher subsequent truth ratings than unintentional mind wandering trials ($b = .21$, $SE = .07$, $t = 3.24$, $p = .001$, 95% CI [.09, .34]) and intentional mind wandering trials ($b = .46$, $SE = .14$, $t = 3.28$, $p = .001$, 95% CI [.19, .71]) from the initial exposure phase.

We computed one final LMEM to test whether prior exposure to statements differently influences their judged truth for intentional relative to unintentional mind wandering. Specifically, we computed a LMEM with intentional mind-wandering trials and unintentional mind-wandering trials (fixed effect), and with judged truth as the outcome variable. Participant and statement were included as crossed random effects (random intercepts only). There was no significant difference in judged truth between intentional and unintentional mind-wandering trial types ($b = .21$, $SE = .16$, $t = 1.36$, $p = .17$, 95% CI [−.08, .54]).

Study 2

The statements chosen for Study 1 were true in reality, but extensive pretesting indicated that participants should not have known their truth status (and thus, the statements were functionally ambiguous). The data shown in Fig. 1 support this assumption, as new statements were near the midpoint of the truth scale. However, the truth inflation identified in Study 1 is not technically *illusory*—true statements seemed more likely to be true even when mind wandering. So, we replicated the results in Study 2 using a complementary set of statements that are *false* in reality. In addition, Study 2 was formally preregistered (https://osf.io/3eqvy).

Method and materials

Participants Ninety American residents who had completed more than 1,000 HITs with an approval rating above 95% completed this study on AMT for monetary compensation (M_{age} = 39 years, SD = 11, $range_{age}$: 22–69, 44 females, 46 males). Eight participants failed more than 50% of the attention checks in the truth rating phase of the experiment (see below for details), so data were analyzed with the remaining 82 individuals. This exclusion criterion was preregistered.

Fig. 2 Average truth ratings and pseudo 95% CIs around subject means for each trial type in Study 2

Materials Critical consisted of 228 *false* declarative statements and 12 *true* declarative statements that were validated and used in previous research (Wang et al., 2016). These false statements are variants of the true statements presented in Study 1. For example, "The body of a rotten tree is called a daddock" is a true statement used in Study 1, and "The body of a rotten tree is called a cambium" is the corresponding false version of the statement used in Study 2. The 12 true statements were included so that we could honestly tell participants, in the instructions preceding the initial exposure phase, that both true and false statements would be presented (these true items were never presented in the two trials before a thought probe, and they served as filler).

Procedure The procedure in Study 2 was the same as in Study 1.

Statistical analyses Study 2 used the same statistical software and methods as in Study 1.

Results

First, we tested whether exposure to the false statements increases their judged truth later on, even when participants are mind wandering. As in Study 1, new, unrepeated statements served as the baseline (intercept) for comparison. The other four kinds of statements were categorized from the initial exposure phase: (1) on task, (2) unintentional mind wandering, (3) intentional mind wandering, and (4) unprobed. The two statements immediately prior to each thought-sampling probe were categorized in accordance with participants' responses to the probe. New statements that were not presented in the initial exposure phase were the fifth and final trial type, representing a baseline for comparison against the four different kinds of trials from the initial exposure phase. Counts for each trial type are presented in Table 1, and descriptive statistics are provided in Table 2. Figure 2 depicts truth ratings for each trial type.

We computed a LMEM with trial type (on task, unintentional mind wandering, intentional mind wandering, unprobed, new) as the fixed-effects term, and with judged truth as the outcome variable. Participant and statement were included as crossed random effects (random intercepts only). Relative to the new statements, participants were significantly more likely to believe that all trial types from the initial exposure phase were true except for trials where they were intentionally mind wandering (see Table 4). So, even when participants reported unintentionally mind wandering, they still rated the statements immediately before the thought-sampling probe higher on the truth scale.

To directly and statistically compare on-task trials to intentional and unintentional mind-wandering trials,

Table 4 Full results from the linear mixed-effects model in Study 2

Variable	*b*	*SE*	*t*	*p*	95% CI
Intercept	3.85	.07	53.52	<.001	[3.70, 3.99]
On-task	.26	.03	7.74	<.001	[.19, .32]
Unintentional MW	.18	.06	3.07	<.001	[.07, .29]
Intentional MW	.07	.13	.50	.62	[−.18, .32]
Unprobed	.24	.02	12.73	<.001	[.20, .27]

The outcome variable is judged truth. All 95% CIs are for the beta estimates. The intercept corresponds to new statements. MW = mind wandering.

respectively, we computed two additional LMEMs. In the first LMEM, we included on-task trials and intentional mind-wandering trials (fixed effect), and participant and statement were included as crossed random effects (random intercepts only). In the second LMEM, we included on-task trials and unintentional mind-wandering trials (fixed effect), and participant and statement were included as crossed random effects (random intercepts only). These LMEMs revealed that on-task trials during the initial exposure phase did not significantly differ in subsequent truth ratings from unintentional mind wandering trials (b = .14, SE = .07, t = 1.88, p = .06, 95% CI [.00, .28]) or intentional mind wandering trials (b = .26, SE = .17, t = 1.58, p = .12, 95% CI [−.06, .62]) from the initial exposure phase. However, the effects were trending in the expected directions: On-task trials resulted in qualitatively higher subsequent truth ratings than unintentional or intentional mind wandering trials.

We computed one final LMEM to test whether prior exposure to statements differently influences their judged truth for intentional relative to unintentional mind wandering. Specifically, we computed a LMEM with intentional mind-wandering trials and unintentional mind-wandering trials (fixed effect), and with judged truth as the outcome variable. Participant and statement were included as crossed random effects (random intercepts only). There was no significant difference in judged truth between intentional and unintentional mind-wandering trial types (b = .25, SE = .19, t = 1.28, p = .20, 95% CI [−.12, .63]).

Computing power for future studies

The current sample size, though pre-registered, was selected based largely on practical constraints (money to pay participants, time to collect, etc.). When computing power for mixed models, there are, at present, no available statistical methods for simulating a crossed random effect design. With that being said, we recognize that future work may be interested in conducting a priori power analyses to determine an effective sample size. It is possible to conduct an a priori power analysis with a single random effect. Here we briefly describe and demonstrate a method that could be used to conduct an a priori analysis for future work. An a priori power analysis could simplify the random effects structure used in our models to a subject-only random effect. To guide power considerations for future studies we have modeled an example of an a priori power analysis using the R package *simr()*, simulating data using the reported beta effect sizes, subject variance, and residuals from the Experiment 2 mixed model (see supplement). All code to conduct this power analysis can be found online (https://osf.io/g8rqp/), as well as the simulation data.

Study 3

In Studies 1 and 2, subsequent truth ratings for statements in both on-task trials and unintentional mind-wandering trials were higher than truth ratings for new statements. That is, there was a consistent illusory truth effect for on-task trials and unintentional mind-wandering trials. However, the results were less consistent across Studies 1 and 2 for intentional mind-wandering trials. While subsequent truth ratings for statements in intentional mind-wandering trials were higher than truth ratings for new statements in Study 1, there was no significant difference in Study 2. These results might indirectly suggest that the *depth* of mind wandering is important in driving the illusory truth effect. Recent research suggests that intentional mind wandering may be more severe (or "deeper") than unintentional mind wandering (Anderson et al., 2021; Forrin et al., 2021; Phillips et al., 2016). So, the illusory truth effect might be more pronounced for more severe mind wandering relative to less severe mind wandering. To investigate this possibility more directly, Study 3 utilizes a measure of mind wandering on a scale from 0 (*not at all mind wandering*) to 100 (*fully mind wandering*). This new measure of mind wandering may offer more nuance and sensitivity in capturing degrees of mind wandering (Seli et al., 2014). In addition, Study 3 was formally preregistered (https://osf.io/gywux).

Method and materials

Participants Ninety-five American residents who had completed more than 1,000 HITs with an approval rating above 95% completed this study on AMT for monetary compensation (M_{age} = 39 years, SD = 11, $range_{age}$: 21–70, 46 females, 49 males).[2] Six participants failed more than 50% of the attention checks in the truth rating phase of the experiment (see below for details), so data were analyzed with the remaining 89 individuals. This exclusion criterion was preregistered.

Materials The same 228 *false* and 12 *true* declarative statements used in Study 2 were used in Study 3.

Procedure The procedure in Study 3 was the same as in Study 2, but with one critical difference: On the thought-sampling probes in the initial exposure phase, participants reported their mind wandering using a scale from 0 (*not at all minds wandering*) to 100 (*fully mind wandering*). See Brosowsky et al. (2021) for a similar mind-wandering measure.

[2] Note that we planned to recruit 90 participants based on the preregistration, but we ended up with 95 participants in the sample.

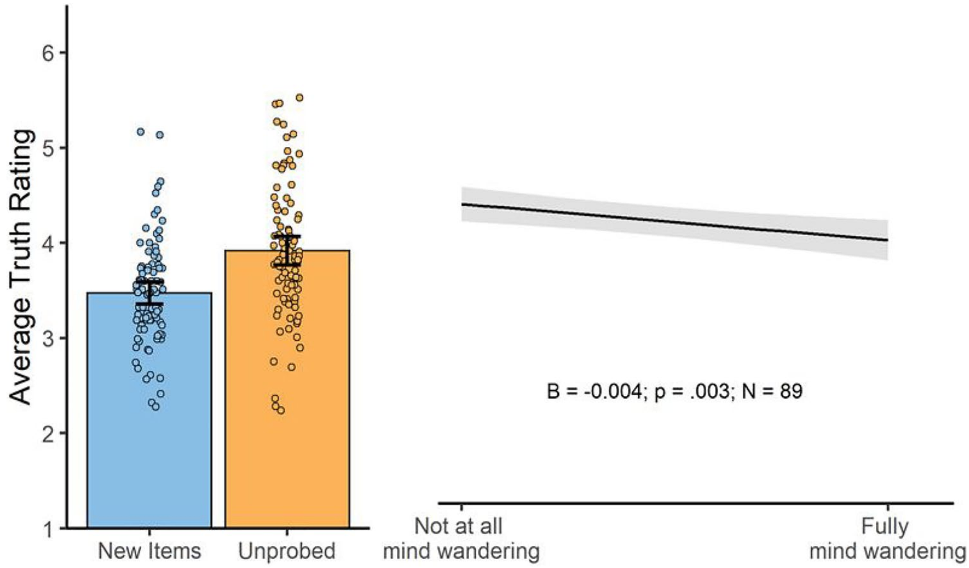

Fig. 3 Average truth ratings and pseudo 95% CIs around subject means for new statements and statements without mind-wandering information (left panel). Plotted fixed-effects from the linear mixed-effects model (right panel)

Statistical analyses Study 3 used the same statistical software and methods as in the previous two studies.

Results

We first tested whether repeated statements (presented in the initial exposure phase) were rated as more likely to be true than unrepeated (new) statements. To this end, we computed a LMEM with trial type (repeated vs. new statements) as the fixed effect, with judged truth as the outcome variable, and with statement were included as crossed random effects (random intercepts only). This analysis revealed that repeated statements ($M = 3.92$, pseudo 95% CI [3.77, 4.07]) were, in fact, judged as more likely to be true than new statements ($M = 3.47$, pseudo 95% CI [3.34, 3.60]; $b = .47$, $SE = .02$, $t = 25.01$, $p < .001$, 95% CI [, .63]). Figure 3 visually depicts the difference between repeated and new statements.

Next, we addressed our primary objective: that the reported severity of mind wandering would predict truth judgments, with increased severity in mind wandering being associated with less of an illusory truth effect. As in the previous studies, we included the two trials preceding each thought-sampling probe in the analyses reported herein. We computed a LMEM with judged severity of mind wandering as the fixed effect, with judged truth as the outcome variable, and with participant and statement were included as crossed random effects (random intercepts only). Supporting our hypothesis, less severe mind wandering during the initial exposure phase was associated with higher subsequent truth ratings ($b = -.004$, $SE = .001$, $t = 3.16$, $p = .002$, 95% CI [−.006, −.002]). See Fig. 3 for a visual depiction of these results.

General discussion

Across three studies, we examined whether repetition boosts the judged truth of claims even when participants report mind wandering during the initial exposure. We found consistent evidence in Studies 1 and 2 that repetition boosts truth judgments even during bouts of unintentional mind wandering. However, the results for intentional mind wandering were less consistent across studies: Repetition boosted truth judgments during bouts of intentional mind wandering in Study 1 but not in Study 2. Using another measure of mind wandering to better capture degrees of mind-wandering severity, Study 3 then showed that less severe mind wandering predicted higher subsequent truth ratings. So, at least during unintentional mind wandering (which may operate like a less severe form of mind wandering; Anderson et al., 2021), repetition boosts truth judgments.

Our findings offer a novel contribution to the growing literature on truth judgments (Brashier & Marsh, 2020), and they extend the boundaries of the illusory truth effect. Recent research has found that repetition increases judged truth for claims most people believe to be implausible (Fazio et al., 2019), for claims that most people know to be false (Fazio et al., 2015), and for claims qualified with terms like “implausible” and “impossible” (e.g., “It is impossible that Japan is divided in 47 prefectures”; Stanley et al., 2019). Some evidence even suggests that repetition boosts truth among groups that are strongly motivated to disbelieve the repeated information: Democrats show an illusory truth effect for Donald Trump's tweets at a similar magnitude as Republicans and Independents (Murray et al., 2020). Adding to this recent work, our studies indicate the illusory truth effect persist even during periods of mind wandering. This is particularly valuable given that some estimates indicate that we spent about 50% of our daily lives mind wandering (Killingsworth & Gilbert, 2010).

Our findings have several implications worth noting. To start, even when students unintentionally mind wander in the classroom, some information from a lecture may still "get through" and influence later judgments and beliefs, even if it is not processed enough to generate the information in response to a short answer question (Szpunar et al., 2013b). In other words, enough information may get through to provide a fluency signal upon subsequent exposure, which may, in turn, make them more confident that the information is true. Mind wandering also has many documented benefits (for a review, see Mooneyham & Schooler, 2013), such as facilitating creative thinking (Baird et al., 2012; but see Smeekens & Kane, 2016) and problem solving (Ruby et al., 2013). So, in some contexts, it may be possible to reap these benefits while still learning external material (on some level). Our findings may also have some implications for marketing and media consumption. For example, people tend to mind wander during commercials (or while scrolling through advertisements on social media), but the information from those commercials may still influence subsequent judgments and beliefs when they unintentionally mind wander (or less deeply).

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