Article

Social Psychological and Personality Science
1-9

DOI: 10.1177/1948550618762300
journals.sagepub.com/home/spp
SAGE

That's My Truth: Evidence for Involuntary Opinion Confirmation

Michael Gilead[1], Moran Sela[2], and Anat Maril[2,3]

Abstract

Past research has investigated deliberate mental acts that allow people to remain entrenched in their convictions. The purpose of the current investigation was to examine whether opinion-confirmation processes can occur involuntarily. We conducted experiments wherein participants made speeded judgments of the grammatical accuracy of statements pertaining to various matters of opinion, and subsequently rated their agreement with those statements. The results show that participants more readily verify the grammaticality of a statement when it corresponds to their opinion. These findings may help explain why opinions are sometimes change resistant, in showing that acceptance (rejection) of confirmatory (contradictory) opinions can occur involuntarily. We discuss possible applications of the paradigm described herein.

Keywords

social cognition, motivated cognition, language, attitudes, automatic processes

The Oxford dictionary has declared the term "post-truth" to be the "word of the year" for 2016, given the rapid ascent in its use (https://en.oxforddictionaries.com/word-of-the-year/word-of-the-year-2016). The term "alternative facts" is likely a strong contender for the title in 2017. The emergence of these terms reflects a situation wherein objective truths may have lost their privileged epistemic status, a blurring of the lines between facts and subjective opinions. Surely, the recent American elections have exemplified how people may value their currently held opinions over objective facts; and yet humans' (sometimes frustrating) tendency to be overly opinionated is old news and can be readily observed across all aspects of social discourse—be it in the context of political attitudes, social values, aesthetic valuation, and so forth. Thus, the question arises—what mental processes breed such stubbornness?

The Merriam-Webster dictionary defines *opinionatedness* (or *willfulness*) as "a steadfast adherence to an opinion, purpose, or course of action in spite of reason, arguments, or persuasion." As evident by its very name, willfulness is construed to be an act of will, an intentional attempt to sustain one's convictions. Indeed, much research has investigated the deliberate mental acts that subserve willful opinion confirmation (see Hart et al., 2009; Nickerson, 1998). For example, people were shown to uphold their opinions by conjuring up opinion-confirmatory interpretations of given information (e.g., Ditto, Munro, Apanovitch, Scepansky, & Lockhart, 2003; Vallone, Ross, & Lepper, 1985) as well as by actively seeking out opinion-confirmatory information (Hart et al., 2009; Smith, Fabrigar, Powell, & Estrada, 2007).

Whereas traditional approaches in psychology highlighted the importance of deliberate reasoning processes in goal-directed behavior (e.g., Ajzen, 1991; Bandura, 1991), recent theories highlight involuntary processes that subserve humans' goal directedness (e.g., Ajzen & Fishbein, 2000; Wyer, 2014). In light of this growing literature, the purpose of the current investigation was to examine whether opinion confirmation necessarily relies on deliberate, controlled reasoning processes, or whether it also occurs involuntarily.

The possibility that opinion confirmation processes can occur involuntarily seems plausible in light of recent research into semantic validation processes (e.g., Isberner, & Richter, 2014; Richter, Schroeder, & Wohrmann, 2009). Richter, Schroeder, and Wohrmann (2009; Experiment 3) presented participants with statements that were either factually correct (perfumes contain scents) or factually incorrect (soft soap is edible), asking them to indicate whether a statement is spelled correctly or not. They found that participants took longer to verify that a statement is spelled correctly when it was factually incorrect. A similar pattern of results was reported by Isberner and Richter (2013) who manipulated event

[1] Department of Psychology, Ben-Gurion University of the Negev, Be'er Sheva, Israel
[2] Department of Psychology, The Hebrew University of Jerusalem, Jerusalem, Israel
[3] Department of Cognitive Science, The Hebrew University of Jerusalem, Jerusalem, Israel

Corresponding Author:
Anat Maril, Department of Psychology and Department of Cognitive Science, The Hebrew University of Jerusalem, Jerusalem, Israel, 9190501.
Email: anat.maril@mail.huji.ac.il

(im)plausibility. These findings were taken to suggest that participants verify the epistemic status of a factual statement in a nonvoluntary manner.

Importantly, whereas *factual* propositions can be either true or false, *opinions* (e.g., "perfumes are only appropriate for women") are defined (e.g., in the legal system of many countries) by their *inverifiability*. Although young children initially fail to distinguish between subjective opinions and objective facts (e.g., they may not understand that someone else might not like ice cream), they gradually come to understand the fact–opinion distinction (e.g., Kuhn, Cheney, & Weinstock, 2000); by adulthood, people can reliably agree on what constitutes a fact or an opinion (Hermann & Rubenfeld, 1985). Thus, because opinions are understood not to be inherently true or false, it is possible that they do not evoke involuntary "fact checking" as occurs for factual, verifiable knowledge (Richter et al., 2009).

One qualification is that despite adults' general understanding of the nature of subjectivity, meaningful individual variation exists in individuals' lay epistemics (e.g., Rokeach, 1954; Webster & Kruglanski, 1994). For example, research has shown that individuals differ in the degree to which they desire to have firm answers to questions, and in the degree to which they have an aversion of ambiguity (i.e., need for cognitive closure [NFC]; Kruglanski & Webster, 1996), and that individuals with high NFC do not expose themselves to information that is incongruent with their previously held beliefs (e.g., Dijksterhuis, van Knippenberg, Kruglanski, & Schaper, 1996). Thus, it is possible that there are important individual differences in the processing of opinion-congruent and -incongruent information.

In light of these considerations, we investigated the processing of statements that are incongruent or congruent with people's opinions. We conducted experiments wherein participants performed speeded judgments of the grammatical accuracy of statements pertaining to various matters of opinion, and subsequently rated their agreement with those statements. We asked whether participants take longer to respond that a statement is grammatically accurate when they disagree with its content. In Experiments 1 and 2, we demonstrated the effect of opinion congruency on response time; in Experiments 3 and 4, we examined the role of NFC in the opinion-congruency effect and addressed potential alternative interpretations of the findings.

Experiment 1

Method

Participants

Our target sample size was 29 participants, providing >95% detection power, based on a pilot study that included a sample of 16 participants and yielded an effect size of Cohen's $d = 0.697$. The final sample included 28 students from the Hebrew University of Jerusalem (18 females, Mage $= 24.68$, $SD = 2.72$, range = 20–33). In all experiments, participants were native Hebrew speakers and received monetary compensation or course credit.

Materials

We created a list of 88 opinion statements, each made up of a subject part that included three to six Hebrew words (e.g., "The Internet has made people more"), complemented with one of two possible single-word predicates (e.g., "isolated," "sociable"). The statements pertained to political topics, personal tastes, and social issues (see Online Supplemental Material). For each statement, we created a corresponding grammatically incorrect statement by altering the gender[1] or number inflection of the predicate to an erroneous form.

Procedure

All experiments were conducted using Presentation (Neurobehavioral Systems, CA) software. Participants performed speeded judgments of the grammatical accuracy of the sentences. The first part of each sentence appeared on screen for 2 seconds and was then replaced by the predicate which remained on screen for two additional seconds (i.e., the sentence remained on screen after participants' response). We presented 44 grammatical and 44 nongrammatical statements, counterbalanced and displayed in random order. Following the grammatical judgment task, we unexpectedly presented the statements again (all in their grammatically correct form), and participants rated their agreement with these statements on a 4-point scale.

Measures

Our dependent variables were response latencies for grammatical and nongrammatical sentences as a factor of participants' personal agreement with the statements. In all experiments, we omitted trials wherein participants made a mistake in their response. Because of a low number of observations in some cells, in Experiments 1, 2, and 4, we collapsed together the responses in the two agreement (*strongly agree* and *agree*) and disagreement bins (*strongly disagree* and *disagree*).

Results and Discussion

Participants were highly accurate at performing the grammatical judgment task ($M = 97.0\%$) averaging less than one error per condition (range 0–4). The degree to which participants agreed with each statement varied, with the majority of items being relatively evenly distributed (81.25% of the items did not deviate by more than 30% from a perfectly even agreement distribution; there were 6.25% of the items for which there was perfect consensus). Based on previous research (Richter et al., 2009), our main dependent measure of interest was participants' response latencies for grammatically correct sentences. Response latencies were log transformed.[2] Mean

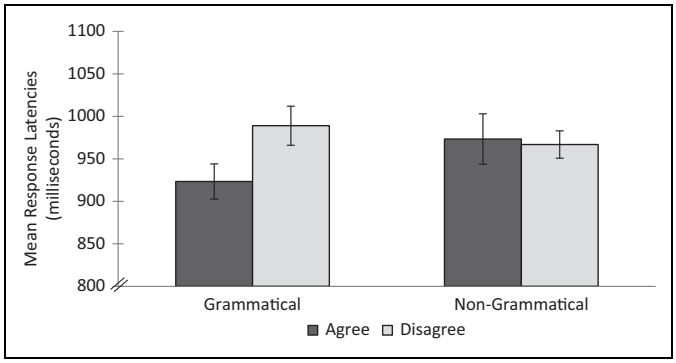

Figure 1. Mean response latencies (milliseconds) for grammatical and nongrammatical sentences in the two agreement conditions in Experiment 1. Error bars represent 95% within-subject confidence intervals (see Cousineau, 2005).

Table 1. Mean Response Latencies (Milliseconds) and Number of Responses for Grammatical and Nongrammatical Sentences in the Two Agreement Conditions in Experiment 1.

	Grammatical		Nongrammatical	
Measure	Agree	Disagree	Agree	Disagree
RT	923.38 (185.47)	989.00 (218.86)	973.35 (198.77)	966.86 (173.02)
Number of responses	605	601	584	595

Note. Standard deviations appear in parentheses. RT = reaction time.

(nontransformed) latencies in the different conditions appear in Figure 1 and Table 1.

We conducted significance tests using both a linear mixed model (LMM) analysis with random effects for participants and items, and a 2 (sentence type) × 2 (agreement) repeated measures analysis of variance (ANOVA). The results of the two analyses did not markedly differ. Due to space limitation and in order to provide standard estimates of effect size, we report the results of the ANOVA herein and refer the reader to the Online Supplemental Material for the LMM analysis. The analysis did not reveal a main effect of sentence type, $F(1, 27) = 1.61$, $p = .215$. There was a main effect of agreement, $F(1, 27) = 8.45$, $p = .007$, partial $\eta^2 = .238$; and importantly, a Sentence Type × Agreement interaction, $F(1, 27) = 9.240$, $p = .005$, partial $\eta^2 = .255$. For grammatical statements, participants were faster to respond when they agreed with a statement, compared to when they disagreed with it, mean difference = −.028, $SE = .006$, $p < .001$, Cohen's $d = 0.594$, 95% confidence interval (CI) [−.041, −.015]. For nongrammatical statements, there was no difference in response latencies, $p = .878$.

Thus, the results show that participants were slower to confirm that an opinion statement is grammatically correct when they disagreed with it compared to when they agreed with it. Importantly, participants' agreement with the statements should not have affected the performance of the task, as it was irrelevant to the designation of the sentences as grammatically accurate. Nonetheless, agreement with the sentence influenced participants' ability to perform the task. Thus, the current results demonstrate that agreement with a stated opinion can have a rapid and involuntary effect on its cognitive processing.

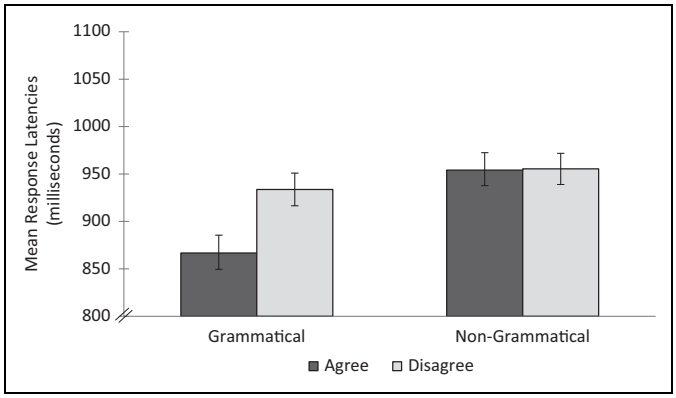

Figure 2. Mean response latencies (milliseconds) for grammatical and nongrammatical sentences in the two agreement conditions in Experiment 2. Error bars represent 95% within-subject confidence intervals (see Cousineau, 2005).

There were no differences in participants' response latencies to nongrammatical statements. This likely stems from the fact that the nongrammatical statements are somewhat nonsensical (e.g., "HATELEFON ADOOMA," which could be thought of in English as "the phone is *reds*"). As such, processing of grammatically incorrect/nonsensical statements likely required more effort and deliberation, preventing or masking a "knee-jerk" response.

Experiment 2

We conducted a replication in order to ensure the reliability of the effect. Our target sample size was 33 participants, providing >95% power, based on the observed Cohen's d of 0.594 from Experiment 1. The final sample included 31 students (20 females, Mage = 25.00, $SD = 3.29$, range = 21–36).

Participants were highly accurate at performing the grammatical judgment task ($M = 96.7\%$) averaging less than two errors per condition (range 0–4). The degree to which participants agreed with each statement varied, with the majority of items being relatively evenly distributed (68.2% of the items did not deviate by more than 30% from a perfectly even agreement distribution; there were 8.5% of the items for which there was perfect consensus). We used the same analysis as in the previous experiment. Mean (nontransformed) response latencies in the different conditions appear in Figure 2 and Table 2.

There was a main effect of sentence type, $F(1, 30) = 15.65$, $p < .001$, partial $\eta^2 = .343$; of agreement, $F(1, 30) = 29.56$, $p < .001$, partial $\eta^2 = .496$; and importantly, a Sentence Type × Agreement interaction, $F(1, 30) = 12.68$, $p = .001$, partial $\eta^2 = .297$. For grammatical statements, participants were faster to respond when they agreed with a statement, compared

Table 2. Mean Response Latencies (Milliseconds) and Number of Responses for Grammatical and Nongrammatical Sentences in the Two Agreement Conditions in Experiment 2.

	Grammatical		Nongrammatical	
Measure	Agree	Disagree	Agree	Disagree
RT	866.69 (139.96)	933.72 (150.39)	954.15 (149.88)	955.41 (143.20)
Number of responses	649	684	599	705

Note. Standard deviations appear in parentheses. RT = reaction time.

to when they disagreed with it, mean difference = −.031, $SE = .005$, $p < .001$, Cohen's $d = 1.016$, 95% CI [−.042, −.020]. For nongrammatical statements, there was no difference in response latencies, $p = .737$.

These results replicate the findings of Experiment 1, wherein agreement with a stated opinion had a rapid and involuntary effect on its cognitive processing.

Experiment 3

Experiment 1 and its replication suggest that statements that are congruent with one's opinions are more readily accepted on an opinion-irrelevant task. However, a possible criticism stems from the fact that in Experiments 1 and 2 participants rated their agreement with the statements on a scale which did not allow them to indicate a lack of opinion. A possible concern is that whenever participants did not have a fully formed opinion concerning a statement, they could have been more likely to say that they disagree rather than agree with it. For example, a participant might say to herself: "I actually don't know whether I think that *The Internet has made people more sociable*. If I don't fully agree with this, I guess this means that I slightly disagree with it." In such a case, the observed response time differences may be reflective of whether participants had an opinion on the topic or not rather than whether they agreed with a sentence or not. In order to address this concern, we conducted a third study wherein we gave participants the possibility to report that "I have no opinion on the matter" and omitted such trials from the analysis.

Additionally, in Experiment 3, we assessed whether individuals' level of closed-mindedness moderates the effects observed in Experiment 1 and its replication. Research shows that individuals differ in the degree to which they desire to have firm answers to questions, and in the degree to which they have an aversion of ambiguity (i.e., NFC; Kruglanski, Webster, & Klem, 1993). Thus, individuals with high NFC may be more prone to believe that their subjective opinions represent ultimate truths, and as such may exhibit more pronounced involuntary truth validation of opinion statements (i.e., a stronger opinion-congruency effect). However, closed-minded individuals have been shown to avoid information that contradicts their beliefs (e.g., Dijksterhuis et al., 1996) and viewpoints that differ from their own (e.g., Kruglanski et al., 1993); furthermore, research has shown that individuals high in NFC may shield themselves from unwanted information by being more effective in selective attention (e.g., Kossowska, 2007). Thus, high-NFC individuals may be better at shielding themselves from the opinions expressed in the statements and in focusing on the grammatical judgment task at hand—thereby exhibiting a diminished opinion-congruency effect. We examined these two competing hypotheses in Experiment 3.

Method

Participants

Due to the expected omission of trials (of statements wherein participants did not have an opinion), we increased our sample size by 20% and conducted a study with 37 students (28 females; *M*age = 23.00, $SD = 1.80$, range = 20–28).

Materials

The statements were identical to those in Experiments 1 and 2. At the end of the experiment, participants filled out a Hebrew-translated NFC Scale (Webster & Kruglanski, 1994); Cronbach's α for the translated questionnaire in the current sample was .782. NFC scores were not calculated for three participants who provided inconsistent answers (based on the criteria described in https://terpconnect.umd.edu/∼hannahk/NFC_Scale.html).

Procedure

We employed an identical procedure to that of Experiment 2, with the only difference being that after the task, participants rated the sentences (again, all in their grammatically correct form) on a continuous scale ranging from *totally agree* to *totally disagree*, with the midpoint representing a lack of opinion. Whenever participants indicated that they did not have an opinion on a statement, this observation was omitted from the analysis (a total of 6.51% of trials). All items in the range of agreement were collapsed together, and likewise for items in the range of disagreement. Following the grammatical judgment task, participants filled out the NFC scale.

Results and Discussion

Participants were highly accurate at performing the grammatical judgment task ($M = 98.1\%$) averaging less than one error per condition (range 0–3). The degree to which participants agreed with each statement varied, with the majority of items being relatively evenly distributed (69.3% of the items did not deviate by more than 30% from a perfectly even agreement distribution; there was only one item for which there was perfect consensus). Mean (nontransformed) response latencies in the different conditions appear in Figure 3 and Table 3.

The results showed no effect of sentence type, $F(1, 36) = 2.49$, $p = .123$, and a significant main effect of agreement, $F(1, 36) = 4.58$, $p = .039$, partial $\eta 2 = .113$. Importantly, there

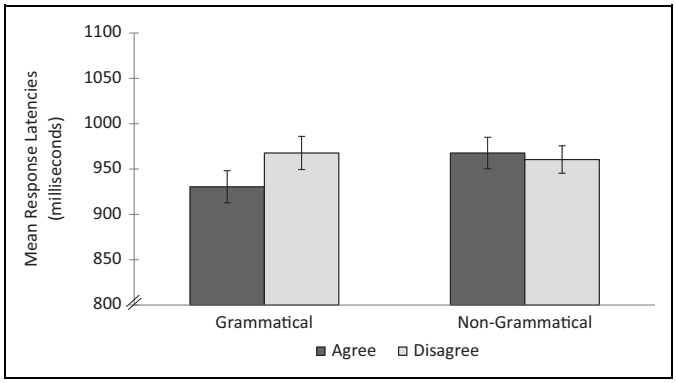

Figure 3. Mean response latencies (milliseconds) for grammatical and nongrammatical sentences in the two agreement conditions in Experiment 3. Error bars represent 95% within-subject confidence intervals (see Cousineau, 2005).

was a Sentence Type × Agreement interaction, $F(1, 36) = 4.843$, $p = .034$, partial $\eta^2 = .119$. For grammatical statements, participants were faster to respond when they agreed with a statement, compared to when they disagreed with it, mean difference $= -.017$, $SE = .006$, $p = .009$, Cohen's $d = 0.546$, 95% CI [−.029, −.004]. For nongrammatical statements, there was no difference in response latencies, $p = .619$.

In order to investigate how NFC affects the opinion-congruency effect observed in Experiments 1 and 2, we calculated for each participant the log-transformed reaction time (RT) difference score ([grammatical disagree] − [grammatical agree]). The results showed a negative correlation between RT difference scores and NFC, $r = -0.336$, $t(33) = 2.015$, $p = .052$.

Thus, the current study showed that even with the omission of trials wherein participants did not have a clear opinion, the results still demonstrate an opinion-congruency effect, indicating that the results of Experiments 1 and 2 did not stem from the existence or lack of opinion concerning a specific statement, but from the extent to which participants agreed with the statement. Furthermore, in our sample, participants with higher NFC may have been slightly less prone to be involuntarily affected by the congruency between the opinion reflected in the statement and their own—however, this negative correlation did not attain statistical significance.

Experiment 4

Experiments 1–3 suggest that statements that are congruent with one's opinions are more readily *accepted* (i.e., designated as valid) on an opinion-irrelevant task. More specifically, the results showed that for grammatically correct sentences, participants were slower to verify that a statement is grammatically valid whenever they disagreed with the opinion it expressed. However, it could still be argued that the effect reported herein does not stem from difficulty in providing an *accepting* response to disagreed-with statements. Rather, it is possible that some other aspects of disagreed-with statements slowed down participants' responses.

Table 3. Mean Response Latencies (Milliseconds) and Number of Responses for Grammatical and Nongrammatical Sentences in the Two Agreement Conditions in Experiment 3.

	Grammatical		Nongrammatical	
Measure	Agree	Disagree	Agree	Disagree
RT	930.47 (141.15)	967.71 (157.26)	967.71 (154.94)	960.49 (148.72)
Number of responses	775	735	750	725

Note. Standard deviations appear in parentheses. RT = reaction time.

First, it is possible that participants had a harder time *comprehending* grammatically correct sentences when they disagreed with them, leading to slower responses. For example, it could be that the opinion-incongruent sentences felt less *familiar*, thus requiring more processing resources. Second, the results of Experiments 1–3 showed that participants responded faster to grammatically correct statements than to all other types of statements. Thus, it could be argued that the interaction between the two stimulus dimensions (grammaticality and agreement) generated a sense of *fluency*, which facilitated the processing of the stimulus and/or the response.

In order to address these possibilities, we conducted a control experiment wherein participants were presented strictly with grammatically correct sentences, as they performed a semantic judgment task. Most importantly, if participants indeed have a harder time comprehending opinion-*incongruent* statements, they should be slower in responding to these statements, regardless of the type of response required in the task (acceptance/rejection). Additionally, because all statements in the current task are grammatically correct, "no" responses are no longer confounded with the inherent disfluency of nongrammatical statements. Therefore, opinion-*congruent* statements should now be equally fluent, regardless of whether they require a "yes" or "no" response. If the results observed in Experiments 1–3 stemmed from differences in fluency, participants should now respond to all opinion-congruent statements with similar latencies, regardless of the required response.

Method

Participants

Fifty-two students (33 females; *M*age = 24.12, *SD* = 2.66, range = 18–32) participated in the experiment. Power analysis using G*Power (Faul, Erdfelder, Lang, & Buchne, 2007) suggested 52 participants provides >80% power to detect the simple effect of interest, if it were of small-to-medium magnitude (i.e., Cohen's $d = 0.35$).[3]

Materials

We used a subset of 56 sentence pairs from the original 88 opinion statements.[4] All sentences were in their grammatically

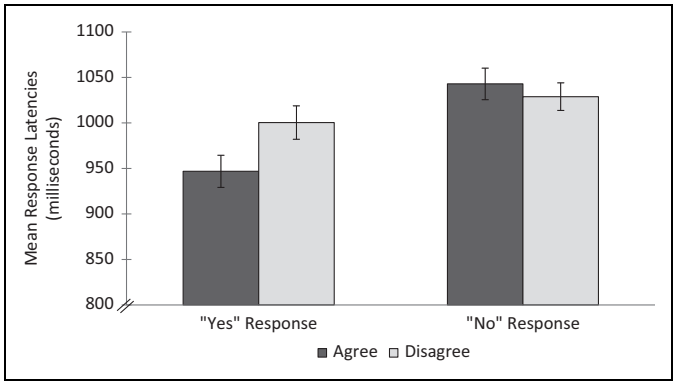

Figure 4. Mean response latencies (milliseconds) for "yes" and "no" responses in the two agreement conditions in Experiment 4. Error bars represent 95% within-subject confidence intervals (see Cousineau, 2005).

correct form, ending with an adjective that implied a positive valuation (e.g., "coriander is *tasty*") or an adjective that implied a negative valuation (e.g., "coriander is *disgusting*").

Procedure

The experiment comprised of two blocks. On *positive* blocks, participants were asked to press a "yes" key if the predicate "stated something positive about the subject of the sentence," and "no" if the predicate "did not state something positive about the subject of the sentence." On *negative* blocks, participants were asked to press a "yes" key if the predicate "stated something negative about the subject of the sentence," and "no" if the predicate "did not state something negative about the subject of the sentence." Stimuli lists and block order were counterbalanced across participants and presented in random order. The first four trials on the second block were discarded to allow for accommodation to the change in task. In order to ensure that participants processed the subject of the sentence and not just the predicate, participants were instructed not to respond whenever the subject of the sentence was an animal. Six such catch trials were intertwined into each block and discarded from the analysis. Following the comprehension task, participants were unexpectedly presented again with the statements and asked to rate their agreement on a 4-point scale.

Results and Discussion

Participants were highly accurate at performing the comprehension task ($M = 95.64\%$) averaging less than one error per condition (range 0–4). The degree to which participants agreed with each statement varied, with the vast majority of items being relatively evenly distributed (67% of the items did not deviate by more than 30% from a perfectly even agreement distribution; there were only 2.8% of the items for which there was perfect consensus). Mean (nontransformed) response latencies in the different conditions appear in Figure 4 and Table 4.

The results showed a significant effect of response type, $F(1, 51) = 31.06$, $p < .001$, partial $\eta^2 = .378$, and agreement, $F(1, 51) = 4.22$, $p = .046$, partial $\eta^2 = .076$. As in Experiments 1–3, there was a Response Type × Agreement interaction, $F(1, 51) = 6.53$, $p = .010$, partial $\eta^2 = .114$. For "yes" responses, participants were faster to respond when they agreed with a statement, compared to when they disagreed with it, mean difference = .023, $SE = .008$, $p = .004$, Cohen's $d = 0.525$, 95% CI [.008, .038]. Importantly, for "no" responses, there was no difference in response latencies between agreed and disagreed with statements, $p = .491$. For opinion congruent statements, participants were faster to respond when an acceptance (i.e., a "yes" response) was required than when a rejection (i.e., a "no" response) was required, mean difference = .044, $SE = .009$, $p < .001$, Cohen's $d = 0.800$, 95% CI [.027, .061].

Table 4. Mean Response Latencies (Milliseconds) and Number of Responses for "Yes" and "No" Responses in the Two Agreement Conditions in Experiment 4.

	"Yes" Response		"No" Response	
Measure	Agree	Disagree	Agree	Disagree
RT	946.84 (166.40)	1,000.40 (184.93)	1,042.91 (171.33)	1,028.86 (145.90)
Number of responses	660	741	634	747

Note. Standard deviations appear in parentheses. RT = reaction time.

These results support the claim that the effect observed in Experiments 1–3 is due to differences in the acceptance/rejection of congruent and incongruent opinions and not to general differences in their fluency/familiarity.

General Discussion

The results of the current study showed that participants were slower to confirm that an opinion statement is grammatically correct when they disagreed with it, compared to when they agreed with it. Participants' agreement with the statements was completely irrelevant to the designation of the sentences as grammatically accurate; nonetheless, it markedly influenced their ability to perform the task. Thus, the results demonstrate that agreement with a stated opinion can have a rapid and involuntary effect on its cognitive processing. More specifically, the results suggest that the acceptance (and perhaps also rejection) of confirmatory (contradictory) opinions can occur without deliberation and volition. Importantly, the demonstration of such a knee-jerk acceptance/rejection of opinions may help explain people's remarkable ability to remain entrenched in their convictions.

Making informed decisions undoubtedly requires individuals to be able to consider the merits and weaknesses of opinions that differ from their own. Much previous work has delineated how explicit, deliberate processes of motivated reasoning contribute to biased information processing (e.g., biased information search: Hart et al., 2009; Holton & Pyszczynski, 1989, for a meta-analysis; biased interpretation: Ditto et al., 2003; Lord, Ross, & Lepper, 1979). The current study suggests that

matters are even worse, in showing that opinion-congruent information may enjoy a processing bias (as compared to opinion-incongruent information) that is present at very early stages of semantic processing; namely, opinion-congruent information is rapidly and involuntarily associated with truthfulness (or opinion-incongruent information is involuntarily associated with falsity).

The finding reported herein is in line with previous research into the "epistemic Stroop effect" (Richter et al., 2009) that showed that people involuntarily reject factual propositions that conflict with their knowledge of the world (e.g., "soft soaps are edible"). Interestingly, the current findings suggest that despite adults' understanding of the notion of subjectivity (Hermann & Rubenfeld, 1985), they may react to opinion-incongruent statements as if they were factually incorrect. The distinction between factual truths and opinions held to be true is pivotal for rational discourse. However, this distinction may apparently be somewhat murky within human psychology.

Following up on the current investigation, future work should continue to examine how mental representations of subjective and objective information differ, if at all. For example, this question could be tackled by examining whether the epistemic Stroop effect (Richter et al., 2009) and the effect reported herein are mediated by the same neural mechanisms. It is possible that the validation of subjective information relies on neural regions that subserve the processing of intentional states (e.g., people's beliefs, goals, and desires; e.g., Frith & Frith, 2006), whereas the validation of facts may rely on regions involved in representing mind-independent (i.e., not subjective, not socially constructed) semantic knowledge, such as physical object taxonomies (e.g., Fairhall & Caramazza, 2013).

The ability to update personally held opinions is crucial to adaptive decision-making at the personal and societal level. Future work could utilize the current paradigm to examine whether characteristics of the situation (e.g., acute stress) and of the individual (e.g., whether one is conservative or liberal) affect the knee-jerk acceptance and rejection of opinions.

Experiment 3 provided tentative evidence of individual differences in the effect reported herein. Our results showed that participants who had higher levels of NFC (Webster & Kruglanski, 1994) were slightly better at selectively attending to the grammatical judgment task, thereby shielding themselves from the involuntary RT effects of opinion-congruency exhibited in low-NFC participants. However, this effect failed short of attaining statistical significance, and future research is needed in order to ascertain its replicability. Furthermore, if this effect proves reliable, further research will be needed in order to ascertain whether NFC affects the processing of subjective versus factual information differentially.

The current paradigm may also have uses as a methodological tool in attitude research. Most of the paradigms used to gauge participants automatic evaluations and implicit beliefs (e.g., the implicit association test; Greenwald, McGhee, & Schwartz, 1998) have a limitation of being able to gauge only very simple attitudes. A unique aspect of the current paradigm is that response latencies negatively correlate with personal agreement to complex-structured propositions (e.g., "parents *today* are *too* pampering") rather than with the association between two concepts (e.g., "pampering" and "good"). This important feature will allow for complex items from well-validated self-report questionnaires (e.g., "It is easy to understand the anger of black people in America"; Modern Racism Scale; McConahay, 1986) to be adapted and used in a response–time paradigm (e.g., "The anger of black people in America is *understandable*").

Recently developed measures of implicit beliefs (i.e., the implicit relational assessment procedure: Barnes-Holmes, Barnes-Holmes, Stewart, & Boles, 2010; relational responding task: De Houwer, Heider, Spruyt, Roets, & Hughes, 2015) have also provided researchers with ways to gauge agreement with complex-structured propositions; however, the paradigm described herein is unique in that participants' beliefs about the content of the statement (and in fact, the semantics of the statement altogether) are irrelevant to the dimension of response (i.e., grammaticality); thus, they need not be processed in order to perform the task at hand (see De Houwer, 2003, for a discussion of the methodological and theoretical importance of task-irrelevant stimulus–response compatibility). In light of this, the opinion-congruency paradigm provides an addition to social psychologists' tool kit.

Despite consistently finding that participants were faster to provide an affirmative response in the grammatical task (as well as the comprehension task in Experiment 4) when they agree with a statement's content (compared to when they disagree), we did not find any difference in the time it took participants' to provide a negating response (which is consistent with the findings in Richter et al., 2009). The lack of such a finding may stem from the fact that the nongrammatical statements are somewhat nonsensical[5] (e.g., "HATELEFON ADOOMA," which could be thought of in English as "the phone is *reds*"). As such, processing of grammatically incorrect/nonsensical statements (or the act of negation itself in Experiment 4) likely required more effort and deliberation, preventing or masking a knee-jerk response.

A possible criticism of the findings of Experiments 1–3 was that the difference in response latencies for agreed-with and disagreed-with statements did not stem from participants' bias toward their acceptance/rejection, but from differences in participants' ability to process the disagreed-with statements, or from the reduced sense of fluency these stimuli evoke. This possibility (which is interesting on its own) is less likely given the results of Experiment 4. In this study, participants' response latencies for "no" responses were *not* slower for disagreed-with (vs. agreed-with) statements (if anything, responses for disagreed-with items were descriptively faster). In contrast, for "yes" responses, agreed-with statements resulted in faster responses. This finding demonstrated that the speed with which opinion-incongruent statements and opinion-congruent statements were processed was dependent on whether participants were to generate an accepting (i.e., "yes") or rejecting (i.e., "no") response.

The present investigation presents evidence that one of the reasons that people's beliefs are sometimes so resistant to

change could be that the acceptance (and perhaps also rejection) of confirmatory (or contradictory) opinions can occur in a rapid and involuntary manner. Such a pattern of processing may limit our ability to consider and challenge our previously held views, which is an essential component of rational and constructive discourse. Furthermore, the paradigm presented could also be used in future studies to measure whether people differ in the extent to which they exhibit such "knee-jerk opinionatedness," as well as to examine the different situations that allow individuals to entertain ideas that challenge their previously held beliefs.

Acknowledgments

The authors wish to thank Alex Fine for his invaluable assistance with data analysis. Michael Gilead wishes to thank Miri Perkas for her assistance. Moran Sela is supported by the Harry and Sylvia Hoffman Leadership and Responsibility Program.

Author Contributions

Michael Gilead and Moran Sela contributed equally to this work.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was support by the ISF (grant no. 350/10 to AM).

Supplemental Material

The supplemental material is available in the online version of the article.

Notes

1. Hebrew is a gendered language, where each noun requires a specified grammatical inflection of its adjective.
2. An identical analysis performed on nontransformed latencies did not change the results.
3. Although the current study was underpowered to detect a small effect, the results suggested that the observed effect was in the opposite direction from that of H1, that is, longer latencies for agreed-with statements in the "no" condition. Thus, the inability to reject H0 is unlikely to be the result of a lack of statistical power.
4. We used only a subset of the original stimuli, because some of the original stimuli did not end in a positive/negative adjective and thus did not lend themselves to the current task.
5. This nonsensicality would not have interfered with the agreement ratings, as those were always performed on grammatically correct versions of the statements.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211.

Ajzen, I., & Fishbein, M. (2000). Attitudes and the attitude-behavior relation: Reasoned and automatic processes. *European Review of Social Psychology*, *11*, 1–33.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, *50*, 248–287.

Barnes-Holmes, D., Barnes-Holmes, Y., Stewart, I., & Boles, S. (2010). A sketch of the Implicit Relational Assessment Procedure (IRAP) and the Relational Elaboration and Coherence (REC) model. *The Psychological Record*, *60*, 527–542.

Cousineau, D. (2005). Confidence intervals in within-subject designs: A simpler solution to Loftus and Masson's method. *Tutorial in Quantitative Methods for Psychology*, *1*, 42–45.

De Houwer, J. (2003). A structural analysis of indirect measures of attitudes. *The psychology of evaluation: Affective processes in cognition and emotion* (pp. 219–244). Mahwah, NJ: Erlbaum.

De Houwer, J., Heider, N., Spruyt, A., Roets, A., & Hughes, S. (2015). The relational responding task: Toward a new implicit measure of beliefs. *Frontiers in Psychology*, *6*, 9. doi:10.3389/fpsyg.2015.00319

Dijksterhuis, A., van Knippenberg, A., Kruglanski, A. W., & Schaper, C. (1996). Motivated social cognition: Need for closure effects on memory and judgment. *Journal of Experimental Social Psychology*, *32*, 254–270. doi:10.1006/jesp.1996.0012

Ditto, P. H., Munro, G. D., Apanovitch, A. M., Scepansky, J. A., & Lockhart, L. K. (2003). Spontaneous skepticism: The interplay of motivation and expectation in responses to favorable and unfavorable medical diagnoses. *Personality and Social Psychology Bulletin*, *29*, 1120–1132.

Fairhall, S. L., & Caramazza, A. (2013). Brain regions that represent amodal conceptual knowledge. *Journal of Neuroscience*, *33*, 10552–10558.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175–191.

Frith, C. D., & Frith, U. (2006). The neural basis of mentalizing. *Neuron*, *50*, 531–534.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, *74*, 1464–1480.

Hart, W., Albarracín, D., Eagly, A. H., Brechan, I., Lindberg, M. J., & Merrill, L. (2009). Feeling validated versus being correct: A meta-analysis of selective exposure to information. *Psychological Bulletin*, *135*, 555–588.

Hermann, D. J., & Rubenfeld, L. S. (1985). Lexical representation of fact and opinion. *Journal of Psycholinguistic Research*, *14*, 81–95.

Holton, B., & Pyszczynski, T. (1989). Biased information search in the interpersonal domain. *Personality and Social Psychology Bulletin*, *15*, 42–51.

Isberner, M. B., & Richter, T. (2013). Can readers ignore implausibility? Evidence for nonstrategic monitoring of event-based plausibility in language comprehension. *Acta Psychologica*, *142*, 15–22. doi:10.1016/j.actpsy.2012.10.003

Isberner, M.-B., & Richter, T. (2014). Does validation during language comprehension depend on an evaluative mindset? *Discourse Processes*, *51*, 7–25.

Kossowska, M. (2007). The role of cognitive inhibition in motivation toward closure. *Personality and Individual Differences*, *42*, 1117–1126. doi:10.1016/j.paid.2006.09.026

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: "Seizing" and "freezing". *Psychological Review*, *103*, 263.

Kruglanski, A. W., Webster, D. M., & Klem, A. (1993). Motivated resistance and openness to persuasion in the presence or absence of prior information. *Journal of Personality and Social Psychology*, *65*, 861–876. doi:10.1037/0022-3514.65.5.861

Kuhn, D., Cheney, R., & Weinstock, M. (2000). The development of epistemological understanding. *Cognitive Development*, *15*, 309–328.

Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, *37*, 2098–2109.

McConahay, J. B. (1986). Modern racism, ambivalence, and the modern racism scale. In J. F. Dovidio & S. L. Gaertner (Eds.), *Prejudice, discrimination, and racism* (pp. 91–125). San Diego, CA: Academic Press.

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology*, *2*, 175–220.

Richter, T., Schroeder, S., & Wöhrmann, B. (2009). You don't have to believe everything you read: Background knowledge permits fast and efficient validation of information. *Journal of Personality and Social Psychology*, *96*, 538–558.

Rokeach, M. (1954). The nature and meaning of dogmatism. *Psychological Review*, *61*, 194–204. doi:10.1037/h0060752

Smith, S. M., Fabrigar, L. R., Powell, D. M., & Estrada, M.-J. (2007). The role of information-processing capacity and goals in attitude-congruent selective exposure effects. *Personality and Social Psychology Bulletin*, *33*, 948–960.

Vallone, R. P., Ross, L., & Lepper, M. R. (1985). The hostile media phenomenon: Biased perception and perceptions of media bias in coverage of the Beirut massacre. *Journal of Personality and Social Psychology*, *49*, 577–585.

Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of Personality and Social Psychology*, *67*, 1049.

Wyer, R. S Jr. (2014). *The automaticity of everyday life: Advances in social cognition* (Vol. *10*). New York, NY: Psychology Press.

Author Biographies

Michael Gilead is an assistant professor in the Department of Psychology at Ben-Gurion University of the Negev.

Moran Sela is a PhD student in the Department of Psychology at The Hebrew University of Jerusalem.

Anat Maril is chair of the Department of Cognitive Science and a professor in the Department of Psychology at The Hebrew University of Jerusalem.

Handling Editor: Kate Ratliff