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Discourse updating after reading a counterfactual event

Manuel de Vega* & Mabel Urrutia

University of La Laguna, Spain

This paper explores the temporal course of discourse updating after reading counterfactual events. To test the accessibility to discourse information, readers were asked to identify probes related to initial events in the text, previous to the counterfactual, or probes related to the critical counterfactual events. Experiment 1 showed that 500 ms after reading events in counterfactual format, initial events were more accessible than after reading the same critical events in factual format. This suggests that discourse updating occurs in factuals, but not in counterfactuals. However, the critical events were equally accessible in both formats, indicating that the alternative "as if" scenario was also activated in counterfactuals. Experiment 2 demonstrated that the initial events continued accessible 1500 ms after reading counterfactuals, but the alternative "as if" scenario becomes less accessible. In sum, the experiments indicate that the realistic meaning of counterfactuals prevents discourse updating at both the early and the late stage, whereas the "as if" meaning was only activated at the initial stage.

People broadly use counterfactual expressions to reason and communicate in everyday situations. Expressions or thought such us "If I had taken a tea instead of a coffee I would have slept all night" unfolds a world of possibilities that momentarily disrupts the realistic encoding of events. Notice, however, that counterfactuals are a sort of "rational fantasy" (Byrne, 2005), because the antecedent events only slightly differ from the real course of the events (although the hypothetical consequences could be important and even dramatic). For example in "If I had left my home just 5 minutes before, I would have arrived on time to get my flight", a small and plausible alteration in the events timing makes the difference between the

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real and the imagined events (Byrne & Girotto, 2009). This sort of counterfactuals, involving small changes of real events (e.g., in spatial or temporal parameters), are much more common than fantastic counterfactual such us "If money grew on trees then we'd all be millionaires". Moreover, from a pragmatic perspective, the former clearly follow the conversational maxims of relation (be relevant) and quality (be truthful), whereas the latter seem to violate the default pragmatic assumptions and are less informative (Grice, 1975; Levinson, 1995).

Counterfactuals play multiple roles in everyday life, such as serving hypothetical reasoning, persuading audiences, modifying beliefs, making prescriptions, decision making and so on (e.g., Byrne & Girotto, 2009; García, 2009). Counterfactuals have been widely studied by social psychologists (e.g., Roese & Olson, 1997; Roese, 2005) who described their role in causal judgments (e.g., Harris, German, & Mills, 1996; Spellman, Kincannon, & Stose, 2005), and in learning from mistakes (Roese & Olson, 1995). On their side, cognitive psychologists have explored the role of counterfactuals in reasoning, and how counterfactual events are represented (e.g., Byrne, 2002; 2005; Walsh & Byrne 2005). Finally, counterfactuals are emotional amplifiers that may result in social emotions of regret, guilt, or blame, as well as in the more positive emotions of relief or satisfaction (e.g., Byrne, 2002; Guttentag & Ferrell, 2004; Johnson-Laird & Byrne, 2002; Kahneman & Miller, 1986).

One important feature of counterfactuals is their dual meaning. When people read or listen to a counterfactual they simulate the actual situation in which the critical events did not happen, but they also must be able to simulate the unreal "as if" situation, in which the events are represented as happening. The dual meaning of counterfactuals has been explored empirically in the field of conditional reasoning (e.g., Byrne, 2002, 2005; Johnson-Laird & Byrne, 2002; Santamaría, Espino, & Byrne, 2005; Thompson & Byrne, 2002). In most cases, these studies use off-line methods in which participants first read a conditional narrative in indicative (factual) or subjunctive (counterfactual) mood, and are then asked to choose from among several sentences those which are more consistent with, or are implied by, the conditional sentence's meaning. The results usually confirm that participants tend to choose exclusively a factual interpretation (p & q) for indicative conditionals, but they choose both factual (p & q) and counterfactual (not-p & not-q) interpretations for subjunctive conditionals (see Thompson & Byrne, 2002). Moving beyond this choice-task methodology, Santamaría et al. (2005) used a sentence priming paradigm, giving participants counterfactual conditionals such as "If there had been roses then there would have been lilies" as primes to understand probe

sentences like "There were roses and there were lilies" or "There were no roses and there were no lilies." The same procedure was used with factual conditional primes such as "If there are roses, there are lilies." When probe reading times were collected, factual sentences primed only the affirmative probe "There were roses and there were lilies," whereas counterfactual sentences primed both the affirmative and the negative probes, suggesting that readers had generated a double representation.

It is useful to contrast counterfactuals and negations, because both appear similar. Thus, counterfactuals although frequently have an affirmative format involve an implicit negation corresponding to their realistic meaning (not-p & not-q), as well as an "as if" simulation of their alternative meaning (p & q). On the other hand, negations in spite of having an explicit negative operator (i.e. not) could momentarily activate a "counterfactual" representation of the negated events as if they have happened, followed by the representation of the actual events, namely an scenario with the negated concepts absent (e.g., Kaup & Zwaan, 2003; Kaup, 2001; Kaup, Lüdtke, & Zwaan, 2006). Thus, it seems that both counterfactuals and negations share dual meaning. However, this is just a superficial similarity because both kinds of linguistic statements considerably differ. For negations the representation of the negated events does not contribute to their proper meaning. We could conceive the simulation of the negated events as an automatic byproduct of lexical processing, which is rapidly suppressed, to give place to the representation of the actual scenario with the negated events absent. By contrast, for counterfactuals the double simulation of the actual events and their imagined alternatives contribute to their meaning. Thus, when you listen to a counterfactual expression you are invited to consider the actual situation (not-p & not-q) but also to consider for a while the alternative "as if" situation (p & q). This dual meaning is essential to fully understand the counterfactual, and to accomplish its psychological functions in communication and reasoning, such as establishing causal inferences, expressing the emotion of regret, learning from experience, etc.

How is the dual meaning of counterfactuals processed on-line? Recently some researchers have applied psycholinguistic methods to explore this issue (de Vega, Urrutia & Riffo, 2007; de Vega & Urrutia, in press; Ferguson & Sanford, 2008; Ferguson, Sanford, & Leuthold, 2008; Stewart, Haigh & Kidd, 2009). For instance, de Vega et al. (2007) investigated how counterfactual sentences embedded in narratives modulated discourse updating, by measuring the activation of certain concepts at the end of the narrative. In their research, de Vega et al. (2007) gave participants short stories including an introductory sentence describing

an initial situation, followed by a critical sentence either in factual or counterfactual format and a subordinate clause shared by the two versions. Then a probe word followed with instructions to verify its appearance in the narratives. The probe was a verb from the introductory situation, or a verb from the subordinate clause shared by the factual and the counterfactual contexts. The results showed that the initial verb was more accessible in counterfactual than in factual contexts, whereas the recent verb was equally accessible in both factual and counterfactual contexts (Exp. 2). These results indicate that factual contexts determine ordinary updating (readers focus on the most recent information whereas old information is outdated). By contrast, counterfactual contexts determine that the updating processes are cancelled, and the linguistic focus remains in the initial situation of the story. The results were also compatible with the dual meaning hypothesis of counterfactuals, because the final information was equally accessible in factual and counterfactual sentences, suggesting that the "as if" meaning was activated in the latter. However, the two meanings of counterfactuals differ in their temporal course. When a new filler sentence was introduced between the subordinate sentence and the probe (Exp. 3), the recent information became more accessible in the factual than in the counterfactual context, suggesting that suppression processes of the as if meaning take place in the latter.

De Vega et al's (2007) study provides evidence compatible with a two-stage process account of counterfactual meaning. Initially the two meanings, the actual and the alternative scenarios, would be activated whereas later on the alternative scenario would be inhibited, remaining only the realistic state of events. One problem with de Vega et al' (2007) study, however, is that it does not provide an accurate measure of the temporal course of this two-stage process, because the "delayed " condition involved not only additional time before the probe but also the processing of a filler sentence. This research overcomes this difficulty, employing exactly the same narratives, with a critical counterfactual or factual sentence, in two experiments that only differed in the temporal delay between the critical sentence and the probe. Each narrative described an event in an introductory scenario, followed by another event in a new scenario either in factual or counterfactual format, and then a subordinate clause shared by both versions. After a delay of 500 ms (Experiment 1) or 1500 ms (Experiment 2) a probe word was presented, consisting of a verb either from the introductory scenario or from the new scenario (the subordinate clause). To conclude the narrative, a filler sentence always consistent with the previous context (either factual or counterfactual) followed. An example of narrative and its manipulations is shown in Table 1.

Table 1. Example of experimental materials, resulting from manipulating the context format (factual / counterfactual) and the probe (initial / recent).

Initial situation (always factual)

Juan estaba en la oficina, / sentado delante del ordenador./ Estaba **tecleando** un informe /que le había solicitado su jefe.

(John was in the office, /sitting in front of the computer./ He was **typing** a report / that his boss had asked him for).

Factual context

Como aún tenía bastante tiempo / bajó a la cafetería / a **beberse** una Coca-Cola.

(As he still had enough time/ he went down to the cafeteria / to **drink** a Coca-Cola).

Counterfactual Context

Si hubiera tenido bastante tiempo, /habría bajado a la cafetería / a **beberse** una Coca-Cola.

(If he had had enough time, /he would have gone to the cafeteria/ to **drink** a Coca-Cola).

Initial Probe

TECLEANDO (TYPING)

Recent Probe

BEBERSE (DRINK)

Final Sentence, following the factual context

Juan pidió también una tapa. (John also ordered a snack)

Final Sentence, following the counterfactual context

Juan empezó a imprimir un borrador. (John started to print a draft)

Comprehension Question

+++ ¿Le había solicitado el jefe a Juan un informe? +++

(Had John's boss asked him for a report?)

The purpose of the study was, thus, to investigate the temporal course of discourse updating after reading either a counterfactual or a factual sentence embedded in a narrative. We predict that after reading a counterfactual event the protagonist's here-and-now does not change, and therefore the narrative situation is not updated. For instance, after reading the counterfactual version in Table 1 the protagonist would remain in the office because the counterfactual event did not really happen. Therefore, the verb "typing" would be highly accessible both 500 and 1500 ms after reading the end of the story. Furthermore, given the dual meaning of counterfactuals, readers could also consider counterfactual events as if they were "real", even though they do not contribute to updating. Thus, we could expect that the counterfactual event "drinking" is also momentarily accessible at the end of the story (at the 500 ms delay). The two scenarios of counterfactual meaning, however, could not be kept in memory for long, and readers will suppress the latter quite soon; we predict that the activation of "drinking" would dissipate at the 1500 ms delay. This complex pattern for counterfactual contexts, contrasts with the comprehension of factual stories, in which a new piece of factual information determines the situation updating while the previous outdated information becomes less accessible. In other words, the initial event "typing" would become less activated immediately whereas the new factual event "drinking" would be highly activated. This pattern would be observed in the short and larger delay alike, for factual narratives.

EXPERIMENT 1: PROBE DELAYED 500 MS

METHOD

Participants. Fifty students (35 women) at the University of La Laguna participated in the experiment voluntarily, and received academic credits for their participation. All were native Spanish speakers with normal or corrected vision.

Design and Materials. A repeated measures factorial design 2 Context format (factual / counterfactual) x 2 Probe (initial / recent) was performed. Forty experimental stories were written in Spanish with the following structure: (1) a paragraph introducing the protagonist describing an event in an initial scenario (e.g., in the office sitting in front of the computer…); (2) a context paragraph describing new events in a new scenario (e.g., going to the cafeteria) either in factual or counterfactual

format; (3) a subordinate clause shared by the factual and counterfactual context that described a new event (e.g., drinking Coca-Cola); (5) a test Probe ; (6) a filler sentence to give a coherent end to the story, and (7) a yes/no comprehension question. In the experimental stimuli the Probe always had appeared in the story either in the initial situation (the introductory sentence previous to the context) or in the recent situation (the subordinate clause following the context). The experimental stories were written in 4 experimental versions resulting from manipulating the context format and probe, namely: factual/recent probe, factual/initial probe, counterfactual/recent probe, and counterfactual/initial probe. Four counterbalanced sets of 40 stories each were created resulting from the different assignment of the story contents to the experimental conditions. Participants were assigned to one of the counterbalanced sets, thus receiving 10 experimental stories in each version. Another set of 40 filler stories was written (half factual and half counterfactual), with a similar structure than the experimental ones. The filler stories included false probes that were absent in the stories. Finally 4 practice stories were also created.

Procedure. Each participant was assigned to one of the counterbalanced list of experimental stories. The practice and the filler sentences were the same for all participants. Stimuli were presented through the ERTS software (http://www.berisoft.com/), and participants were instructed to read each story for comprehension, and respond to the test probe (yes= the word was present; and no= the word was not present) and to the comprehension question (yes= true; no= false). The comprehension questions aimed to ensure readers' comprehension of the stories, and were not analyzed statistically. Yes/no responses were assigned to the P and Q keys in the keyboard, respectively, and the computer collected their accuracy and latency. Each story was segmented in 7 parts, most of them corresponding to clauses that were presented automatically (see Table 1). The sequence of presentation for each story was as follows: 1) the message "NEW TEXT" (500 ms + 100 ms blank); 2) a fixation point (500 ms + 100 ms blank), 3) the 7 segments of text (1700 ms + 100 ms blank each); 4) a blank of 500 ms; 5) the Probe that remained in the screen until participant's response or a maximum of 3000 ms; 6) the final sentence of the story (1700 ms + 300 ms); 7) a yes/no comprehension question, which remained on the screen until participants' response or for a maximum of 3 seconds.

RESULTS

Analyses of variance (ANOVAs) were performed including two factors: 2 Context (factual / counterfactual) x 2 Probe (initial / recent), for probe latencies and errors, which were the only theoretically interesting measures. Four participants were discarded from the data because their poor performance both in the test probe and in the comprehension questions (accumulating more than 35% errors). Participant data corresponding to probe errors (11 % of data), as well as clause reading times longer than 3500 ms or shorter than 300 ms (about 3 % of data) were also dismissed from the analyses.

Probe latency. There was a significant main effect of Context [F1 (1, 46)= 14.9, MSe = 9347.397, p< .0001; and F2 (1,39) = 8.679, MSe= 14937.846, p< .005], that indicated shorter probe latencies in counterfactual (M=1233, SD= 280) than factual contexts (M=1180, SD= 247); and also a main effect of Probe [F1 (1, 46)=179.06, MSe =28403.624, p< .0001; and F2 (1,39)=172.955, MSe = 24295.527], being recent probes much faster than initial probes (see Figure 1).

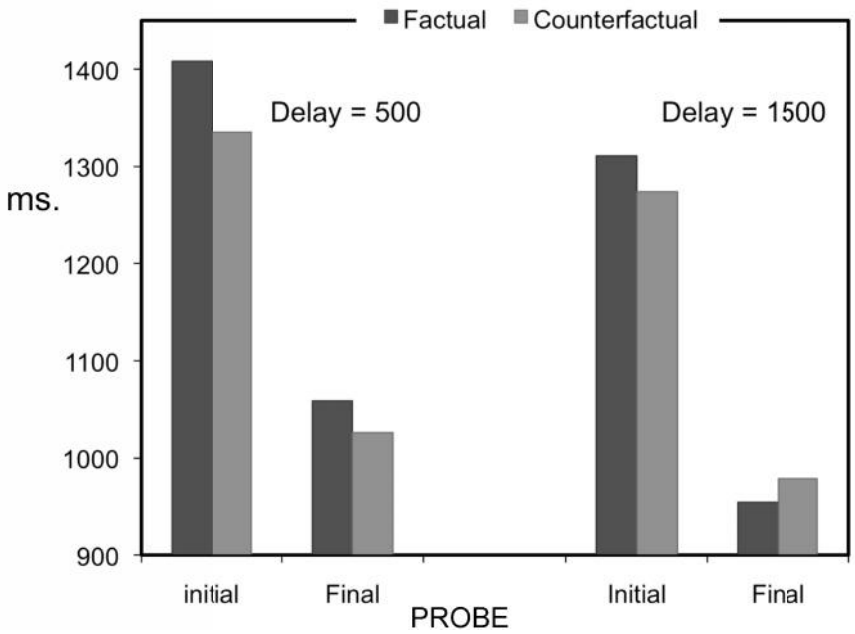

Figure 1. Mean response times to the test probe as a function of context (factual / counterfactual) and probe (initial / recent), corresponding to probe delays of 500 ms (Exp. 1), and 1500 ms (Exp. 2).

The expected Context x Probe interaction was not obtained [F1(1,46)= 1.16, MSe=16000.229, p>.2; and F2(1,39)< 1], because the advantage of counterfactual over factual contexts occurred for initial probes (t1(46)=2,519, p < 0.015; t2(39)= 2.14, p<.039) as well as for recent probes (t1(46)=2.121, p>.005; t2(39)=1.96, p = .057), as Figure 1 shows.

Probe errors. Participants made more errors in the initial than the recent probe (F1 (1, 46)= 91.86, MSe= 151.96, p<. 0001). This effect, however, was qualified by the important Context x Probe interaction (F1 (1, 46) = 4.1, MSe= 74.861, p< .049). Participants tend to produce more error in the initial probe for factual than counterfactual contexts, whereas the pattern reversed in the most recent probe (Figure 2).

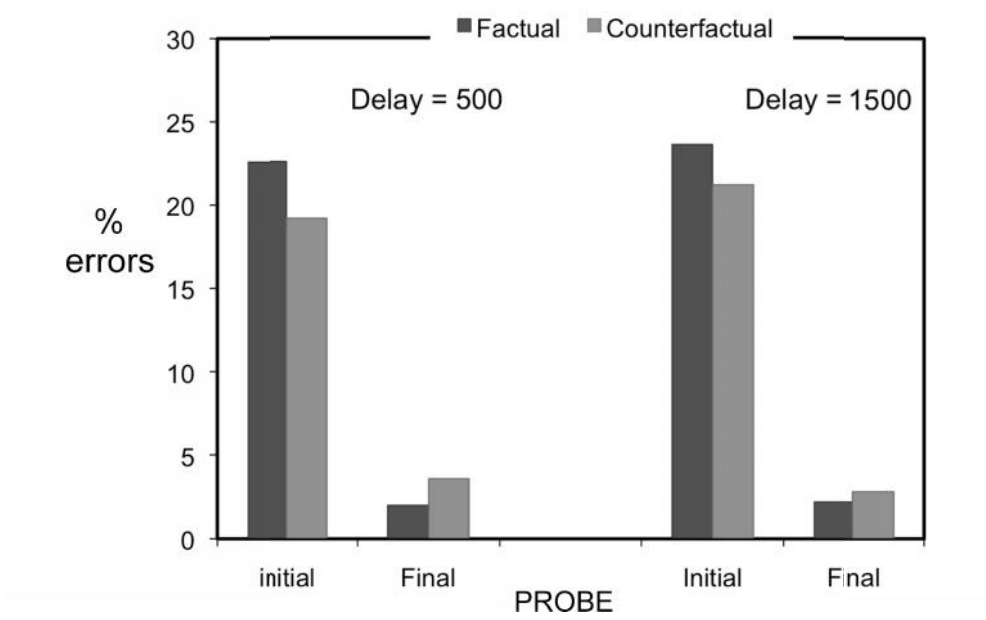

Figure 2. Percent errors in the test probe as a function of context (factual / counterfactual) and probe (initial / recent), corresponding to the probe delays of 500 ms (Exp. 1), and 1500 ms (Exp. 2).

DISCUSSION

The hypothesis for the 500 ms delay condition was partially confirmed: performance for the initial probe was better (faster latencies and fewer errors) for counterfactual than factual contexts. These results reinforce the idea that updating of information takes place in factual contexts, namely the new events described by the critical factual sentence becomes highly activated whereas the initial information becomes outdated. For instance, in the factual version of Table 1 the protagonist is not longer in the office because he moved to the cafeteria and consequently the initial event of typing in the computer becomes less accessible. By contrast, counterfactual contexts do not contribute to updating, and the initial contents of the story remain quite accessible. In the counterfactual version in Table 1 the protagonist only expresses (counterfactually) the wish to move to the cafeteria but he remains in the office and the typing event is still relevant and accessible (de Vega et al., 2007).

Concerning the participants' performance in the recent probe condition, the results were unexpected. We hypothesized that the recent information was equally accessible under counterfactual and factual contexts, because the "as if" meaning of counterfactual is similar to the actual meaning of factual sentences (even though it does not contribute to updating). Surprisingly, the recent probe produced faster responses in counterfactual than factual contexts, although this was partially compensated by a small increase of errors. This result is compatible with the dual meaning of counterfactuals, because it involves a clear activation of the "as if" meaning. However, it is unclear why recent information is less accessible in factual stories. One possibility is that readers of factual materials devote some mental resources to infer the incoming information (remember that the final sentence of the story comes immediately after the probe). On its side, the dual meaning of counterfactuals requires all the reader's mental resources to keep in parallel the two alternative meanings, at least in the 500 ms time window of this experiment.

EXPERIMENT 2: PROBE DELAYED 1500 MS

This experiment tested the accessibility of events belonging to the initial scenario or the new scenario (the subordinated clause) in factual and counterfactual versions, after a longer delay of 1500 ms.

METHOD

Participants. Fifty students (30 women) at the University of La Laguna participated in the experiment voluntarily, and received academic credit for their participation. All were native Spanish speakers with normal or corrected vision.

Materials, Design, and Procedure. They were exactly the same as in experiment 1 except that the delay was set at 1500 ms.

RESULTS

Like in the previous experiment, the data were submitted to 2 Context x 2 Probe repeated measure ANOVAs, by participants (F1), and by stories (F2). Two participants were discarded from the data because their poor performance both in the probe and in the comprehension questions (more than 35% errors). Latencies corresponding to errors in the probes (11% of data), as well as clause reading times longer than 3500 ms or shorter than 300 ms, were also dismissed from the analyses (about 2% of data).

Probe Latency. There was a significant main effect of Probe [$F(1,47)=198.260$, $MSe=25788.842$, $p<.0001$; F2 $(1,39)=198.470$, $MSe=23272.687$, $p<.0001$], because the recent probes were responded to much faster than the initial probes. Most important, there was a significant Context x Probe interaction [$F1\ (1, 47)= 4.751$, $MSe=9525.849$, $p< .05$; F2 $(1,39)=5.079$, $MSe=12825.196$, $p< .05$], consisting of faster responses for initial probes in counterfactual than factual contexts, and faster responses for recent probes in factual than counterfactual contexts (Figure 1). The pairwise comparisons (counterfactual-initial/factual-initial and counterfactual-recent/factual-recent) did not reach statistical significance. However, the interaction was a genuine and robust effect, significant both by participants and stories.

Probe Errors. The only significant effect was that initial probes produced more errors than recent probes ($F1(1, 47) = 128$, $MSe= 148.39$, $p<.0001$), as shown in Figure 2.

DISCUSSION

The pattern of accessibility for the 1500 ms delay was partially similar to that observed at 500 ms. For both delays the initial information was more accessible for counterfactual than factual contexts, indicating that updating did not occur in the former and therefore the initial situation was still accessible. By contrast, in factual contexts updating occurred and the initial information became out of the linguistic focus. However, unlike in the previous experiment, after a delay of 1500 ms the accessibility of recent information was better in factual than counterfactual context, indicating that the "as if" simulation was less accessible than in the short delay of Experiment 1. In other words, the alternative simulation was relatively inhibited whereas the realistic simulation was still operating.

GENERAL DISCUSSION

The goal of Experiments 1 and 2 was to explore how updating processes are modified when counterfactual sentences are embedded in narratives, in comparison with control factual sentences with similar content. Initial-related and recent-related probes followed each experimental story at two delay conditions: 500 and 1500 ms. The manipulation of delay aimed at checking how the mere passing of time could modify the accessibility of information in otherwise identical experimental tasks and materials. This simple manipulation differs from that of de Vega et al.'s research (2007), in which the manipulation of delay involved a modification of the linguistic materials: in their Experiment 2 (short delay) the probe immediately followed the critical sentence, whereas in their Experiment 3 (long delay) there was an intervening sentence between the critical one and the probe.

The probe latencies in the short delay condition clearly showed that readers are immediately sensitive to the representational status of counterfactuals. In comparison with factual stories, readers of counterfactual stories have faster access to the introductory events demonstrating that the linguistic focus remains in the initial scenario and events (e.g., John in his office, sitting in front of computer, typing…). By contrast, immediately after reading a factual event the information belonging to the initial part of the story becomes less accessible, because the linguistic focus moves to the new scenario and events (e.g., John went to the cafeteria to drink a Coca-Cola). In other words, updating took place in factual contexts, but not in counterfactual contexts. These results are consistent with the hypothesis that, in spite of the grammatical complexity

of counterfactuals, their realistic meaning (the implicit not-p & not-q) is activated in the very first moment. Concerning the most recent events in the text, we expected that, at the short delay, they would be equally accessible both in counterfactual and factual contexts, because the "as if" meaning of counterfactuals is coincidental with the actual meaning of factual sentences. Surprisingly, recent events were more accessible in counterfactual than factual contexts, as suggested by the faster responses to the recent-related probes in the former than in the latter contexts. One possible explanation for this counterfactual advantage for recent information is that at the 500 ms delay readers of counterfactuals are dealing with the two alternative representations simultaneously, whereas it is possible that at this delay readers of factuals have already completed the processing of the factual meaning and they are engaged in top-down inference about the end of the story. For instance, after reading that the protagonist is in the cafeteria drinking a Coke, the reader of factual stories could get involved in script-based inference such as "he paid to the waiter", or similar. In other words, 500 ms delay is sufficient time to finish the updating process in factual stories and anticipate additional events, and this fact slows the response to the target. Of course, this is just a tentative explanation and further experiments would be necessary to replicate the phenomenon and explain it.

Concerning the long delay condition (Experiment 2), the pattern of accessibility partially changed, because a clear Context x Probe interaction was obtained. This interaction means that at 1500 ms delay the initial information still has the same accessibility trend than at 500 ms delay. Namely, the events in the initial scenario are more accessible in counterfactual than in factual stories, confirming again that counterfactual's realistic meaning prevents normal updating. However, the most recent information becomes less accessible in counterfactual than factual contexts reversing the trend observed at 500 ms delay. This result suggests than the counterfactual's alternative meaning is short-lived because it was active at 500 ms delay, but it was out of the linguistic focus at 1500 ms delay.

The results clearly support the view that counterfactuals activate a dual meaning, as defended by cognitive linguistic theories (e.g., Fauconnier, 1994; Langacker, 1991) and conditional reasoning data (e.g., Byrne, 2002, 2005; Johnson-Laird & Byrne, 2002; Santamaría et al., 2005; Thompson & Byrne, 2002). These approaches assume that readers of counterfactuals build a double representation, the "p & q" meaning and the "not-p & not-q" meaning. The former meaning is an "as if" simulation of the events in the counterfactual scenario. The negative "not-p & not-q" meaning is a realistic simulation in which the counterfactual events did not occur. The present study supports this proposal but, in addition, provides a more articulated

view of the temporal course of dual meaning. The two meanings seem to coexist in working memory for a while, as the accessibility data suggest. First, the relatively high accessibility of the initial scenario preceding the counterfactual suggests that readers have processed the implicit negation "not-p & not-q" and have kept activated (or they have reinstated) the initial situation model. Second, the relatively high accessibility of the final scenario indicates that the simulation of the "p & q" situation had also been constructed. However, after a certain delay (1500 ms) the unrealistic "as if" representation becomes out of focus.

The representation features of the two counterfactuals meanings cannot be established from the current experiments. One possibility is the propositional account of counterfactual meaning (Carpenter, 1973). According to this proposal, a sentence such as "If Mary had left, Judy would have died" triggers the activation of two meanings: a "complex" propositional representation of the negation truth-value (false [Mary left] & false [Judy died]) and a simplified propositional representation of the actual events ([Mary stayed] & [Judy lived]), and the two meanings have a different temporal course. Namely, at short delays people are likely focusing on the negated state of affairs (the complex proposition), but when given sufficient time they would shift to the realistic representation of the events. However, this proposal does not explain the current results, because even in the short delay we obtained that the "realistic" situation model was activated impeding updating. By contrast, this study supports the claim that two situation models are immediately activated, although they have different role in discourse processes: the situation model corresponding to the state of events (not-p & not-q) is the most prominent and readers are immediately aware of their status of reality, as indicates the fact that the initial situation is kept accessible. On its side, the alternative "as if" model does not contribute to updating and becomes less activated after long delays.

The present results with counterfactual meaning are comparable to those obtained with the processing of explicit negations (see Kaup & Zwaan, 2003; Kaup et al, 2006). These authors assume that negation is implicitly captured in the deviation between a factual simulation and a not-factual simulation. In their research they found that negated concepts keep accessibility at 750 ms delay, while they lose accessibility at 1500 ms delay because the actual state of events replaced the "counterfactual" representation of negated events. However, as discussed in the introduction, negations and counterfactuals differ qualitatively. In negations the activation of the negated events is a byproduct of lexical processing. For instance, "the door is not open" momentarily activates a representation of

the door open, because the impact of the negative operators is slower than the lexical access to "door" and "open". By contrasts, in counterfactuals the activation of the counterfactual events as well as the realistic events are both necessary to accomplish the psychological functions of counterfactual thinking and communication.

RESUMEN

Actualización del discurso tras la lectura de un evento contrafactual. Este artículo explora el curso temporal de la actualización del discurso tras la lectura de eventos contrafactuales. Para comprobar la accesibilidad de la información discursiva, los lectores debían identificar una palabra perteneciente al texto inicial, previo al contrafactual, o bien relacionada con los eventos contrafactuales. El Experimento 1 mostró que 500 ms después de leer eventos en formato contrafactual, los eventos iniciales eran más accesibles que después de leer los mismos eventos criticos en formato factual. Ello indica que se produce actualización del discurso en los contextos factuales, pero no en los contrafactuales. Sin embargo, los eventos críticos resultaron igualmente accesibles en ambos formatos, indicando que el escenario alternativo "como si" también se activó en los contrafactuales. El Experimento 2 demostró que los eventos iniciales continuaron accesibles 1500 ms después de leer los contrafactuales, pero el escenario alternativo "como si" se volvió menos accessible. En suma, los experimentos indicaron que el significado realista de los contrafactuales impide la actualización del discurso tanto en la etapa temprana como en la tardía mientras que el significado "como si" sólo se activó en la etapa inicial.

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