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Fluency, Familiarity, Aging, and the Illusion of Truth

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ABSTRACT

Research has shown that repeated statements are rated as more credible than new statements. However, little research has examined whether such "illusions of truth" can be produced by contextual (nonmnemonic) influences, or compared to the magnitude of these illusions in younger and older adults. In two experiments, we examined how manipulations of perceptual and conceptual fluency influenced truth and familiarity ratings made by young and older adults. Stimuli were claims about companies or products varying in normative familiarity. Results showed only small effects of perceptual fluency on rated truth or familiarity. In contrast, manipulating conceptual fluency via semantic/textual context had much larger effects on rated truth and familiarity, with the effects modulated by normative company familiarity such that fluency biases were larger for lesser-known companies. In both experiments, young and older adults were equally susceptible to fluency-based biases.

One of the most important findings of modern cognitive psychology is that people's experiences, judgments, and actions can be influenced by factors of which they are unaware. Such effects are often fairly innocuous, such as completing a word stem with one word rather than another (for reviews, see Kelley & Lindsay, 1996; Toth, 2000). However, they can also have more serious consequences as demonstrated by research on false memory (e.g., Roediger & McDermott, 1995; Jacoby, 1999a) and the malleability of eyewitness reports (e.g., Loftus & Palmer, 1974; Cohen & Faulkner, 1989). Four critical theoretical issues surrounding unconscious influences are the specific conditions in which they occur, their limitations or boundary conditions, the cognitive mechanisms underlying these influences, and individual differences in susceptibility

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to unconscious influences. With regard to the latter issue, one important factor that has received little attention thus far is the role of age.

Prior research has shown that repeated statements are rated as more credible than new statements, a phenomenon dubbed the "illusion of truth." Research reviewed below suggests that one of the mechanisms underlying this illusion is that of perceived familiarity; that is, repeated items are judged more true than nonrepeated items because they seem familiar to people. One major goal of the present experiments was to examine the degree to which truth judgments can be biased by nonmnemonic, contextual factors that are present while the judgment is being made. A second goal was to examine possible age-related differences in susceptibility to contextually biased illusions of truth. More generally, our experiments can be viewed as investigating the fluency hypothesis of subjective experience and its relation to truth judgments. This hypothesis, elaborated below, is part of a larger theoretical framework based on the idea that subjective experiences, and the evaluations and judgments based on those experiences, are constructed from heuristic, attributional processes (Jacoby et al., 1989; Whittlesea, 1993). Although this hypothesis has been extensively examined in young adults, few studies have examined its application to older adults.

THE ILLUSION OF TRUTH

Hasher et al. (1977) were the first to investigate the idea that familiarity breeds truth, showing that repeated declarative statements garnered higher truth ratings than did newly presented statements. This finding has now been replicated in a number of laboratories using statements that range from arcane trivia (e.g., Bacon, 1979; Hasher et al., 1977) to opinion statements about political and social issues (Arkes et al., 1989) to relatively specific (albeit fictitious) claims about well-known commercial brands and products (Hawkins & Hoch, 1992; Law et al., 1998; Law, 1998; Law & Hawkins, 1997). The effect has been shown to occur over a period of minutes (Begg et al., 1992; Schwartz, 1982; Law et al., 1998; Law, 1998) as well as weeks (Hasher et al., 1977; Bacon, 1979; Arkes et al., 1991; Boehm, 1994; Brown & Nix, 1996) and has been shown to occur in relatively "real-world" contexts—as, for example, when statements are incidentally presented on posters in classrooms and public areas (Boehm, 1994).

What cognitive processes underlie the illusion of truth? One possibility is that, compared with new statements, repeated statements are judged truer because they evoke an elevated feeling of familiarity (Bacon, 1979; see also Hawkins & Hoch, 1992). Consistent with this possibility, Boehm (1994) used regression techniques to show that judgments of familiarity accounted for a larger percentage of the variance in truth ratings than did *actual* repetition (see also Arkes et al., 1991). This research thus suggests that the illusion of truth is contingent on *perceived* repetition, with the subjective experience

of familiarity being more important than the actual status of an item as previously presented or new (Bacon, 1979).

The relation between familiarity and truth ratings suggest a role for memory mechanisms in producing the illusion of truth. It is important to note, however, that while feelings of familiarity may lead to elevated truth ratings, more controlled forms of memory—such as conscious recollection or specific semantic knowledge—may lead to the opposite effect. For example, using the process-dissociation procedure (Jacoby, 1991), Begg et al. (1992) showed that while manipulations (e.g., divided attention) that undermined recollection were associated with an increased illusion of truth, conditions associated with optimal recollection were associated with a reduction in the illusion. These results led Begg et al. (1992) to argue that both recollection and familiarity contribute to truth ratings but in different ways; while familiarity operates to increase the illusion, conscious recollection of a statement's prior presentation allows participants to avoid the illusion. In a similar vein, Srull (1983) demonstrated that knowledge about a particular topic can attenuate the otherwise biasing effects of repetition on truth judgments (for related findings, see Mussweiler & Strack, 2000; Peracchio & Tybout, 1996; Wilson, Houston, Etling, & Brekke, 1996). Thus, as intuition might suggest knowledge about a topic may act as a protective factor against illusions of truth stemming from familiarity (cf. Arkes et al., 1989; Boehm, 1994).

In sum, prior research has shown that truth ratings increase as a function of prior exposure and that this effect may be mediated by the subjective experience of familiarity. In some ways, this account makes adaptive sense: Assuming that one encounters more true than false statements, a feeling of familiarity may often constitute reasonable grounds for deciding that a statement is true (cf. Gilbert, Tafarodi, & Malone, 1993). Importantly, however, two considerations suggest problems with using familiarity as a proxy for truth: First, not all of the statements that one encounters are true. Second, the feeling of familiarity can itself be an illusion.

ILLUSIONS OF FAMILIARITY

A large amount of research has shown that feelings of familiarity are not always valid indices of prior occurrence, but can arise from variations in cognitive processing driven by contextual factors that are unrelated to memory. In one of the first demonstrations of this sort, Whittlesea et al. (1990) presented participants with a series of words, followed by a probe word for which a recognition decision was required. All recognition probes were presented in a dynamic visual-noise mask that, unbeknownst to participants, varied in density thereby changing the ease with which the probes were perceived. This manipulation created an illusion of familiarity such that participants were more likely to judge a probe word was "old" (presented in the

previous list) when it was lightly masked as compared to more heavily masked, regardless of its actual old/new status.

The results of Whittlesea et al. (1990) were interpreted as evidence for a "fluency heuristic" operating in the context of recognition memory (Jacoby et al., 1989). The notion is that subjective experiences—including experiences of familiarity—arise from an attributional process that is triggered by unexpected changes in the fluency (speed or ease) with which an item is processed. Moreover, the interpretation of this change in fluency, and thus the resultant subjective experience, is strongly determined by the context in which a judgment is made. Thus, in the context of recognition memory, fluent processing may be (mis-) attributed to the past and experienced as familiarity. In the context of other judgments, other subjective experiences may arise, such as those related to pleasantness (Whittlesea, 1993) or problem difficulty (Kelley & Jacoby, 1996).

Relevant to the present article are findings that fluency-based illusions of familiarity can be produced by either perceptual or conceptual factors. For example, in an experiment similar to that described above, participants judged whether a probe word was *related to* any words in the prior list, with the fluency of those probes manipulated by placing them at the end of sentences that were either predictive or nonpredictive of the probes (Whittlesea, 1993, Experiment 2). Regardless of their actual relation to words presented earlier, probes presented in predictive contexts were judged as related to prior words more often than those presented in nonpredictive contexts. That is, similar to how variations in *perceptual fluency* produced illusions of physical repetition, variations in *conceptual fluency* produced illusions of conceptual (meaning-based) repetition.

Although illusions of familiarity can arise from either perceptual or conceptual fluency, Whittlesea (1993) showed that the fluency heuristic is more complex than a simple "if fluent, then familiar" rule. Specifically, he found that manipulations of perceptual fluency failed to produce reliable effects on conceptual relatedness judgments unless the experimental situation was arranged such that participants *interpreted* perceptual fluency as conceptual fluency (see Whittlesea, 1993, Experiment 4). On the basis of these findings, Whittlesea argued that the fluency heuristic is, paradoxically, both crude and sophisticated. It is crude in the sense that it does not distinguish between past and present sources of fluency, yet sophisticated in discriminating between conceptual and perceptual sources of fluency.

If the illusion of truth is mediated by feelings of familiarity (e.g., Bacon, 1979; Boehm, 1994), and feelings of familiarity can themselves be produced by processing fluency (e.g., Whittlesea, 1993), then it might be possible to produce illusions of truth without "going through" memory—but instead by directly varying the fluency of processing. Indeed, such a possibility was examined by Reber and Schwarz (1999) who manipulated the

perceptual (figure/ground) contrast of written statements presented for truth judgments. They found truth judgments to be higher for statements with greater contrast and concluded that the perceptual fluency afforded by contrast increased perceived truth. Assuming that truth judgments are conceptual (meaning-based) in nature, Reber and Schwarz's findings would appear to contradict Whittlesea's (1993) claim that the fluency heuristic is sensitive to the (perceptual or conceptual) source of fluency. Noteworthy, however, is that the difference in rated truth for fluent (high-contrast) and nonfluent (low-contrast) items in Reber and Schwarz's study was only about 1.7% (a difference that was nevertheless reliable given the 229 participants tested). Thus, Reber and Schwarz's findings suggest only a minor qualification to Whittlesea's claim that the fluency heuristic is sensitive to the source of variations in fluency.

AGING, SUBJECTIVE EXPERIENCE, AND TRUTH JUDGMENTS

Investigations of aging and subjective experience have been largely restricted to the effects of memory-based manipulations, and for good reason. Recollection declines with age, and because recollection can be used to counteract unconscious influences of memory (Begg et al., 1992; Jacoby, 1999a, 1999b), most investigations of subjective experience in older adults have focused on the effects of repetition. For instance, research examining the "false fame" effect has demonstrated that when controlled uses of memory are impaired, due to either divided attention or aging, participants are more likely to rely on familiarity and thus make more false fame errors (Dywan & Jacoby, 1990; Jacoby et al., 1989; Jennings & Jacoby, 1993).

Although relatively little research has examined age-related differences in subjective experience, an increased susceptibility to the illusion of truth as a function of age has been documented. For instance, using fictitious brand claims as stimuli, Law et al. (1998; Experiment 1) found that older adults exhibited a larger illusion of truth than did young adults. Importantly, older adults' greater susceptibility to the illusion was associated with poorer recognition (d') and source memory for the claims. Consistent with this, a second experiment showed that when age differences in memory were eliminated, so were age differences in susceptibility to the truth illusion.

Related research has shown older adults to be more susceptible to a sleeper-type effect when making credibility judgments. For example, Skurnik et al. (2000; see also Brown & Park, 2003) presented young and older adults with health-related statements labeled as true or false (e.g., "It is *not* true that shark cartilage alleviates arthritis"). These statements were presented once or three times, and then later re-presented for truth judgments without their labels. Repeated exposure to the "false" warnings helped older adults avoid the illusion of truth, but only when the delay between study and

test phases was short; with a longer, 3-day, delay they were more likely to believe a *false* statement that had been presented three times than they were a *true* statement that had been presented only once. In contrast, repeated warnings about false information helped young adults avoid the illusion at both short and long delays. Mutter et al. (1995) also found older adults to be less able than the young to use prior disconfirming evidence about trivia statements when making truth judgments.

In summary, most investigations of subjective experience and aging have focused on the influence of mnemonic factors. Investigations of the illusion of truth have shown older adults to be more susceptible to the illusion due to poor recollection or source memory. Thus, a decline in the ability to recollect episodic information coupled with relatively preserved familiarity (see Jacoby, 1999a, 1999b; Yonelias, 2002) appears to render older adults more susceptible to illusions of truth. However, it is unknown whether similar age differences will be found when the source of the bias is contextual, as opposed to being memory-based.

GOALS AND OVERVIEW OF THE PRESENT EXPERIMENTS

The present experiments had two main goals. One was to determine if illusions of truth could be produced by manipulations of perceptual and conceptual fluency. A second was to examine the magnitude of these illusions as a function of age. There were also a number of subsidiary goals. One was to determine whether our fluency manipulations could produce illusions of *pre-experimental* familiarity. With only one exception (Begg et al., 1996), work on the fluency heuristic has concentrated on how variations in fluency influence judgments of "episodic familiarity" (i.e., judgments about items presented in the experimental context). An interesting extension of this work would be to show that variations in fluency can induce people to claim that they have encountered a claim earlier in their lives. Having participants judge pre-experimental familiarity may also attenuate the illusion of truth when familiarity judgments precede truth judgments (see Begg & Armour, 1991). A final goal was to examine whether illusions of truth (and pre-experimental familiarity) would be moderated by the normative (i.e., baseline) familiarity of the target of judgment. As noted above, researchers have found that some judgmental biases are inversely related to knowledge about the target of judgment (e.g., Srull, 1983; but see Arkes et al., 1989; Boehm, 1994).

Toward these ends, we had young and older adults rate a series of fictitious claims about actual companies or products (e.g., *ChapStick contains seven percent wax*). In Experiment 1, the fluency of perceptually processing these claims was varied by manipulating the graphic style in which they were presented. In Experiment 2, the fluency of conceptual processing was varied by manipulating the semantic/textual context of the claims via a

paragraph that preceded each claim. Participants rated the truth of (different sets of) statements on two tests—one in which they rated truth only and a second in which they rated pre-experimental familiarity before rating truth. Finally, we also manipulated the normative familiarity of the companies and products referenced in the claims (e.g., Wrigley's gum vs. Alloc garage doors). In order to ensure that stimuli had similar levels of normative familiarity as well as baseline truth for young and older adults, we first normed the companies and products (see *Materials and Design* for Experiment 1).

We expected fluent items to receive higher truth and familiarity ratings than nonfluent items. Based on the assumption that truth judgments are conceptual (meaning-based), we also expected conceptual fluency to produce larger biases than perceptual fluency. Another expectation was for fluency effects to be larger for lesser-known, as compared to well-known, companies and products. Finally, fluency effects were expected to be attenuated when statement familiarity was rated immediately prior to truth. Most interesting for the present experiments were the effects of age. To our knowledge, no research has examined the effects of contextual fluency manipulations on judgments in older adults (but see Hess et al., 1998). But given prior research showing age-related increases in memory-based biases (e.g., Jennings & Jacoby, 1993; Law et al., 1998), we expected any observed age differences to favor the young, such that older adults would be more susceptible to illusions of truth.

EXPERIMENT 1: PERCEPTUAL FLUENCY

Method

Participants

Fifty-eight undergraduates enrolled in a psychology course at Georgia Tech participated for extra credit, and 50 older adults from Atlanta participated for $10 an hour. Of the 58 undergraduates, data from 10 were set aside either because they reported intentionally rating fluent items as true and nonfluent items as false, or because they correctly reported the purpose of the study. Of the 50 older adults, data from 2 were set aside for the same reasons. Excluded data are described in more detail in *Results*. Thus, the final groups consisted of 48 young adults (mean age = 19.8) and 48 old adults (mean age = 70.4).

Materials and Design

All participants completed two tests: On Test 1 they rated the truth of the claims while on Test 2, using a different set of claims, they rated the pre-experimental familiarity of each claim before rating its truth.

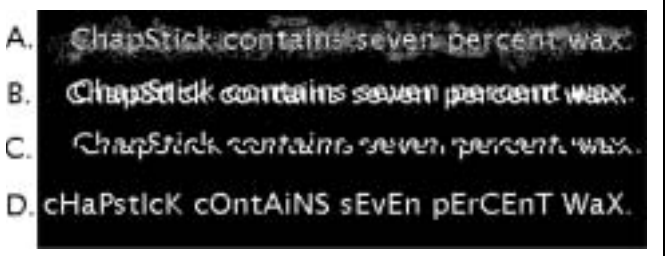
Prior to the experiments, normative ratings of truth (for the claims) and familiarity (for the companies or products alone) were gathered for three reasons: First, as noted earlier, familiarity and/or knowledge may attenuate

judgmental biases; thus, it was important to identify products and companies that were well known versus lesser known. A second reason to norm the stimuli was to identify a set of items that were most likely to be sensitive to the fluency manipulations; that is, we wanted to select a set of items that received ratings in the middle of each response scale. Finally, and most importantly, it was necessary to identify a set of items that young and older adults were equally familiar with, and for which their unbiased truth ratings were approximately equivalent.

Thus, an initial norming study was conducted in order to determine average truth ratings for the claims as well as ratings of normative familiarity for the companies or products referenced in each claim. A set of 340 fictitious claims were created, all of which were designed to be relatively neutral or positive with respect to the company's image (e.g., *ChapStick contains seven percent wax; Snyders of Hanover has been making pretzels since 1861*). Normative data were collected from 30 young adults and 30 older adults, each of whom completed two rating tasks—one for the truth of the claims, and another for the familiarity of the companies or products used in the claims. For the truth-rating task, participants rated the truth value of the claims on a four-point scale (Definitely False 1 2 3 4 Definitely True). Participants were told that they were unlikely to know the "objective truth" for many of the items and thus should base their ratings on first impressions. For the familiarity-rating task, participants rated their familiarity with each company or product using a four-point scale (Completely Unfamiliar 1 2 3 4 Extremely Familiar). Note that for this rating, the companies/products were presented in isolation, making this judgment different than that made in the actual experiments (where participants rated the familiarity of the claims per se). The two rating tasks were counterbalanced such that half the participants completed the familiarity task first, and half completed the truth test first.

Claims for the fluency experiments were selected based on their mean ratings in the norming study. Four lists of 40 claims were constructed such that the mean normative familiarity and truth ratings were approximately equal for all lists (mean company/product familiarity ratings ranged from 2.70 to 2.74 across lists with a mean of 2.72; mean truth ratings ranged from 2.67 to 2.68 across lists with a mean of 2.67). Within each list, half of the claims referred to lesser-known companies (mean familiarity rating of 1.64) and half referred to well-known companies (mean of 3.80). The lists were also constructed so as to obtain approximately equal truth and normative familiarity ratings between the age groups, and between the well-known and lesser-known halves of the lists. Overall, the mean familiarity ratings of the lesser-known halves of each list ranged from 1.62 to 1.67 for the young adults and from 1.61 to 1.64 for the older adults. For the well-known halves of the lists, the mean familiarity ratings for young adults ranged from 3.78 to

FIGURE 1. Graphic styles used for nonfluent presentations in Experiment 1.



3.81 and the mean familiarity ratings for older adults ranged from 3.80 to 3.81. Collapsing across age, the mean truth ratings were 2.62 and 2.73 for the lesser-known and the well-known halves of the lists, respectively. Collapsing across the well-known and lesser-known halves of the lists, the mean truth rating was 2.72 for the young adults and was 2.63 for the older adults.[1] These four lists were rotated through the experimental (fluency and test) conditions such that each list occurred equally often in each experimental condition.

Five different presentation styles were chosen as a means of manipulating perceptual fluency. Fluent statements appeared in a standard text (Lucida Sans font at 16 points), whereas nonfluent statements were degraded in one of four manners (see Figure 1). These four graphic styles will be referred to as (A) Spray Paint, (B) Double Vision, (C) Computer Glitch, and (D) Case. Graphic styles were systematically manipulated such that there were three young and three older participants in each combination of list and graphic style.[2] This allowed for an analysis of the different presentation styles in terms of their effects on truth ratings and reading times, the latter serving as a check on the fluency manipulation.

Finally, a Letter Comparison test, Pattern Comparison test (e.g., Salthouse, 1996) and the Shipley Vocabulary test (Shipley, 1986) were also administered. Each of the former two tests consist of two pages and require participants to compare two items (either strings of letters or two simple black and white line patterns) to determine if they are the same or different. The

[1] The goal of the norming study was to obtain materials that could be equated for truth ratings across different levels of familiarity, and equated for both truth and familiarity ratings across the age groups. Unfortunately, this was not completely feasible; although the lists were equated as much as possible, there remained a significant main effect of age group (young or old), F (1, 316) = 4.56, MSe = .121, $p < .04$, and normative familiarity (lesser-known or well-known), F (1, 316) = 7.85, MSe = .121, $p < .01$. Young adults gave higher ratings of truth than did older adults (2.72 vs. 2.63, respectively), and well-known items received higher truth ratings than did claims referencing lesser-known companies (2.72 vs. 2.62, respectively).

[2] This is true for all the young subjects. However, due to experimenter error, one older adult was run in the wrong graphic condition, resulting in four older adults in one combination of list and graphics conditions, and only two in another.

Shipley Vocabulary test consists of 40 items for which subjects choose one out of four words that is closest in meaning to a target word.

Procedure

All stimuli were presented on a computer screen in white 16-point font centered near the top of the screen against a black background. Presentation of the stimuli was controlled by the Beta 4 version of the EPrime program run on an IBM-compatible computer. Participants were tested individually and the experimenter was present at all times.

The order of tasks in this experiment was the same for all participants, and proceeded as follows: Test 1 (truth alone), Test 2 (pre-experimental familiarity + truth), structured interview, Letter Comparison, Pattern Comparison, and the Shipley Vocabulary test. Written instructions were presented on the computer screen before each computer task (i.e., Test 1 and Test 2), and key points were reiterated by the experimenter. Participants were instructed that the purpose of the experiment was to investigate the effects of different graphic styles on reading times, as well as to investigate knowledge and beliefs about different companies and products. Claims were presented one at a time and remained on the screen until a truth rating was entered. For both tests, participants read the statements aloud and pressed the spacebar as soon as they had finished reading a given claim. On Test 1, pressing the spacebar produced a four-point truth scale ("Definitely False 1 2 3 4 Definitely True") at the bottom of the screen. Entering a truth rating cleared the screen for 1 s before the next claim appeared. Participants were instructed to base their ratings on their first impression when they were not sure what the "correct" answer was. Six practice trials and an opportunity to ask questions preceded Test 1.

Test 2 (pre-experimental familiarity + truth) immediately followed Test 1. On this test, participants rated the pre-experimental familiarity of each claim before rating its truth. As all of the claims were novel (created by us), we asked participants to rate their familiarity with the *general idea* conveyed by each claim, rather than deciding if they had ever encountered the claim verbatim. As before, participants read each statement aloud and pressed the spacebar as soon as they finished reading the claim. This key press produced the familiarity scale ("Completely Unfamiliar 1 2 3 4 Extremely Familiar") which appeared at the bottom of the screen. Entering a familiarity rating erased the scale and produced a 1-s pause followed by the truth scale. A response on the truth scale cleared the screen for 1 s before the next claim appeared.

A structured interview was administered by the experimenter immediately following Test 2. The interview began with general questions and became increasingly more specific with respect to the participants' strategies. The questions were:

1. What do you think was the purpose of this test?

2. On the first test, did you use any particular strategies to rate the truth of the statements? If yes, what strategies did you use? Did these strategies change on the second test? If yes, how?
3. Did you notice any consistent differences in the items? If yes, what did you notice?
4. Did you ever intentionally rate an item as true or false because of its appearance?
5. Did you ever intentionally rate an item as familiar or unfamiliar because of its appearance?
6. Do you think that the appearance of the items influenced your judgments in any way? If yes, how?
7. Did you rate the items as true or false on the basis of how familiar you were with them?

Except for the first, all questions allowed for yes/no responses as well as explanations with ambiguous answers followed up by the experimenter. The primary purpose of the interview was to identify participants who were aware of the purpose of the study, or who intentionally made ratings based on the fluency manipulation (i.e., deliberately judging fluent items as true and nonfluent items as false or vice versa). Data from participants who met either of these criteria were excluded from the analyses.

The Letter Comparison and Pattern Comparison tests were administered after the interview. Participants were given 30 s to work on each page for each test. The Shipley Vocabulary test was administered last and participants were allowed to complete the test at their own pace. The entire procedure took approximately 1 hour.

Results

Alpha was set at .05 for all tests unless otherwise indicated. Measures of effect size are reported for significant differences among means: Cohen's d is reported for *t*-tests, and Cohen's f is reported for main effects and interactions (Cohen, 1988). For repeated measures ANOVAs, effect sizes were calculated as ω-squared using the equations presented by Dodd and Schultz (1973) and then transformed to Cohen's f.

Excluded Participants

Data from participants were excluded either because they correctly reported the purpose of the experiment or because they reported intentionally rating fluent items as true and the nonfluent items as false (or vice versa). Collapsing over age and test, participants who reported intentionally

rating the items based on their appearance gave fluent items a mean truth rating that was .18 greater than that for nonfluent items, a difference that is (numerically) larger than that observed for nonexcluded participants. For individuals who correctly reported the purpose of the experiment, the fluent/nonfluent difference in truth ratings was −.05, a difference that is on par with the results reported below.

Vocabulary and Speed Measures

Older adults scored higher on the Shipley Vocabulary test than younger adults (means of 36.25 and 31.21, respectively), t (94) = −7.08, SE = .71, $p < .001$, d = 1.43. Additionally, older adults correctly completed fewer items than young adults on both the Letter Comparison (9.31 and 14.23, respectively), t (94) = 9.34, SE = .53, $p < .001$, d = 1.89, and the Pattern Comparison tests (15.99 and 23.05, respectively), t (94) = 10.82, SE = .65, $p < .001$, d = 2.18.

Manipulation Check

We examined reading times as a check on our manipulation of fluency. Mean median reading times, presented in Table 1, were submitted to a mixed-design ANOVA with fluency as the within-subjects factor and age group as the between-subjects factor. This analysis revealed a significant main effect of fluency (F (1, 94) = 137.72, MSe = 244300.46, $p < .001$, f = .11) and age group (F (1, 94) = 31.47, MSe = 2730042.21, $p < .001$, f = .17); items were read faster when presented in the standard style as compared to the degraded styles, and young adults read more quickly than the old. Both main effects were qualified by a significant interaction (F (1, 94) = 11.78, MSe = 244300.46, $p < .002$, f = .03), indicating that the difference in reading times between fluent and nonfluent items was greater for older than younger participants.

An additional analysis was conducted to determine the effects of the different graphic styles on reading times and truth judgments. For this analysis, graphic style (Spray Paint, Double Vision, Computer Glitch, and Case) was entered as a within-subjects factor with age group as the between-subjects factor. Main effects of both graphic style (F (3, 282) = 19.38, MSe = 676773.04, $p < .001$, f = .18) and age group (F (1, 94) = 32.96, MSe =

TABLE 1. Mean Median Reading Times Obtained in Experiment 1

			Nonfluent			
	Fluent	Nonfluent	Spray Paint	Double Vision	Computer Glitch	Case
Young Adults	5811	6409	6540	6204	6792	6315
Older Adults	6909	7986	7717	7848	8878	8003

1978199.89, $p < .001$, f = .50) were qualified by a significant interaction (F (3, 282) = 4.92, $p < .003$, f = .09). Post-hoc contrasts revealed that although older adults read all graphic styles more slowly than did young adults, the increase in reading time for the Computer Glitch style was greater for older adults than for younger adults (F (1, 94) = 7.07, MSe = 651075.43, $p < .01$, f = .06). However, an analysis of the effects of the different graphics on truth ratings of the nonfluent items revealed no significant effects (all F's < 1); thus, in subsequent analyses, the four nonfluent graphic styles were treated as one.

Truth Ratings

Mean truth ratings are presented in the first four columns of Table 2. The effects of the fluency manipulation were exceedingly small and, at best, only appear to have influenced young adults' truth ratings on the first test for claims about lesser-known companies, and older adults' ratings on the second test for claims about well-known companies. Perhaps most noteworthy is that, although there are some small differences, ratings for the young and old adults were generally more similar than different.

Mean truth ratings were submitted to a mixed-design ANOVA with fluency (fluent vs. nonfluent), normative familiarity (well-known vs. lesser-known companies), and test (1 vs. 2) entered as within-subjects factors, and age group entered as a between-subjects factor. As expected, a main effect of test was found (F (1, 94) = 11.38, MSe = .16, $p < .002$, f = .14) with participants giving higher truth ratings on Test 1 than Test 2. However, this effect was qualified by a number of interactions. First, a reliable interaction was

TABLE 2. Mean Truth and Familiarity Ratings for Young and Older Adults in Experiment 1

	Truth Ratings					
	Test 1		Test 2		Familiarity Ratings	
	Fluent	Nonfluent	Fluent	Nonfluent	Fluent	Nonfluent
Young Adults						
Well-Known	2.70	2.71	2.66	2.65	2.11	2.06
Lesser-Known	2.81	2.76	2.64	2.67	1.58	1.58
All Claims	2.76	2.73	2.65	2.66	1.85	1.82
Older Adults						
Well-Known	2.76	2.81	2.79	2.70	1.97	1.97
Lesser-Known	2.75	2.72	2.57	2.59	1.59	1.59
All Claims	2.76	2.76	2.68	2.64	1.78	1.78
All Adults						
Well-Known	2.73	2.76	2.73	2.67	2.04	2.02
Lesser-Known	2.78	2.74	2.60	2.63	1.59	1.59
All Claims	2.76	2.75	2.66	2.65	1.81	1.80

found between normative familiarity and age group (F (1, 94) = 11.78, MSe = .09, $p < .002$, f = .11); young adults rated claims about well-known and lesser-known companies almost equivalently (2.68 and 2.72, respectively) while older adults rated claims about well-known companies as truer than claims about lesser-known companies (2.76 and 2.66, respectively). A reliable interaction also obtained between normative familiarity and test (F (1, 94) = 9.79, MSe = .05, $p < .003$, f = .07) such that participants rated claims about well-known and lesser-known companies almost equally on Test 1 (2.75 and 2.76), but rated claims about well-known companies (2.70) as truer than claims about lesser known companies on Test 2 (2.62). However, these effects were further qualified by a three-way interaction between fluency, normative familiarity, and test (F (1, 94) = 7.84, MSe = .03, $p < .007$, f = .05). Fluent claims on Test 1 were rated slightly higher than nonfluent claims only if they referenced lesser-known companies. In contrast, fluent claims received higher ratings on Test 2 only when they referred to well-known companies.[3]

Pre-Experimental Familiarity Ratings

An analysis of pre-experimental familiarity ratings, presented in the last two columns of Table 2, revealed no effect of the fluency manipulation. A main effect of normative familiarity was found (F (1, 94) = 112.38, MSe = .17, $p < .001$, f = .35) such that pre-experimental familiarity ratings were greater for claims about well-known companies than for claims about lesser-known companies. No other effects approached significance.

Relation Between Familiarity and Truth Ratings

Prior research has shown strong relations between feelings of familiarity and rated truth when fluency is manipulated by prior exposure (e.g., Bacon, 1979; Boehm, 1994). Does the same relation occur when processing fluency is varied via contextual factors? To address this issue, we computed gamma

[3] We examined this interaction further by analyzing each test separately. For Test 1, a reliable interaction between normative familiarity by age (F (1, 94) = 6.69, MSe = .06, $p < .02$, f = .09) indicated that young adults rated claims about lesser-known companies as truer than claims about well-known companies, whereas older adults showed the opposite pattern. A marginally reliable interaction also obtained between fluency and familiarity (F (1, 94) = 3.04, MSe = .04, $p = .08$) indicating a trend for fluent claims about lesser-known companies to be rated truer than nonfluent claims, while the opposite trend obtained for claims about well-known companies. Analysis of Test 2 revealed a reliable main effect of normative familiarity (F (1, 94) = 8.83, MSe = .07, $p < .005$, f = .12), which was qualified by an interaction with age group (F (1, 94) = 8.83, MSe = .07, $p < .004$, f = .12). Whereas young adults rated claims about well-known and lesser-known companies equivalently (2.65 and 2.65, respectively), older adults rated claims about well-known companies as truer than claims about lesser-known companies (2.74 and 2.58, respectively). Finally, a reliable interaction between fluency and normative familiarity obtained (F (1, 94) = 5.83, MSe = .03, $p < .02$, f = .06), but in a direction opposite to that expected; whereas fluent claims about well-known companies were rated truer than the corresponding nonfluent claims, claims about lesser-known companies showed a small trend in the opposite direction.

correlations between pre-experimental familiarity and truth ratings on Test 2 for each participant. The resulting average gamma (.51) was reliable (t (95) = 13.99, SE = .04, $p < .001$) confirming an association between pre-experimental familiarity and truth judgments even when fluency is manipulated via contextual factors. There was also a reliable difference in the gammas for young (.43) and older adults' (.59), t (94) = –2.31, SE = .07, $p < .03$, suggesting that older adults may be more likely to base their truth ratings on feelings of familiarity.

Discussion

The main finding from Experiment 1 was that variations in perceptual fluency produced little, if any, influence on truth judgments, and no influence on judgments of pre-experimental familiarity. With respect to truth judgments, the magnitude of the fluency effect was never greater than 2.3% (.09 on our four-point scale) a difference that is similar to the 1.7% effect reported by Reber and Schwarz (1999). Thus, while Experiment 1 could be viewed as replicating their results, the magnitude of these effects does not seem to warrant any revision to Whittlesea's (1993) claim that fluency-based biases on judgment require a match between the source of fluency (perceptual or conceptual) and the type of judgment being rendered. The importance of this match may also explain why our manipulation of perceptual fluency had no influence on judgments of pre-experimental familiarity. That is, because we asked participants to judge *conceptual* repetition, rather than exact repetition, variations in perceptual fluency may not have been treated as indicative of prior (pre-experimental) experience.

We did find relatively clear evidence that requiring an initial judgment of pre-experimental familiarity reduced overall truth ratings (Begg & Armour, 1991). Nevertheless, there was still a relatively strong correlation between pre-experimental familiarity and truth ratings, thus providing evidence that feelings of familiarity drive judgments of truth even in the absence of episodic memory manipulations (Bacon, 1979). Of course, more interesting would be to examine this relation in a situation in which fluency was producing a clear bias in truth ratings. Experiment 2, using a manipulation of conceptual fluency, was designed to achieve this goal.

EXPERIMENT 2: CONCEPTUAL FLUENCY

The purpose of Experiment 2 was to determine whether manipulations of conceptual fluency would bias truth judgments, and to determine whether such effects would differ for young and older adults. To manipulate conceptual fluency, we used a variant of Whittlesea's (1993) context paradigm (described in the Introduction), such that product claims were placed in paragraph contexts that provided either a continuity of meaning (fluent) or no such continuity (nonfluent). If the fluency heuristic requires that "the

fluency of performance feel as though it is due to a source that normatively would be appropriate for the decision to be made" (Whittlesea, 1993, p. 1244), then manipulating conceptual fluency should stand a better chance of producing illusions of truth.

Method

Participants

Fifty-five undergraduate students participated for extra credit in a psychology course, and 35 older adults from Atlanta participated for $20. Data from 24 young adults and 11 older adults were excluded for intentionally rating items in accordance with the paragraphs (fluent vs. nonfluent). Data from an additional eight young participants and one older participants were excluded because they correctly reported the purpose of the experiment. Thus, the experiment proper included data from 24 young (mean age 20.0) and 23 older adults (mean age 71.2). The exclusion of participants is discussed more fully below.

Materials and Design

The 160 target claims were identical to those used in Experiment 1. For each of these claims, we created a congruent and incongruent context paragraph, written to precede each claim and influence how fluently it would be processed. The congruent and incongruent paragraphs were all two to three sentences in length and, for each claim, were written to be highly similar with the exception of a few keywords. Examples of these context paragraphs, along with their corresponding company/product claims, are presented in Table 3. Note that, within each paragraph, the source of the to-be-judged target claim (e.g., a billboard, a person) was the same for each pair of congruent and incongruent paragraphs. Also, to avoid possible repetition priming effects, the context paragraphs did not include the specific company or product referenced in the target claim.

Claims were separated into four lists (see Experiment 1) and rotated through the fluency (congruent vs. incongruent paragraph) and test (1 vs. 2) conditions such that six young adults and six older adults were run in each combination of list and experimental condition. There was one exception to this pattern; in the older adult group, only five older adults were run in one of the counterbalance conditions. Claims were presented in a random order for each participant.

Procedure

All stimuli for Test 1 (truth alone) and Test 2 (familiarity + truth) were presented in white, 16-point font against a black background. Most participants were tested individually, although a small portion of the older adults

TABLE 3. Examples of Fluent and Nonfluent Context Paragraphs for Claims About Familiar and Unfamiliar Companies

Context Paragraphs and Product Claims	
Well-Known Companies	Claim
Vanessa looked at the pictures in the magazine and remarked to her husband that she was always amazed by the quality of the photography. She was even more impressed when he told her that:	National Geographic photographers are not allowed to enhance their pictures through computer technology.
Vanessa went through the things her mother had sent and remarked to her husband that she was amazed that none of the items had been damaged in the mail. She was even more impressed when he told her that:	
When Jerry accidentally swallowed his gum, his brother laughed and said that it would take seven years to digest. Jerry's parents assured him that he would be ok, but he wasn't so sure because a friend had told him that:	Wrigley's is conducting research to determine how dangerous it is to swallow gum.
When Jerry accidentally broke a mirror, his brother laughed and said that it meant seven years of bad luck. Jerry's parents assured him it was nothing to worry about, but he wasn't so sure because a friend had told him that:	

(continued)

TABLE 3. *Continued*

Lesser Known Companies	Claim
Tom had always wanted to collect firearms, but was worried about having a gun in the house with his six-year-old son. However, some of his concerns were relieved when he heard that:	Raven's twenty-five caliber pistols require forty pounds of pressure to pull the trigger.
Tom had always wanted to build a bar in his basement, but was worried about having alcohol in the house with his sixteen-year-old son. However, some of his concerns were relieved when he heard that:	
Fran thought her boss had lost his mind when he said that they were going to hang the new computer monitors on the walls of the cubicles. When she asked how they were going to do this without causing the cubicles to fall over, her boss was pleased to tell her that:	ViewSonic's UltraSlim computer monitor is less than three inches thick.
Fran thought her boss had lost his mind when he said that everyone would be allowed to set their own working hours and vacation time. When she asked how this plan was going to work without people taking advantage of his good will, her boss was pleased to tell her that:	

were tested in groups of two. The experimenter was present at all times for all participants.

Written instructions were presented on screen, key points were reiterated by the experimenter, and practice items preceded both Test 1 and Test 2. Each trial of Test 1 began with a context paragraph appearing at the top of the screen (without the brand claim that served as the conclusion to that paragraph). Participants were instructed to read the paragraph silently and then to press the spacebar to reveal the last sentence (the claim to be rated). Pressing the spacebar caused the context paragraph to be erased and the target claim to be presented at the same starting point as the paragraph. Participants were instructed to (re-)press the spacebar as soon as they had finished reading the target statement. This key press (recorded as the participant's reading time) produced the truth scale at the bottom of the screen (the same scale used in Experiment 1). Once a rating was entered, the screen was cleared for 800 ms and then the next paragraph was presented. The sequence was identical for Test 2 except that, after reading the target claim, the familiarity scale appeared at the bottom of the screen. After this rating was entered, the familiarity scale disappeared and was replaced (500 ms later) by the truth scale (with the claim remaining at the top of the screen).

Instructions for Test 1 and Test 2 were similar to those used in the previous experiment. They informed participants that the purpose of the study was to investigate the effects of different background contexts on reading times, as well as to investigate knowledge and beliefs about different products, brands, and companies. Participants were also informed that, although some of the target sentences would be related to their context paragraphs and others would not be, their task was to rate only the truth (and/or familiarity) of the target claim.

Immediately following Test 2, the strategy interview was conducted. Interview questions were the same as those used in Experiment 1 with the exception that they referred to paragraphs instead of different graphic styles. Additionally, for those participants who reported that the paragraphs influenced their ratings, we added the question "*Did you attempt to avoid that influence*?" After the interview, the Letter and Pattern Comparison tasks and the Shipley Vocabulary tests were administered. The entire procedure took between 90 and 120 minutes.

Results

Excluded Participants

As noted above, several participants were excluded from the present experiment on the basis of responses to interview questions that asked about the purpose of the study, and whether the participant had intentionally based their ratings on the fluency manipulation. We felt it important to exclude

participants who correctly reported the purpose of the experiment as such knowledge would likely alter their responses. More critically, we excluded participants who reported intentionally rating claims in accordance with the paragraphs as such responses would likely bias the data in favor of the hypothesis under investigation. Although these criteria are the same as those used in Experiment 1, a far larger number of participants were excluded in the present experiment, probably because the fluency manipulation was more obvious in the present experiment.

Data from the excluded participants are consistent with their responses to interview questions. Averaged across Tests 1 and 2, truth ratings favored fluent items for both the young (.58) and older adults (.38), who reported intentionally rating the claims as a function of fluency. These differences are larger than those for nonexcluded participants (i.e., those reporting that they did not rate the claims based on fluency). Young participants who correctly reported the purpose of the experiment showed a .l3 difference favoring fluent items. This difference is smaller than that found in the primary data set and suggests that some of these "informed" participants may have attempted to avoid the biasing effects of the fluency manipulation.

Speed and Vocabulary

As expected, older adults scored higher on the Shipley Vocabulary test than younger adults (t (45) = –2.57, SE = 1.05, $p < .02$, d = .74), but correctly completed fewer items on both the Letter Comparison (t (45) = 6.33, SE = .63, $p < .001$, d = 1.81) and the Pattern Comparison tests (t (45) = 9.62, SE = .76, $p < .001$, d = 2.75).

Manipulation Check

Reading times for the target claims as a function of the paragraph contexts are presented in Table 4. In an analysis of these data, one older adult was excluded due to a difficulty with pressing the spacebar after reading the target claim. The analysis showed only main effects of fluency (F (1, 44) = 16.23, MSe = 80970.77, $p < .001$) and age group (F (1, 44) = 50.59, MSe = 2010976.70, $p < .001$). Thus, old adults were slower than younger adults, and claims were read faster when presented in congruent, as compared to incongruent, contexts.

TABLE 4. Mean Median Reading Times From Experiment 2

	Fluent	Nonfluent
Young Adults n = 24	3338	3522
Older Adults n = 22	5517	5810

Truth Ratings

Mean truth ratings are presented in the first four columns of Table 5. The means suggest that the effect of fluency was indeed greater in this experiment than in Experiment 1. Moreover, the difference between ratings of fluent and nonfluent claims appears to be slightly greater in the young group (collapsing over baseline familiarity and test, the difference is .26) than for the older group (.17), and the manipulation of baseline familiarity seems to have influenced the older adults' ratings more than it did the young adults' ratings. However, the addition of the familiarity rating in Test 2 appears not to have had much systematic influence on responses.

These observations were tested in a mixed-design ANOVA, with fluency, normative familiarity, and test as within-subjects factors and age group as a between-subjects factor. Main effects of normative familiarity (F (1, 45) = 24.33, MSe = .07, $p < .001$, f = .16) and fluency (F (1, 45) = 11.72, MSe = .37, $p < .002$, f = .26) were obtained, with claims about well-known companies receiving higher ratings than claims about lesser-known companies, and fluent claims receiving higher ratings than nonfluent claims. However, these effects were qualified by significant interactions between normative familiarity and age group (F (1, 45) = 20.27, MSe = .07, $p < .001$, f = .14) and between normative familiarity and fluency (F (1, 45) = 4.50, MSe = .02, $p < .04$, f = .03). The familiarity by age interaction reflected the fact that, as in Experiment 1, young adults rated claims about well-known and lesser-known companies equivalently (2.74 vs. 2.73), whereas older adults rated claims about well-known companies as truer than claims about lesser-known companies (2.77 vs. 2.52). More theoretically important, the familiarity by fluency interaction reflects the fact that the difference between fluent and

TABLE 5. Mean Truth and Familiarity Ratings From Experiment 2

	Truth Ratings					
	Test 1		Test 2		Familiarity Ratings	
	Fluent	Nonfluent	Fluent	Nonfluent	Fluent	Nonfluent
Young Adults						
Well-Known	2.88	2.64	2.85	2.59	2.26	2.07
Lesser-Known	2.84	2.63	2.89	2.55	1.65	1.48
All Claims	2.86	2.63	2.87	2.57	1.96	1.78
Older Adults						
Well-Known	2.85	2.74	2.83	2.71	1.96	1.93
Lesser-Known	2.68	2.42	2.60	2.43	1.40	1.35
All Items	2.77	2.58	2.72	2.57	1.68	1.64
All Adults						
Well-Known	2.86	2.69	2.84	2.65	2.11	2.00
Lesser-Known	2.76	2.53	2.75	2.49	1.52	1.42
All Items	2.81	2.61	2.79	2.57	1.82	1.71

nonfluent claims was smaller for well-known (.18) as compared to lesser-known companies (.25). Although the three-way interaction among familiarity, fluency, and age was not reliable, it should be noted that the familiarity-by-fluency interaction appears to be largely driven by the older group. For young adults, the difference in ratings for fluent and nonfluent claims was fairly similar for well-known and lesser-known companies (.25 vs. .27). Older adults, in contrast, showed a trend toward being more influenced by the fluency manipulation when the claims were about lesser-known companies (.21) as compared to well-known companies (.12). No other effects were significant.

Familiarity Ratings

Mean familiarity ratings are presented in the last two columns of Table 5. Compared to the previous experiment, these means suggest that fluency did produce an illusion of pre-experimental familiarity. An ANOVA of these ratings revealed main effects of normative familiarity (F (1, 45) = 38.50, MSe = .42, $p < .001$, f = .48) and fluency (F (1, 45) = 9.00, MSe = .07, $p < .007$, f = .08). Claims about well-known companies were rated as more familiar than were claims about lesser-known companies, and fluent claims were rated as more familiar than nonfluent claims. Thus, in contrast to the perceptual manipulation used in Experiment 1, manipulating conceptual fluency produced an illusion of pre-experimental familiarity. No other effects were significant.

Relation Between Familiarity and Truth Ratings

Intra-individual gamma correlations were computed and averaged over participants. The overall mean correlation (.51) was significantly greater than zero (t (46) = 9.47, SE = .05, $p < .001$) and was highly similar in magnitude to that found in Experiment 1. Unlike Experiment 1, however, the difference in correlations for the young (.51) and older adults (.52) was not reliable ($t < 1$).

Discussion

The main finding of Experiment 2 was that company and product claims presented in the context of congruent paragraphs were given significantly higher truth ratings than were claims presented in incongruent paragraphs. Based on the fact that the congruent claims were read more quickly than were the incongruent claims, these findings are consistent with the idea that conceptual fluency can produce illusions of truth. Note also that the size of this illusion was much larger than that found in Experiment 1. Based on mean ratings, the magnitude of the fluency effect ranged from .11 to .34 (on our four-point scale), a difference that translates into a proportional effect of about 2.8% to 8.5%. Importantly, however, the effect of fluency was moderated by the normative familiarity of the companies, being smaller for claims about well-known companies as compared to claims about lesser-known companies.

In addition to influencing truth, the manipulation of conceptual fluency also produced an illusion of pre-experimental familiarity, thus replicating previous work (Begg et al., 1996), but using a contextual rather than a memory manipulation. Interestingly, the illusion of pre-experimental familiarity did not differ for well-known versus lesser-known companies, suggesting possibly important differences between truth and familiarity judgments.

One drawback to the current study concerns the high number of participants whose data were excluded from the primary analyses. Recall that a participant's data were excluded if they claimed either (a) knowledge of the study's purpose (8 young, 1 old) or (b) intentionally rating items based on their congruency with the context paragraph (24 young, 11 old). Such high exclusion rates raise the possibility that other, nonexcluded subjects might have had similar knowledge, or responded similarly on the tests, but were not detected by our post-test interview. Nevertheless, we believe a number of factors argue against demand characteristics as the driving force behind our effects. First, participants were asked directly and without prejudice whether they had rated target claims on the basis of the accompanying paragraph. Had they been doing so, it is unclear why they would not have stated so. Second, the test instructions emphasized that all ratings were to be based on the target claims alone; moreover, target claims were presented in isolation when the ratings were made (see *Methods*). Finally, twice as many young, as compared to older, participants were excluded for rating claims on the basis of paragraph congruency. Assuming that these excluded participants provide an index of how many nonexcluded participants made "paragraph-based" responses, one should have found much larger fluency effects for the young, as compared to older, adults. Yet, despite a slight numeric advantage, the young adults showed fluency effects that were statistically equivalent to those shown by the older adults. Overall, then, although we cannot definitively rule out demand characteristics, we believe the results are more consistent with the notion that elevated truth (and familiarity) ratings reflected increased processing fluency of the target claims.

GENERAL DISCUSSION

The experiments reported here were designed to investigate whether variations in processing fluency, operationalized in terms of reading speed, could produce illusions of truth in young and older adults. Of primary interest were possible age differences in susceptibility to this illusion, whether a conceptual manipulation would be more effective than a perceptual manipulation, and whether fluency-based biases would be moderated by the normative familiarity of the company or product referenced in the claims. Finally, the experiments were also designed to examine the relation between feelings of familiarity and the illusion of truth when a contextual manipulation was employed. We elaborate on these issues below.

Conceptual and Perceptual Fluency

Whittlesea (1993) presented evidence that variations in fluency will only bias judgments when such variations are interpreted as stemming from an appropriate source. In contrast, Reber and Schwarz (1999) found effects of a perceptual manipulation (figure/ground contrast) on rated truth, a decidedly conceptual judgment. One issue addressed in the present research was whether the attributional process underlying the fluency heuristic can distinguish between appropriate and inappropriate sources of fluency as Whittlesea's results suggest, or whether it cannot, as Reber and Schwarz's results suggest.

In general, our results support Whittlesea's position in that a conceptual manipulation of fluency (Experiment 2) produced much larger biases on truth judgments than did a perceptual manipulation (Experiment 1). Experiment 1 did provide some limited evidence that perceptual manipulations of fluency can influence a conceptual (truth) judgment. Nevertheless, the weak and inconsistent nature of that influence suggests that the degree of "leakage" from a perceptual source of fluency into a conceptual judgment is small at best; and, thus, that a mismatched source of fluency will rarely be as influential as that arising from a normatively appropriate source.

In our view, tthe sensitivity of the attributional process to the nature of fluency can be viewed as an adaptive constraint on human information processing (see Gigerenzer, 2001), in the sense that (heuristically rendered) judgments are attuned to normatively relevant sources of information. In judging truth, for example, the font of a written statement would not be expected to bear on its validity, whereas the continuity of meaning (i.e., the "logic" of the statement) would. Nevertheless, we acknowledge that the relation between sources of fluency and types of judgment can be ambiguous. Whittlesea (1993), for example, argued that conceptual judgments could be influenced by perceptual manipulations if the latter were *interpreted* as stemming from a conceptual source. Such results place a heavy burden on researchers to appropriately characterize (or constrain) participants' interpretations. Further, one can imagine ostensibly conceptual judgments being *appropriately* influenced by perceptual characteristics—for instance, deciding whether a person is telling the truth may be appropriately influenced by the fluidity and volume of speech (among other perceptual details). Thus, while there does appear to be an important relation between fluency-based biases and their (apparent) sources, we encourage additional research that can more formally specify that relation.

Aging and the Fluency Hypothesis

Several studies have shown that age-related declines in recollection can result in greater susceptibility to unconscious influences of memory. However, to our knowledge, ours is the first investigation of contextual

(fluency-based) influences on older adults' judgments. One of the questions driving this research was whether older adults' greater susceptibility to unconscious influences of memory would be mirrored when the influence stemmed from contextual, rather than mnemonic, factors.

Although past research has shown older adults to be more susceptible than young adults to memory-based fluency biases (e.g., Dywan & Jacoby, 1990; Jennings & Jacoby, 1993; Law et al., 1998), we found no evidence of age-related differences in susceptibility to contextually based fluency biases. We believe the discrepancy likely reflects the different strategies for avoiding judgmental biases stemming from mnemonic vs. contextual sources. In particular, while avoidance of memory-based biases depends, at least partially, on a person's ability to consciously recollect previously encountered biasing information, avoidance of contextual biases is more likely to depend on detection (and thus awareness) of the biasing influence (see Wilson & Brekke, 1994). Thus, memory-based judgmental biases may often be greater in older adults because of their inability to remember details of a prior (potentially biasing) event. When contextual factors are employed, in contrast, age differences will only emerge when the older (or younger) adults are at a disadvantage in detecting that influence.

Indeed, although the present experiments found no age differences in susceptibility to judgmental biases, this result appears to have been partially due to our exclusion of participants. That is, in Experiment 2, younger adults ($N = 17$) were much more likely than older adults ($N = 1$) to correctly report the purpose of the experiment, and thus appeared to exhibit greater awareness of the potential for bias. Of course, differences in reporting the purpose of the study (i.e., suspecting biasing factors) may not be due to age per se; it may be that university students or those taking psychology courses are more likely than nonstudents to detect bias attempts in an experimental setting. Nevertheless, such a cohort difference would still translate into differential susceptibility to bias manipulations. Thus, although young and older adults may be equally susceptible to contextual influences, the opportunity to avoid such influences may often differ for the two age groups (see also Gaeth & Heath, 1987; Hess et al., 1998).

Normative Familiarity and Fluency-Based Bias

The present experiments found contextually biased illusions of truth to be moderated by the normative familiarity of the companies referenced in the target claims, such that judgment biases were larger for claims about lesser-known, as compared to well-known, companies (see also Srull, 1983). Analogous effects have been found in studies examining the biasing effects of anchors on judgment (see Mussweiler & Strack, 2000; Wilson et al., 1996). Intuitively, these findings make sense: The more one knows about a topic (company or product), the less one's judgments about that topic should

be susceptible to bias. Theoretically, these findings are consistent with the idea that knowledge about a topic acts to constrain the perceived plausibility of putative facts about that topic (Mussweiler & Strack, 2000).

We hasten to add, however, that neither we, nor Srull (1983), measured knowledge in the sense of specific semantic facts but, rather, measured only normative familiarity as a proxy for knowledge. And while high levels of knowledge are likely associated with high levels of familiarity, the reverse may not always be true. Moreover, knowledge and familiarity are likely not the only two factors affecting truth judgments. In particular, truth judgments are also influenced by source memory (see Arkes et al., 1989; 1991) and by recollection of details surrounding a claim—including whether it was initially affirmed or denied (see Begg & Armour, 1991; Brown & Nix, 1996) or was initially imparted by a reliable or unreliable source (see Begg et al., 1992). Better understanding of these three factors (knowledge, familiarity, and episodic recollection) and how they interact may help resolve the discrepancy between the present results and other studies that have found a positive relation between "knowledge" and susceptibility to illusions of truth (e.g., Arkes et al, 1989). They may also help explain why unconscious influences of repetition are sometimes found to produce equivalent biases in experts and nonexperts (e.g., Brooks, Norman, & Allen, 1991; Ste.-Marie & Lee, 1991).

The Role of Familiarity in Mediating Illusions of Truth

Prior studies employing memory manipulations have shown strong relations between feelings of familiarity and the illusion of truth (see Arkes et al., 1991; Bacon, 1979; Boehm, 1994). The present experiments allowed us to examine this association when performance was influenced by contextual, rather than mnemonic, factors. In fact, we found strong correlations between judgments of pre-experimental familiarity and judgments of truth, with average gammas of .51 in both experiments. Although the design of our experiments does not allow us to address the causal relation between familiarity and truth, the strong and highly similar correlations across the two experiments seem noteworthy, especially given that only Experiment 2 found clear effects of fluency on truth judgments. These findings suggest that, similar to studies using memory manipulations, the influence of contextual fluency on rated truth may be mediated through a feeling of familiarity.

On the other hand, fluency manipulations have been shown to bias a number of judgments other than truth. For example, prior exposure has been shown to increase the perceived duration of briefly presented words (Witherspoon & Allen, 1985), to decrease the perceived loudness of background noise (Jacoby et al., 1988), to decrease the rated difficulty of word problems (Kelley & Jacoby, 1996), to increase the apparent fame of novel names (e.g., Jacoby et al., 1989), to increase the apparent frequency of words in the English language (Toth & Daniels, 2002), and to increase feelings of relatedness or pleasantness

(Whittlesea, 1993). While feelings of familiarity may underlie some of these judgments (such as fame or word frequency), it seems unlikely that people use this feeling as the basis for otherjudgments (such as those of loudness or duration). Future research should examine the relation between feelings of familiarity and judgment biases in these various domains.

In summary, the experiments reported here illustrated differential effects of perceptual and conceptual fluency on truth judgments as well as on judgments of pre-experimental familiarity. Our results appear to confirm Whittlesea's (1993) suggestion that, in order to have any appreciable effects on judgments, fluent processing must originate from a source that is interpreted as appropriate for the type of judgment being made. This appears to be equally true for young and older adults as the operation of the fluency heuristic was similar in two age groups; that is, older adults were no more, and no less, susceptible to the fluency manipulations than were younger adults. Despite finding no age differences in susceptibility to bias, we did find some evidence that the two age groups differed in their ability to detect the presence of those influences. Thus, even if young and older adults are equally biased by contextual factors, potential age-related differences in the detection of these biases, and the ability to avoid them, may have important practical implications for older adults.

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