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Counterfactual thoughts about experienced, observed, and narrated events

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Four studies show that observers and readers imagine different alternatives to reality. When participants read a story about a protagonist who chose the more difficult of two tasks and failed, their counterfactual thoughts focused on the easier, unchosen task. But when they observed the performance of an individual who chose and failed the more difficult task, participants' counterfactual thoughts focused on alternative ways to solve the chosen task, as did the thoughts of individuals who acted out the event. We conclude that these role effects may occur because participants' attention is engaged when they experience or observe an event more than when they read about it.

Keywords: Counterfactual thinking; Role effects; Actor–observer effect; Observer–reader effect.

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Imagine you have the choice to invest in fund A or else in fund B. You end up choosing fund A. A year later, fund A has collapsed and fund B has rocketed to the top of its category. You are likely to think, "If only I had invested in fund B." When decisions yield bad outcomes, they evoke counterfactual "if only" thoughts about the alternative options. This tendency appears to be typical of normal decision making and counterfactual thinking (Byrne, 2005; Kahneman & Miller, 1996; Roese, 2005). A failure to compare the outcome of a chosen option and a rejected alternative can lead to maladaptive behaviour. For example, some patients with lesions to the orbitofrontal cortex are unable to make counterfactual comparisons between the negative outcome of the gamble they choose and the better outcome of the rejected gamble. Unlike controls, these patients persist in choosing gambles with a high probability of a negative outcome (Camille et al., 2004).

However, not all decisions imply that the decision maker simply selects one option and waits to see the resulting outcome. In many cases, from enrolling in a school to starting a new business, individuals select one option and then apply their effort (e.g., by studying, working), in order to obtain a positive outcome. These *choice plus performance* cases are common and important in real life. Yet previous research on counterfactual thinking has largely neglected them, possibly under the assumption that thinking about the outcome of a choice that did not require a performance is the same as thinking about the outcome of a choice that required the performance of an action or a task. But this assumption has been challenged by recent evidence (Girotto, Ferrante, Pighin, & Gonzalez, 2007). In one study participants chose one of two envelopes, to find the one containing a prize. When they failed they imagined having chosen the alternative (e.g., "If I had chosen the other envelope"). In another study participants chose one of two multiplication problems, to solve it and obtain a prize. When they failed they did not imagine having chosen the alternative, easier problem. Instead, they imagined they had attempted to solve the chosen, difficult problem in different ways (e.g., "If I had had a calculator"; "If I had had more time"). The results show that actors do not always mentally undo their *choice* to perform an action that has led to a negative outcome, but rather they change their performance itself.

However, readers create different counterfactuals from actors. A group of participants read a story whose protagonist (Anna) made the same choices and experienced the same negative outcomes as the actors in the previous studies. When they read a story in which Anna failed to select the envelope containing the prize, readers undid her choice (e.g., "If Anna had chosen the other envelope"). They also did so when they read a story in which Anna failed to solve the chosen, difficult problem (e.g., "If Anna had chosen the other problem"). The results show that, unlike actors, readers mentally

undo the choice to perform an action that was made by a hypothetical character, rather than her performance (see also Girotto, Legrenzi, & Rizzo, 1991; McCloy & Byrne, 2000).

What are the sources of this actor–reader role effect? One explanation is that the effect occurs because only actors are motivated to avoid self-blame for their deeds (Elster, 1999). Actors, however, modify their potentially blameworthy performance even when they are not responsible for choosing the difficult problem (Girotto et al., 2007). Another explanation can be derived from the traditional account of causal attribution, according to which actors attribute a given behaviour to the *situation* in which it occurs, whereas observers attribute it to the traits and disposition of the *person* who acted (Jones & Nisbett, 1972; but see Malle, Knobe, & Nelson, 2007). On such an account, actors modify the problem features because they focus on the situation, whereas readers, who could be considered to be a type of observer, modify the character's choice of the problem because they focus on the person. This account predicts that proper observers (i.e., participants who actually observe a real person's actions) should construct the same counterfactuals as readers. In particular, observers who witness an actor who fails to solve a problem should mentally undo the actor's choice, just as readers do. Our explanation is different. The actor–reader effect has been demonstrated in "choice plus performance" situations. Actors who choose and fail a given task tend to focus their attention on their own performance. Hence, they tend to think about the alternative ways to solve the task. In contrast, readers' attention is not absorbed by the details of the task, and their model of the situation is likely to represent only the choice and the negative outcome of the character's performance (see Liberman & Trope, 2008). Thus readers tend to think about the alternative task the character might have chosen. If our explanation is correct, then participants who play the role of observers should construct counterfactuals similar to those constructed by *actors*, not readers. Unlike readers who merely imagine the events described in the story, observers witness the actor's attempt to solve the chosen task. Thus, like actors, observers undergo a participatory experience that engages their attention, and keeps them from considering the alternative task the acting individual might have tackled. Hence, when observers are asked to imagine how things would have been better for the actor, they should be less likely than readers to think about the rejected task. We tested these predictions by comparing the counterfactuals of actors, observers and readers who were asked to think about the same outcome.

EXPERIMENT 1

Participants in the actor role experienced a negative outcome: they failed to solve a randomly chosen problem (Experiment 1a) or a deliberately

chosen one (Experiment 1b). They had to indicate how things would have been better for them. Participants in the reader role read a story in which the protagonist failed to solve a problem she had chosen, just like the participants in the actor condition. They had to indicate how things would have been better for the protagonist. Participants in the observer role watched an individual (a confederate) who behaved like participants in the actor condition and failed to solve a problem she had chosen. They had to indicate how things would have been better for the observed actor.

Experiment 1a

Method

Participants and design. In all of the experiments, participants were undergraduates from Trinity College Dublin (Experiment 1a) or the University IUAV of Venice (Experiments 1b, 2, 3) who participated voluntarily. In Experiment 1a the participants were 153 students randomly assigned to one of three conditions: actor ($n = 50$), observer ($n = 50$), and reader ($n = 53$).

Materials and procedure. In the reader condition, participants were required to read a story (from Girotto et al., 2007) and to complete its final sentence. It read as follows:

> Anna, an undergraduate at your university, was asked to participate in a game. A research assistant told her, "In order to win two chocolates, you have to mentally multiply either two one-digit numbers or two two-digit numbers, in 30 seconds. If you fail, you do not receive the chocolates. The two multiplication problems are contained in two sealed envelopes. Let's call them envelope A and envelope B. Of course, we do not know which envelope contains the one-digit multiplication problem and which one contains the two-digit multiplication problem." Anna accepted the offer to participate. She chose envelope A, and the research assistant opened it. Unfortunately, it contained the two-digit multiplication problem. She failed.

Participants were required to complete the sentence: "Things would have been better for Anna, if . . ."

In the actor condition, participants were invited to take part in a game in which they had the possibility to win two chocolates by solving a multiplication problem. The game was the same one described in the story above. They had to choose one of two envelopes. The experimenter informed them that one envelope contained a difficult multiplication problem and the other one an easy multiplication problem. In fact, unknown to participants, both envelopes contained a difficult problem (i.e., 68×76). No participants solved the chosen problem. After they had failed,

participants were required to complete the sentence: "Things would have been better for me, if . . ."

In the observer condition participants were required to observe an individual described as "the player" (a female confederate—the same individual for all participants) who took part in the game described above. Like participants in the actor condition, she chose an envelope, tried to solve the multiplication problem it contained (68×76) and failed by not providing any answer within 30 seconds. The player sat at a square table in front of the experimenter, while the participant in the observer role sat at one of the two free sides of the table, so that he or she saw the multiplication problem that the player attempted to solve. At the end of the game the player left the room, and the participant was required to complete the sentence: "Things would have been better for the player, if . . ."

In all of the experiments, participants were tested individually. The experimenter fully debriefed them and provided the justification for the mild deception employed in the actor and observer conditions.

Results

Responses that altered the protagonist's or actor's choice (e.g., "If I/the player/Anna had chosen the other envelope", "If I/the player/Anna had picked envelope B") were coded as *choice* modifications. Responses that altered the protagonist's or actor's behaviour or features (e.g., "If I/the player/Anna had concentrated better", "If I/the player/Anna had greater arithmetic skills") were coded as *agent* modifications. Responses that altered the problem features (e.g., "If I/the player/Anna had had pen and paper", "If I/the player/Anna had had more time", "If I/the player/Anna had had a calculator") were coded as *situation* modifications. The remaining responses were non-informative (e.g., "If I/the player/Anna had won the chocolates") or ambiguous (e.g., "If I/the player/Anna had had more luck"). They were coded as *other* modifications.[1]

Two independent judges coded the responses with an agreement rate that was always above 95%. Disagreements were solved via discussion. As in the past literature, we analysed only the first modification provided by each participant.[2] In all of the experiments, we analysed the data by means

[1]This four-category coding allowed us to test the role effects using a more fine-grained scoring than Girotto et al's (2007) three-category coding, wherein the agent and situation responses were combined as a *problem* modification category.

[2] We did not take into account responses falling into the *other* category, unless they were the only responses produced by a given participant. If a participant produced one or more *other* responses, and then a specific category of counterfactual, we scored the latter. In fact very few participants produced one or more *other* responses before a specific counterfactual. In Experiment 1a no participant in the actor and observer conditions produced a response of this

TABLE 1
Percentages of counterfactual modifications in the three groups of Experiment 1a

	Modification			
Group	*Choice*	*Agent*	*Situation*	*Other*
Actor	6	16	76	2
Observer	18	6	72	4
Reader	62	25	4	9

of a *G*-test, a log likelihood ratio test that approaches a χ^2 distribution (see, e.g., Sokal & Rohlf, 1995). In order to improve the exactness of the probability estimates we applied Williams' correction, henceforth indicated by q (Williams, 1976), to G statistics, henceforth indicated by G^2.

There was a significant difference between the three conditions, $G^2(6, N = 153) = 88.94$, $q = 1.04$, $p = 3 \times 10^{-16}$. Actors' and observers' counterfactuals did not differ significantly from each other, $G^2(3, n = 100) = 5.89$, $q = 1.09$, $p = .14$, but they differed from readers' counterfactuals, $G^2(3, N = 153) = 83.05$, $q = 1.04$, $p = 4 \times 10^{-17}$. As predicted, actors and observers changed the situation more often than readers did (74% combined vs 4%, see Table 1), $G^2(1, N = 153) = 80.45$, $q = 1.01$, $p = 5 \times 10^{-19}$. Thus they changed the choice (12% combined vs 62%) less often than readers did, $G^2(1, N = 153) = 41.74$, $q = 1.01$, $p = 1 \times 10^{-10}$. They also changed the agent (11% combined vs 25%) less often than readers did $G^2(1, N = 153) = 4.58$, $q = 1.02$, $p = .03$.

Experiment 1b

In Experiment 1a the actors made a blind choice between the easy problem and the difficult one. To test whether the role effects generalise to situations in which an actor makes an informed choice, in Experiment 1b the actors deliberately choose to tackle the difficult problem, rather than the easy one, because they hoped to obtain a greater reward.

Method

Participants were randomly assigned to one of three conditions. The actor condition ($n = 69$) was the same as in Experiment 1a, except that the participants had to choose to tackle either an easy or a difficult deductive problem in 20 seconds. Solving the easy problem resulted in a prize of 1 euro.

kind, and only two participants in the reader condition did. The rate of these responses was extremely low in the other experiments too.

Solving the difficult problem resulted in a prize of 7 euros. We chose deductive problems based on height relations rather than multiplication problems because we wanted to avoid the possibility that participants would simply refuse to choose the more difficult problem. Individuals often have strong beliefs about their ability to solve multiplication problems which could lead them to choose only an easy one, whereas individuals tend not to have a priori beliefs about their ability to solve deductive problems based on height relations. Participants were informed that the easy problem presented two premises describing the height relations between three individuals, and that the difficult problem presented four premises describing the height relations between five individuals. In both cases the participants' task was to order the individuals by height, from tallest to shortest. The easy problem was: "Luca is shorter than Franca, Luca is taller than Antonio. The series is …". The difficult one was: "Antonio is shorter than Luca, Elena is shorter than Franca, Elena is taller than Luca, Mario is taller than Franca. The series is …". The observer ($n = 50$) and reader ($n = 29$) conditions were changed accordingly (i.e., the confederate/Anna deliberately chose the more difficult problem with the larger prize, and failed it). A total of 21 participants preferred the easy problem and were excluded from the analysis, leaving 48 participants in the actor condition.

Results

We scored the responses with the four-category coding. The responses were similar to those obtained in Experiment 1a (with the minor exception that participants in some cases referred to the syllogistic nature of the task, e.g., "If I/the player/Anna had ordered the individuals from the tallest to the smallest, rather than vice versa").

There was a significant difference between the three conditions, $G^2(6, N = 127) = 45.36$, $q = 1.25$, $p = 3 \times 10^{-6}$. Actors' and observers' counterfactuals did not differ significantly from each other, $G^2(3, n = 98) = 2.77$, $q = 1.19$, $p = .51$. But they differed from readers' counterfactuals, $G^2(3, N = 127) = 42.58$, $q = 1.28$, $p = 3 \times 10^{-7}$. Once again, actors and observers

TABLE 2
Percentages of counterfactual modifications in the three groups of Experiment 1b

	Modification			
Group	*Choice*	*Agent*	*Situation*	*Other*
Actor	10	40	50	0
Observer	10	28	60	2
Reader	72	10	17	0

Percentages do not always sum to 100 because of rounding.

changed the situation more often than readers did (55% combined vs 17%, see Table 2), $G^2(1, N = 127) = 13.92$, $q = 1.02$, $p = .0002$. Thus they changed the choice less often than readers did (10% combined vs 72%), $G^2(1, N = 127) = 42.41$, $q = 1.03$, $p = 1 \times 10^{-10}$. They also changed the agent more often than readers did (34% combined vs 10%), $G^2(1, N = 127) = 6.93$, $q = 1.02$, $p = .01$.

EXPERIMENT 2

In Experiments 1a and 1b actors were asked to imagine how things would have been better for them, whereas observers and readers were asked to imagine how things would have been better for the agent. In Experiment 2 we tested whether role effects generalise to situations in which all participants take the agent's perspective. We compared the counterfactuals produced by actors, observers who had to adopt the actor's perspective, and readers who had to adopt the perspective of the protagonist of the story.

Method

Participants were randomly assigned to one of three conditions. In the actor condition ($n = 30$) the procedure was the same as in Experiment 1a. In the observer ($n = 22$) and reader ($n = 27$) conditions the procedure was the same as in Experiment 1a, except that the participants were asked to carry out the following task: "Imagine being the player. How do you think that she would complete the following sentence 'Things would have been better for me if . . .'?" or "Imagine being Anna. How do you think that Anna would complete the following sentence 'Things would have been better for me if . . .'?"

Results

There was a significant difference between the three conditions, $G^2(6, N = 79) = 28.80$, $q = 1.14$, $p = .0003$. Actors' and observers' counterfactuals did not differ significantly from each other, $G^2(3, n = 52) = 0.37$, $q = 1.06$, $p = .95$, but they differed from readers' counterfactuals, $G^2(3, N = 79) = 28.43$, $q = 1.12$, $p = 1 \times 10^{-5}$. Once again, actors and observers changed the situation more often than readers did (77% combined vs 19%, see Table 3), $G^2(1, N = 79) = 25.92$, $q = 1.02$, $p = 5 \times 10^{-7}$. Thus they changed the choice (12% combined vs 48%) less often than readers did, $G^2(1, N = 79) = 12.58$, $q = 1.03$, $p = .0005$. Their agent modifications did not significantly differ from the readers' ones (12% combined vs 26%).

TABLE 3
Percentages of counterfactual modifications in the three groups of Experiment 2

	Modification			
Group	*Choice*	*Agent*	*Situation*	*Other*
Actor	10	10	80	0
Observer	14	14	73	0
Reader	48	26	19	7

Percentages do not always sum to 100 because of rounding.

EXPERIMENT 3

Observers create counterfactuals that change an actor's performance, e.g., "If the actor had had more time . . .", just as actors do. But in the preceding experiments observers saw the problem tackled by the actor and they might have tried to solve it themselves. They may imagine alternatives to the actor's performance on the task because they have actually performed the task themselves. If this "experience-sharing" explanation is correct, then observers who do not see the problem, cannot attempt to solve it, and will not create counterfactuals that focus on it. Instead, they will undo the actor's choice, just as readers do. Conversely, readers who are told the content of the problem will attempt to solve it and will create counterfactuals that focus on it, just as actors do. To test this possibility, Experiment 3 compared the counterfactuals produced by actors, observers and readers who had to solve the problem chosen by the acting individual, and observers and readers who did not know the content of the problem.

Method

Participants were randomly assigned to one of five conditions. In the actor condition ($n = 22$), the procedure was the same as in Experiment 1a. In the *active observer* condition ($n = 27$), the experimenter opened the envelope chosen by the player and asked the participants to solve the same problem, at the same time and with the same constraints as the player did. After the player had failed the problem by not providing any answer and had left the room, participants were required to complete the sentence, "Things would have been better for the player, if . . ." They were not required to state their answer to the multiplication problem until after they completed the counterfactual. None of them stated the correct answer. In the *passive observer* condition ($n = 32$), the experimenter opened the envelope chosen by the player without showing its contents to the participants, who simply observed what the player did. The rest of the procedure was the same as in

the *active observer* condition, with the exception that participants did not have to state any answer to the multiplication problem. In the *active reader* condition ($n = 34$), participants read a version of the story about Anna up to the point at which the multiplication problem contained in the chosen envelope (i.e., 68×76) was described. At this point the experimenter asked participants to solve the problem mentally in 30 seconds. When the time was up, the experimenter provided participants with the final part of the story, which described Anna's failure, and asked them to complete the sentence "Things would have been better for Anna, if ..." They were not required to state their answer to the multiplication problem until after they completed the counterfactual. None of them stated the correct answer. In the *passive reader* condition ($n = 32$), the procedure was the same as in the reader condition of Experiment 1a.

Results

There was a significant difference between the five conditions, $G^2(12, N = 147) = 41.17$, $q = 1.07$, $p = .0001$. The two observer conditions did not differ significantly from each other, $G^2(3, n = 59) = 2.79$, $q = 1.19$, $p = .51$, nor from the actor condition, $G^2(3, n = 81) = 3.87$, $q = 1.25$, $p = .38$. The two reader conditions did not differ significantly from each other, $G^2(3, n = 66) = 0.71$, $q = 1.06$, $p = .88$. But actors' and observers' counterfactuals were different from readers' counterfactuals, $G^2(3, N = 147) = 33.80$, $q = 1.03$, $p = 4 \times 10^{-7}$. Once again, actors and observers changed the situation more often than readers did (47% combined vs 12% combined, see Table 4), $G^2(1, N = 147) = 21.96$, $q = 1.02$, $p = 3 \times 10^{-6}$. Thus they changed the choice less often than readers did (21% combined vs 56% combined), $G^2(1, N = 147) = 19.56$, $q = 1.01$, $p = 1 \times 10^{-5}$. Their agent modifications did not differ significantly from the readers' ones (31% combined vs 23% combined).

TABLE 4
Percentages of counterfactual modifications in the five groups of Experiment 3

	Modification			
Group	*Choice*	*Agent*	*Situation*	*Other*
Actor	14	23	64	0
Active Observer	26	26	44	4
Passive Observer	22	41	38	0
Active Reader	53	24	12	12
Passive Reader	59	22	13	6

Percentages do not always sum to 100 because of rounding.

GENERAL DISCUSSION

When participants read a story about a protagonist who tackled the more difficult of two problems and failed it, they created counterfactuals that changed the protagonist's *choice*, by thinking about the alternative, easier problem. But when they observed an individual who tackled and failed the difficult problem, they created counterfactuals that changed the actor's *performance*, by thinking about alternative ways to solve the problem, just as actors did (Experiment 1a). We obtained this effect even when the acting individuals deliberately chose the difficult problem (Experiment 1b), when the readers imagined being the acting individual (Experiment 2), and when the observers did not know the content of the chosen problem and the readers did (Experiment 3). The experiments show that observers of a bad outcome imagine different alternatives to reality than individuals who read about it.

The experiments examined a variety of conditions. Yet each of them produced the same pattern of results: actors and observers produced counterfactuals that were different from readers' ones. In a final analysis, we merged the responses produced by the 150 actors, 181 observers, and 175 readers in the four experiments. Figure 1 shows the percentages of their various counterfactual modifications.

As indicated by the figure, the order of importance of the three main categories of responses produced by actors (i.e., situation, agent, choice) is

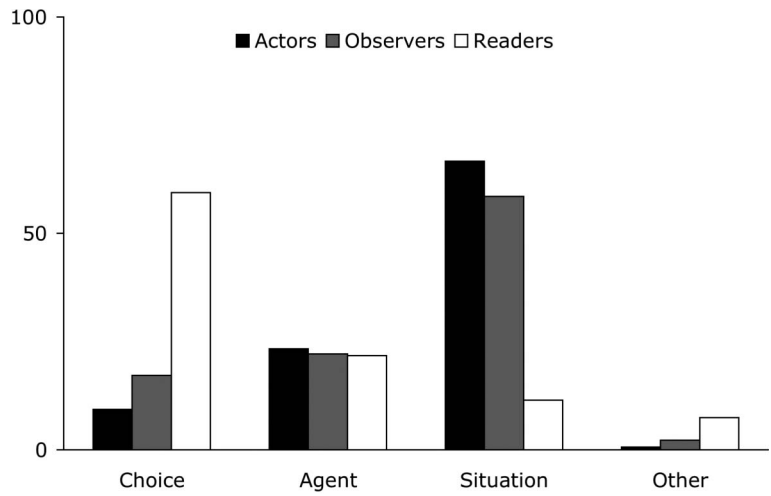

Figure 1. Percentages of counterfactual modifications elicited by the three roles (actor, observer, reader) across experiments.

the inverse of the corresponding order in the readers' responses. Moreover, no experiment yielded a significant difference between actors' and observers' responses. However, an analysis of the responses obtained in all the experiments overall reveals that actors may have produced counterfactuals that marginally differ from those produced by observers, $G^2(3, n = 331) = 6.11$, Williams' correction $q = 1.04$, $p = .11$.

Figure 1 shows that the pattern of the observers' responses is always in between those of actors and readers. One interpretation of this feature of the results is that not all observers answered like actors. Suppose that half of the observers answered like the actors, and the other half answered like the readers. In this case the pattern of the observers' responses would be the average of actors' and readers' responses. To test this interpretation we tested a straightforward model of the possible sources of observers' counterfactuals: Let p_{Act} be the probability distribution of the actors' counterfactuals, and p_{Read} the probability distribution of the readers' counterfactuals. The model of the observers' answers hypothesises that the probability distribution of their counterfactuals, namely p_{Obs}, equals $e.\, p_{\mathrm{Act}} + (1 - e).\, p_{\mathrm{Read}}$, where e is the probability that they answer like actors and $1 - e$ is the probability that they answer like readers. Following this model, an estimation of the parameter e that maximises the likelihood of our data is about .84. In order to test the goodness of fit of the model to the data we computed a G^2 statistic[3] (asymptotically distributed like a chi-square when the data obey the present model, see, e.g., Riefer & Batchelder, 1988). In the present case $G^2(2, N = 506) = 0.30$, $p = .86$. This result shows that the model of the observers' answers fits almost perfectly the responses obtained: a proportion of 5/6 of observers behaved like actors. We can conclude from this analysis that not *all* observers behave like actors, but almost all of them do (5/6 of them).

The results show that role effects in counterfactual thinking cannot be explained by an actor–observer attributional hypothesis that actors have a generic preference for situation-based counterfactuals whereas non-actors have a preference for person-based counterfactuals (see Jones & Nisbett, 1972). Both observers and readers were non-acting individuals. Yet, observers—unlike readers—tended to construct situation-based counterfactuals about the problem-solving phase rather than person-based

[3] This G^2 statistic equals the natural logarithm of the square of the ratio of two likelihoods; that is, the maximum likelihood of the data when p_{Obs} is left unspecified (free data), and the maximum likelihood of the data when the model specifies p_{Obs}. Concerning free data, the observers' responses have three degrees of freedom because we consider four categories of response. Concerning the data based on the model, the observers' responses have only one degree of freedom, which corresponds to the free parameter e. The difference in degrees of freedom of the data introduced by the model, that is $3 - 1 = 2$, defines the degrees of freedom of the G^2 statistic.

counterfactuals about the actor's choice of the problem. These results parallel Malle et al.'s (2007) finding that there is no generic actor–observer asymmetry in causal attribution.

Our interpretation of these role effects is based on the different attentional focus of actors and observers on the one hand, and readers on the other hand. When actors tackled the problem, they engaged in various cognitive activities (e.g., they applied strategies, checked and recalled the intermediate results, monitored the time left, and so on). Thus they did not tend to think about the simpler problem they might have tackled. Likewise observers, including those who did not know the content of the problem (Experiment 3), focused their attention on the actor's attempt to solve the chosen problem. Hence, they did not tend to think about the alternative problem. In contrast, the attention of readers, including readers who knew the content of the problem (Experiment 3), was not absorbed by the details of the task, and so readers were not limited by the same attentional constraints as actors and observers. Hence, compared to actors and observers, readers were more likely to think about the alternative, unchosen problem.

A previously reported result supports this interpretation: Actors who chose a problem and, before knowing its content, had to *imagine* tackling and failing it, undid their choice, just as readers did (Girotto et al., 2007, Study 5). Similar differences have been reported for other forms of judgement (Gilbert & Wilson, 2007). For example, actual and imagined experiences often produce different hedonic evaluations, perhaps because actual experiences consume attention to a greater extent than imagined ones (Morewedge, Gilbert, Myrseth, Kassam, & Wilson, 2010; Novemsky & Ratner, 2003), or elicit a more detailed representation of the means necessary to reach a goal and the constraints governing it (Liberman & Trope, 2008). Our results show that observing an event may be closer to actually experiencing the event, compared to reading a description of it. The finding parallels the recent discovery that individuals who observe another person's action may falsely remember having performed it, unlike those who read a description of it (Lindner, Echterhoff, Davidson, & Brand, 2010). The finding also fits with neuro-imaging evidence that observing the regretful outcome of another person's choice activates a subset of the brain regions associated with a personal experience of regret (Canessa et al., 2009; Canessa, Motterlini, Alemanno, Perani, & Cappa, 2011).

Our results lead to three conclusions. First, individuals do not always create counterfactuals that undo a *choice* that has led to a negative outcome. When they think about an event that requires a choice and a performance, they often imagine how their *performance* might have produced a better outcome (see also McCrea, 2008, Study 2). Second, individuals with different roles differ in their imagination of alternatives to the same events:

there is a strong observer–reader effect, as well as an actor–reader effect (Girotto et al., 2007). Third, scenario studies, in which participants occupy the role of readers, offer an incomplete view of counterfactual thinking. For example, readers undo the outcome of a scenario by altering antecedents that are under the protagonist's direct control, rather than those that are not under his or her control (Girotto et al., 1991). Our participants did the same when they occupied the role of readers (e.g., "If Anna had chosen the other problem"). And actors do the same when they think about simple choices (e.g., "If I had selected the envelope containing the prize", see Girotto et al., 2007, Study 6). But our actors and observers did not. They had to think about events that contained a choice and a performance, and they modified uncontrollable antecedents, such as the rules of the game (e.g., "If I/the player had had a calculator"), rather than controllable antecedents, such as the choice of the problem. Controllability may shape actors' and observers' counterfactuals to a lesser extent than readers' ones. Current explanations of counterfactual thinking have heavily relied on scenario-based counterfactuals, on the implicit assumption that the way in which individuals acquire information—through reading, observing, or acting—does not affect their counterfactual thoughts. Our results necessitate a reappraisal of such accounts.

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