

# Thinking Counterfactually – How Controllability Affects the ‘Undoing’ of Causes and Enablers

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## Abstract

Previous research on counterfactual thoughts about prevention suggests that people tend to focus on enabling rather than causing agents. However, research has also demonstrated that people have a preference for mutating controllable events. We explore whether counterfactual thinking about enablers is distinct from ‘undoing’ controllable events. We presented participants with scenarios in which a cause and an enabler contribute to a negative outcome. Participants were randomly assigned to one of four groups in which we systematically manipulated the controllability of the cause and the enabler. Participants generated counterfactuals which focused on the cause or the enabler and completed blame ratings for the cause and the enabler. The results indicate that participants had a preference for mutating the enabling relation, apart from in one condition where the cause was controllable and the enabler was uncontrollable. Participants tended to assign more blame to the cause than the enabler, regardless of controllability. The findings are discussed in the context of previous research on causal and counterfactual thinking.

**Keywords:** counterfactuals; causality; enabling conditions

## Introduction

The ability to consider what might have been (e.g., if I had arrived earlier I would have prevented the accident) is an important and pervasive part of everyday thought (e.g., Kahneman & Tversky, 1982; Byrne, 2005). Counterfactual thinking has implications for how we assign blame (Creyer & Guerhan, 1997), and in emotions such as guilt, shame and regret (Mandel, 2003). It is also important in helping people to learn from past mistakes (Roese, 1994). Counterfactual conditionals have been studied by philosophers (e.g., Lewis, 1973), linguists (e.g., Athanasiadou & Dirven, 1997), psychologists (e.g., Kahneman & Tversky, 1982) and used in politics (e.g. Tetlock & Belkin, 1996) and artificial intelligence (e.g., Costello & McCarthy, 1999).

Several decades of research into counterfactual thinking have revealed that the counterfactuals people generate in response to unexpected events follow regular patterns. Counterfactuals tend to focus on exceptional rather than routine events (Kahneman & Tversky, 1982), socially undesirable actions, rather than socially acceptable actions, (e.g., McCloy & Byrne, 2000; N'gbala & Branscombe,

1995), actions rather than inactions (Kahneman & Tversky, 1982) and the first event in a dependent causal sequence of events (Wells, Taylor, & Turtle, 1987).

People's counterfactual thoughts also tend to be about controllable rather than uncontrollable events, such as being home late due to the decision to go to the gym compared to being delayed due to having an asthma attack (Giroto, Legrenzi, & Rizzo, 1991). Previous research has also demonstrated that people focus on undoing enabling relations, rather than causes, in their counterfactual thoughts (N'gbala & Branscombe, 1995; Mandel & Lehman, 1996). Causes are the events that bring about an outcome, such as a spark that causes a fire, whereas enablers are the events that make it possible for a cause to have its effect, such as oxygen that makes it possible for the spark to cause a fire. However, it is not clear why this preference to think counterfactually about enablers exists. One possibility is that causes and enablers are fundamentally different. Another possibility, which we explore in this paper, is that enablers may be more controllable than causes.

## Causal and counterfactual thinking

There has been a long standing controversy over how people distinguish between causes and enabling conditions (or enablers). A number of characteristics have been identified according to which causes and enablers tend to differ. Enablers tend to be constant (e.g., oxygen) and causes inconstant (Cheng & Novick, 1991), enablers also tend to be normal whereas causes tend to be out of the ordinary (Hart & Honoré (1959/1985) and furthermore, causes tend to be conversationally relevant whereas enablers tend not to be (Hilton & Erb, 1996). The problem with distinguishing between causes and enablers in this way is that these differences do not always explain the difference (e.g., Cheng & Novick, 1991, Goldvarg & Johnson-Laird, 2001). Consider the following scenario: *Laura threw a lighted cigarette into a bush. Just as the cigarette was going out, Mary threw petrol on it. The resulting fire burnt down the neighbor's house.* In this case both the enabler (the cigarette) and the cause (the petrol) are conversationally relevant, out of the ordinary and inconstant. There appears to be a difference between causes and enablers that goes beyond a simple distinction along some characteristics.

The mental model theory distinguishes between causes and enablers in a different way (Goldvarg & Johnson-Laird, 2001). Accordingly, causes and enablers are consistent with different possibilities and as a result they differ in meaning and in their logical implications. Causes are consistent with the following three possibilities: 'cause and outcome', 'no cause and outcome' (an alternative cause produced the outcome) and 'no cause and no outcome'. Enablers are consistent with three different possibilities: 'enabler and outcome', 'enabler and no outcome', and 'no enabler and no outcome' (Goldvarg & Johnson-Laird, 2001). Frosch and Byrne (2006) also demonstrated that causes and enablers prime different possibilities. Hence, previous research demonstrates that people keep different possibilities in mind for causes and enablers.

Causal and counterfactual thinking are closely linked as counterfactual thoughts about how events could have turned out differently are often of a causal nature. In order for counterfactual thoughts about how an outcome could have been different to make sense people must perceive a causal connection between the antecedent of the conditional and the consequent. For example a counterfactual such as 'if the sky had not been blue Peter would not have broken the chair' does not make sense unless people can perceive a causal link between the sky being blue and Peter breaking the chair. However, a counterfactual such as 'if Mary had taken the shortcut then she would have arrived on time' makes sense as people can immediately see the causal connection between the antecedent ('Mary took the shortcut') and the consequent ('she arrived on time').

Psychologists have recognized that the relation between causal and counterfactual thoughts is complex (Byrne, 2005). The relation between causal and counterfactual thoughts is in fact bidirectional. Causal relations imply certain counterfactuals and counterfactuals allow people to distinguish between correlation and causation by allowing them to assess whether an effect would have occurred had a particular event not happened (Sloman, 2005). Philosophers have also long debated the relation between causal and counterfactual thinking. Lewis (1973) suggests that a cause is something that makes a difference, a difference which would not have occurred had the cause not been present.

Counterfactual thoughts influence beliefs about causality. Consider a story in which a couple, who were refused a lift by a taxi driver, died when their car drove off a collapsed bridge. People attribute a causal role to the taxi driver who refused them a lift when they know he drove across the bridge safely (and so they can think, 'if only he had given them a lift') but not when they know he also drove off the collapsed bridge (Wells & Gavanski, 1989). But people focus on different events when they think about the cause of the outcome, the collapsed bridge, and when they think about counterfactual alternatives, 'if only the taxi driver had given them a lift' (Mandel & Lehman, 1996). Counterfactual thoughts may tend to focus on enabling relations and thus focus on how an event could have been

prevented whereas causal thoughts focus on strong causes (Byrne, 2005).

### **Controllability or enablers?**

Research on counterfactual thinking has revealed certain regularities in the events people choose to mutate (see Byrne, 2005 for a review). As we have already indicated, one of these regularities is that people tend to generate counterfactuals about enablers (e.g., if only the 9/11 terrorists had been prevented from getting on board) rather than about causes (e.g. if only the terrorists had had second thoughts). The question arises of whether people tend to mutate enablers because there is something special about them (e.g. Byrne, 2005) or whether enablers just tend to be perceived as more controllable. In the example above perhaps preventing the terrorists from boarding the plane is perceived as being more 'controllable' than the terrorists having second thoughts, and this is the reason why the enabler is undone rather than the enabler being special. Although previous research has indirectly addressed this question (e.g., N'gbala & Branscombe, 1995, Mandel & Lehman, 1996), methodological weakness such as the use of single scenarios, immoral causes or manipulating only the controllability of the enabler make it difficult to draw specific conclusions from these findings.

## **Experiment**

The primary aim of this experiment was to examine how controllability affects the generation of counterfactuals about causes and enablers. In order to achieve this we systematically manipulated the controllability of both a cause and an enabler in bringing about a negative outcome in a series of scenarios. In addition, we also examined how blame ratings, foreseeability, and social acceptability ratings for each of the antecedent actions were related to the counterfactuals participants generated. Previous research indicates that these factors are related to counterfactual thinking (e.g. Mandel & Lehman, 1996, N'gbala & Branscombe, 1995, Lagnado & Channon, in submission).

### **Method**

**Materials and Design** We first conducted a pilot study to identify suitable materials. There has been some debate over how people distinguish between causes and enablers (e.g., Goldvarg & Johnson-Laird, 2001) so we wanted to ensure that our materials clearly conveyed the two sorts of causal relations. We generated 18 vignettes which described two antecedent actions and a negative outcome (see Table 1). In each vignette we manipulated the controllability of each of the two causal events, which resulted in four different versions of each vignette: A. controllable cause and enabler, B. controllable cause and uncontrollable enabler, C. uncontrollable cause and enabler and D. uncontrollable cause and controllable enabler. All four versions of a scenario resulted in the same negative outcome.

Table 1: Controllable and uncontrollable causes and enablers in a sample scenario

	Controllable	Uncontrollable
Cause	Anne decided to park on a double yellow line near the office building as this was the closest place to park.	Anne decided to park on a double yellow line near the office building because it was an emergency and there was nowhere else to park.
Enabler	On the way back to the car Anne bumped into her friend and stopped for a chat.	On the way back to the car Anne urgently needed to use the bathroom and returned to the office building.
Outcome	When Anne returned to the car she saw she had just been given a ticket.	

We used a within participants design for the pilot study and thus each participant saw at least four vignettes from each condition. For some of the materials the enabling action preceded the causal action and for some the causal action preceded the enabling action. We also included four filler items which described either two causes, or a cause and an irrelevant action.

Participants were asked whether each of the two antecedent actions caused, enabled or had nothing to do with the outcome. At the top of each page we printed a definition for cause and enabler. It read as follows: ‘A cause brings about an outcome. An enabler makes it possible for an outcome to occur’. Participants were then asked to judge how controllable each of the actions was. These judgments were made on 7 point rating scales. We tested 31 Psychology students who took part for course credit. There were 29 women and 2 men with a mean age of 24 (range 18-51 years).

For the main experiment, we identified 8 vignettes (see Appendix) for which participants identified cause and enabler with an average accuracy of 77% with a minimum acceptable level of 70%. The results of the controllability scales indicated that the causes and enablers were controllable (5.91 and 6.31) or uncontrollable (3.54 and 3.97) as appropriate. We employed a between participants design and thus each participant was tested in only one of the four conditions; A: controllable cause and enabler (n = 19); B: controllable cause and uncontrollable enabler (n = 20); C: uncontrollable cause and enabler (n = 20); D: uncontrollable cause and controllable enabler (n = 19). Participants were asked to generate a counterfactual in response to each scenario, by completing the following sentence: “Things could have turned out differently: ‘If only’...”. We also gave participants a number of rating scales where we asked them to judge how causal each of the two antecedent events was, how much each of the events was to blame, how much they contributed to the outcome, how socially acceptable, and how foreseeable they were.

**Participants** We tested 78 Psychology students who took part for course credit. There were 69 women and 9 men with a mean age of 21 (range 18-51 years).

**Procedure** Participants completed the booklets in groups of up to 10 people. The experiment was divided into two parts. In the first part participants saw each of the eight vignettes and generated a counterfactual for each. In Part 2, they saw each vignette again (in different random orders) and were asked to answer the remaining questions (which were presented in different orders).

## Results

The counterfactuals generated in the first part of the experiment were categorised as mutating either the cause, the enabler, both or other. Ninety-four percent of the counterfactuals generated either mutated the cause or the enabler, so our analysis focuses on these two categories. As can be seen in Figure 1, overall participants generated significantly more counterfactuals about enablers than causes (56% vs. 38%),  $t(77) = 3.58, p = .001$ , and this was the case for groups A, C and D ( $t(18) = 2.38, p = .029$ ;  $t(19) = 2.37, p = .029$ ;  $t(18) = 9.03, p < .001$ , respectively). In group B (cause controllable, enabler uncontrollable) participants generated significantly more counterfactuals about causes than enablers (57% vs. 37%),  $t(19) = 2.46, p = .024$ .

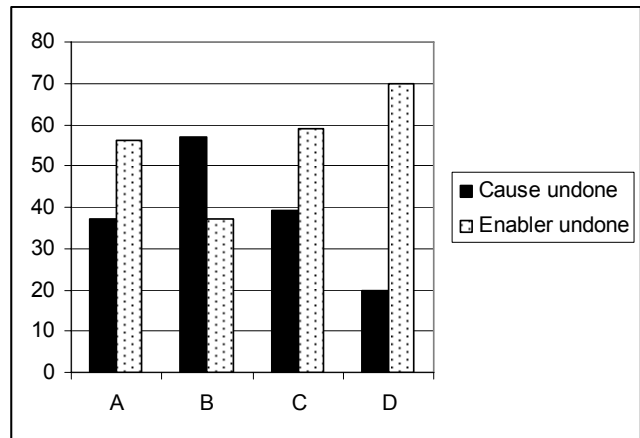


Figure 1: Percentages of counterfactuals relating to causes and enablers in each of the four conditions

Results indicate that there was a significant difference between the four groups in the number of counterfactuals generated about causes,  $F(3,77) = 15.08, p < .001$ . Post hoc tests (Tukey) revealed that significantly more counterfactuals about causes were generated for version B (57%, cause controllable, enabler uncontrollable), than in the other versions,  $p \leq .003$  and the least generated were for version D (20%) (cause uncontrollable, enabler controllable),  $p \leq .016$ . There was no significant difference in the number of counterfactuals generated about causes for

versions A (37%, controllable cause and enabler) and C (39%, uncontrollable cause and enabler),  $p = 1.00$ .

Results for enablers similarly indicate that there was a significant difference between the four groups in the number of counterfactuals generated,  $F(3,77) = 8.39, p < .001$ . Post hoc tests (Tukey) showed that this difference was due to group B generating significantly less counterfactuals about enablers than any of the other groups (37%),  $p \leq .03$ . Similar to the causes there was no significant difference in the number of counterfactuals generated about enablers for versions A (56%, controllable cause, controllable enabler) and C (59%, uncontrollable cause, uncontrollable enabler),  $p = 1.00$ . Although participants receiving version D tended to generate more counterfactuals about enablers than the other three versions this only reached significance when compared to version B,  $p < .001$ .

Table 2: Mean ratings for the rating scales (measured on 7-point rating scale)

	A	B	C	D
<b>Cause blame</b>	5.96*	6.04*	5.08*	4.95
<b>Enabler blame</b>	4.05	3.44	3.79	4.67
<b>Cause acceptability</b>	2.62*	2.45*	3.22*	3.47*
<b>Enabler acceptability</b>	4.97	5.07	4.59	4.38
<b>Cause causality</b>	5.51*	5.43*	5.38*	5.29*
<b>Enabler causality</b>	4.24	4.13	4.46	4.73
<b>Cause foreseeability</b>	5.39*	5.36*	5.03*	4.69*
<b>Enabler foreseeability</b>	3.09	3.17	3.26	3.69
<b>Cause contribution</b>	6.36*	6.38*	6.11*	5.81*
<b>Enabler contribution</b>	4.51	4.00	4.64	5.03

\* Significantly different to figure directly below

A: cause and enabler both controllable

B: cause controllable and enabler uncontrollable

C: cause and enabler both uncontrollable

D: cause uncontrollable and enabler controllable

The mean ratings participants assigned for causes and enablers on the five rating scales are presented in Table 1. Participants assigned more blame to causes than enablers overall (5.51 vs. 3.98),  $t(77) = 10.60, p < .001$ . This was the case for versions A, B and C but not D:  $t(18) = 11.62, p \leq .001$ ;  $t(19) = 9.30, p \leq .001$ ;  $t(19) = 7.47, p \leq .001$ ;  $t(18) = 1.21, p = .244$ , respectively.

Participants also assigned more blame to controllable than uncontrollable events for both causes (A&B vs. C&D: 6.00 vs. 5.01),  $t(76) = 5.80, p < .001$ , and enablers (A&D vs. B&C: 4.46 vs. 3.62),  $t(17) = 4.69, p < .001$ .

Overall, causes were rated as more socially unacceptable than enablers (2.94 vs. 4.75),  $t(76) = 13.63, p < .001$ , and more foreseeable in bringing about the outcome (5.13 vs. 3.30),  $t(76) = 17.98, p < .001$ . They were also rated as making a greater contribution to the outcome (6.17 vs. 4.54),  $t(77) = 15.65, p < .001$ , and as having greater causality than enablers (5.40 vs. 4.39),  $t(76) = 5.36, p < .001$ . These results held for all four groups,  $p \leq .022$ .

## Discussion

The aim of the experiment was to examine whether the tendency to generate counterfactuals about enablers was due to the specific nature of enabling relations or whether it was more closely related to controllability. The results of our experiment suggest that when the controllability of causes and enablers is perceived to be comparable, i.e., both controllable or both uncontrollable, then participants had a preference to generate counterfactuals about the enabler. It was only in one condition, where the cause was controllable and the enabler was uncontrollable, that participants tended to generate counterfactuals about the cause rather than the enabler. These results therefore suggest that, all things being equal, people do prefer to generate counterfactuals about enablers rather than about causes.

Byrne (2005) provides an explanation for why enablers tend to be more mutable than causes. She proposes that enablers are understood by keeping in mind two possibilities; enabler & outcome and no enabler & no outcome; whereas causes tend to be understood by keeping in mind only one possibility; cause & outcome. As a result it is easier for people to think counterfactually about an enabler than about a cause.

An alternative explanation for why enablers are more mutable is that because enablers are not consistent with the possibility 'no enabler outcome' and causes are consistent with the possibility 'no cause outcome' people should recognise that the enabler is necessary for the outcome whereas the cause is not. Enablers tend to be preconditions and without them the cause will not have its effect. An enabler makes it possible for a cause to have its effect, when an enabler is removed then the cause can happen and it will not have the same effect, e.g. in one of the scenarios used in the experiment someone wore inappropriate shoes on a building site and as a consequence he broke his toe when a bag of cement was dropped on his foot, if we now imagine the same scenario without the wrong shoes then dropping the bag on his foot loses its potency. Here we might be getting to the heart of the matter, the relationship between causes and enablers is not a conjunctive one, instead the two factors are dependent on one another to have their effect. The cause cannot produce an effect without the presence of the appropriate enabler.

Causal model theory (e.g. Sloman, 2005) assigns a central role to intervention. Mandel and Lehman (1996) argue that counterfactuals are more about how someone personally can prevent a similar outcome in the future and intervene whereas causal thoughts aid the prediction of events. Perhaps intervening on an enabler is somehow easier or requires less intervention than intervening on a cause. The question still arises as to why that would be the case. The difference in foreseeability of causes and enablers may provide an explanation. The causes in our scenarios were rated as more foreseeable than the enablers in bringing about the outcome. Foreseeable actions may be less likely to be mutated because they seem inevitable and therefore less mutable; perhaps an enabler carries less causal potency.

A different explanation is that people tend to mutate enablers rather than causes because enablers tend to occur prior to causes. This explanation is consistent with the finding that people tend to mutate the first event in a sequence of causally dependent events (Wells et al, 1987). At present we cannot fully rule out this possibility, however, we argue that causes and enablers are not related to one another like a causal chain of events. Enablers do not cause a cause to bring about an effect. Instead enablers work together with a cause to bring about an outcome. A systematic investigation in the future will provide more clarity on this matter.

The experiment revealed that in each condition participants tended to assign higher blame ratings for causes than enablers. This finding is consistent with Mandel and Lehman (1996) who demonstrated a dissociation between causal and counterfactual thinking. However, Mandel and Lehman did not manipulate the controllability of the cause. Our findings suggest that this dissociation is markedly reduced in condition D where the cause was uncontrollable and the enabler was controllable, as blame ratings did not reliably differ. If blame ratings were merely associated with controllability then we would expect to see the opposite pattern to the blame ratings in condition B, where the cause is controllable and the enabler uncontrollable. However, in condition B we see the greatest discrepancy in blame ratings between causes and enablers. A comparison of the results for these two conditions suggests that in condition D, where the cause is uncontrollable, we merely see a reduction in the tendency to blame the cause, but this tendency is not eliminated.

Across all four conditions participants rated the causal action as less socially acceptable than the enabling actions. Previous research suggests that people tend to generate more counterfactuals about socially undesirable actions (McCloy & Byrne, 2000; N'gbala & Branscombe, 1995) than socially desirable actions. Our findings go against this trend as participants generated more counterfactuals about the more socially acceptable enablers than the less socially acceptable causes. Hence, this finding provides further evidence for the special role played by enabling relations.

The main aim of the experiment was to examine whether counterfactuals about enabling relations are distinct from counterfactuals about controllable actions. In addition to showing that they are indeed distinct, we have also provided further converging evidence for the idea that causes and enablers are logically distinct. Understanding the differences between causes and enablers is important, because, in our view, it is central to human conceptions of causality.

In addition, understanding this distinction has implications in the legal domain. Neither British nor American law recognizes this distinction (e.g., Roberts & Zuckerman, 2004) and as a result very divergent judgments are made in cases involving enablers (Johnson-Laird, 2006). One court decided that gun makers who negligently supplied guns to stores in States with weak gun laws were a cause of murders that criminals committed with the guns; whereas another

court decided that a builder who negligently left an open lift shaft unguarded was not the cause of an accident when a young lad deliberately invited a stranger to step inside. However, people are sensitive to the distinction between causes and enablers and assign different amounts of blame and punishments to them (Frosch, Johnson-Laird, & Cowley, 2007). Understanding this distinction and the role it plays in bringing about an outcome may have implications for psychologists, philosophers and the legal domain.

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## Appendix

Experimental materials for conditions A (cause and enabler both controllable) and C (cause and enabler both uncontrollable) with causes marked in bold and enablers marked in italics.

Controllable	Uncontrollable
Jane <i>decided to take a different route home</i> to her normal route. On the way she encountered a rough stretch of road that was being resurfaced and had a 10mph speed limit. Jane <b>drove too quickly</b> over this road, resulting in her getting a flat tyre.	An accident on Jane's normal route home forced her to take an alternate route. On the way she encountered a rough stretch of road where a lorry had shed its load. A nail got stuck in her tyre, resulting in her getting a flat tyre.
Whilst working on a building site Tim was <i>wearing trainers</i> rather than the required steel-toed shoes, because he thought his trainers looked cooler. John carelessly <b>threw a bag of cement</b> over to Tim, which landed on his foot and broke his big toe.	Whilst working on a building site Tim was wearing trainers rather than the required steel-toed shoes, because it was his first day. John lost his balance and dropped a bag of cement which landed on Tim's foot and broke his big toe.
Anna is on her way to a job interview and <i>decides not to wear her rain mac</i> as she does not like the look of it. As Anna is walking down the street, Phoebe, who is driving her van particularly fast, <b>speeds straight through a puddle</b> , splashing Anna and soaking her clothes.	Anna is on her way to a job interview and is unable to wear her rain mac as her sister borrowed it without asking permission. As Anna is walking down the street, Phoebe, who is driving his van, swerves to avoid hitting a dog and drives straight into a puddle, splashing Anna and soaking her clothes.
Oscar <i>decides to take the lift to the top floor</i> of the library because he is too lazy to take the stairs. When Oscar reaches the top floor the lift door gets stuck and won't open because James, the lift maintenance worker, <b>didn't bother to oil the lift machinery</b> that morning.	Oscar has to take the lift to the top floor of the library because the stairs are closed for repairs. When Oscar reaches the top floor the lift door gets stuck and won't open because James, the new lift maintenance worker, didn't realise that the lift machinery had to be oiled every day.
Richard is writing up his thesis and cannot be bothered to spend a few minutes <i>backing it up</i> to the University server. When he checks his emails he <b>opens an email</b> from a stranger with an attachment containing a virus which renders his computer and all the files on it useless.	Richard is writing up his thesis and still hasn't been given access to the University server, so he is unable to back it up. The virus checker is faulty and as a result he opens a file containing a virus which renders his computer and all the files on it useless.
Kate took the <i>decision to take the scenic route home</i> rather than her usual route. When Kate came to a junction Tina, who was coming from a different direction, <b>jumped a red light</b> because she was in a hurry and crashed into her.	A diversion forced Kate to take the scenic route home rather than her usual route. When Kate came to a junction Tina, who was coming from a different direction, jumped a red light because the brakes failed and crashed into her.
Daniel <i>threw a lighted cigarette</i> into a bush. Just as the cigarette was going out, Joseph deliberately <b>threw petrol</b> on it. The resulting fire burnt down his neighbour's house.	Daniel accidentally dropped a lighted cigarette into a bush. Just as the cigarette was going out, Joseph, who was carrying a petrol canister, stumbled and spilled the petrol onto the bush. The resulting fire burnt down his neighbour's house.