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Imagined alternatives to episodic memories of morally good acts

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ABSTRACT

When people witness an act of moral excellence, they wish to emulate it. Five experiments examine a striking difference: for episodic memories of a morally good act, people imagine how things could have been *worse*, by mentally *subtracting* something that happened, and they form a *general* aspiration to emulate; in contrast, for memories of a morally bad act, they imagine how things could have been *better*, by mentally *adding* something new, and form *specific* plans (Experiments 1 and 2). They do so for memories of a good act with a good outcome, but not a bad outcome, and their spontaneous helping is greater for the former (Experiments 3 and 4). The differences in intentions to emulate occur when people imagine how things could have been different, not when they think about what actually happened (Experiment 5). The results shed light on the role of the counterfactual imagination in moral judgments.

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Moral-elevation; imagination; counterfactual-thinking; episodic-memory; intentions

In May 2018, Mamoudou Gassama, a Malian immigrant living in France, scaled the sheer walls of a towering apartment block to try to save a small child who was dangling from a fourth-floor balcony (BBC News, 2018). Many people who witnessed the video footage of his heroic actions felt uplifted, as is often the case when people learn of the morally good actions of others (e.g. Algoe & Haidt, 2009; Pohling & Diessner, 2016). The feeling of 'moral elevation' can even inspire people to act in morally good ways themselves (e.g. Cox, 2010; Diessner, Iyer, Smith, & Haidt, 2013; Freeman, Aquino, & McFerran, 2009; Schnall & Roper, 2012). Moral judgments can affect moral intentions and behavior in many different ways (e.g. Effron, Miller, & Monin, 2012; Malle, Monroe, & Guglielmo, 2014). Our aim is to examine the cognitive processes that underlie how people think about episodic memories of moral excellence. We focus on thoughts about how the situation could have turned out differently.

Our interest rests on the idea that the link between the experience of moral elevation, and the formation of intentions to emulate, may depend in part on thoughts about how things could have been different. The proposal is that when people think about an act of moral excellence, such as Mr. Gassama climbing to rescue the child, they can readily imagine how things could have been worse if he had not acted, and this imagined alternative to reality provides the ingredients for the formation of an intention to emulate. This hypothesised counterfactual imagination link between moral elevation and emulation is supported indirectly by three observations.

The first observation is that actions that inspire moral elevation are exceptional, and exceptional events prompt people to spontaneously create counterfactual alternatives to reality (e.g. Byrne, 2005; Roese & Epstude, 2017). People also think about how things could have turned out differently for unexpected and unusually good outcomes, such as winning a large prize (e.g. Dixon & Byrne, 2011; Kahneman & Tversky, 1982; McEleney & Byrne, 2006; Sanna & Turley, 1996). Hence, people may spontaneously think about how things could have turned out differently when they witness morally excellent events, which can often seem exceptional and unexpected.

The second observation is that imagined alternatives to reality have been implicated in other sorts of moral judgments. For example, when people hear about an individual who tried to help someone, such as a woman who runs into traffic to save a child from an oncoming truck, they judge that the woman should have carried out the action, and they do so more often when they hear a counterfactual about how things could have turned out worse if she hadn't acted, compared to when they hear about how things would have turned out the same if she hadn't acted (Byrne & Timmons, 2018). Similarly, when they hear about an individual who attempted to harm someone, such as a boy who throws a brick off an overpass bridge (that luckily happened not to kill anyone), they judge that the boy

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Supplemental data for this article can be accessed here.

should be blamed, and they do so more often when they imagine how things could have turned out worse, compared to when they imagine how things could have turned out the same (e.g. Lench, Domsky, Smallman, & Darbor, 2015; Parkinson & Byrne, 2017; see also Branscombe, Owen, Garstka, & Coleman, 1996; Malle et al., 2014). Hence, thoughts about how things could have turned out differently may affect other sorts of moral experiences, such as the link between moral elevation and emulation.

The third observation is that counterfactual thoughts help people to form intentions (e.g. McCloy & Byrne, 2000; Roese & Epstude, 2017). For example, aviation pilots who have been in a near-accident construct effective intentions to prevent a recurrence if they generate counterfactuals about how things could have been better (e.g. Morris & Moore, 2000). Moreover, when people read about negative everyday events, such as John who spills food on his shirt, they respond faster to intentions that would prevent the event from recurring in the future, e.g. 'eat more carefully', when they read a counterfactual statement, e.g. 'it would have been possible to eat more carefully' rather than a factual statement, e.g. 'in the past John had eaten more carefully' (Smallman & Roese, 2009; see also Smallman & McCulloch, 2012). Hence, thoughts about how things could have turned out differently for a morally elevating event may affect the formation of intentions to emulate moral excellence.

These three observations provide some support for the idea that imagined alternatives to reality provide a link between the experience of moral elevation and the formation of intentions to emulate. To test the idea more directly, the five experiments we report examined the sorts of counterfactual thoughts that people create when they recall memories of morally good acts, and the sorts of intentions they form.

We first compare participants' thoughts about memories of witnessing a morally good act, e.g. seeing a young woman help a homeless man, to their memories of witnessing a morally bad act, e.g. seeing a young woman push an older woman's hand out of the way in a sale (in Experiments 1 and 2). We refine the comparison further, to distinguish between the valence of the act (a morally good or bad act) and the valence of its outcome (a morally good act that leads to a good or bad outcome). Hence, we also examine participants' thoughts about memories of witnessing a morally good act that had a good outcome, e.g. seeing a woman give a sandwich to a homeless man and in response he talked gratefully with her, compared to their memories of witnessing a morally good act that had a bad outcome, e.g. seeing a woman give a sandwich to a homeless man and in response he shouted angrily at her (in Experiments 3, 4, and 5). Our aim is to examine the occurrence of three sorts of thoughts about such memories:

(1) *Counterfactual comparisons to better or worse alternatives*. People can construct a counterfactual that compares what happened to an imagined alternative that is *better*, e.g. 'if the woman had caught the little girl before she fell, she wouldn't have cut her knee'; or to an imagined alternative that is *worse*, e.g. 'if the woman hadn't run into the traffic, the little girl would have been killed'. People can create both sorts of counterfactual comparisons readily for non-moral everyday matters, and they tend to spontaneously make comparisons to better alternatives more often than to worse alternatives (e.g. Roese, 1997; Sanna, Turley-Ames, & Meier, 1999; see also De Brigard, Addis, Ford, Schacter, & Giovanello, 2013).
(2) *Counterfactual constructions based on additive or subtractive changes*. People can construct a counterfactual by *adding* something extra and new to the mental representation of what happened, e.g. 'if the truck driver had braked … ', or by *subtracting* something that is already mentally representation about what happened, e.g. 'if the woman hadn't run into the road … '. People can create both sorts of counterfactual constructions readily for non-moral everyday matters, and they tend to construct counterfactuals based on additive changes more often than subtractive ones (e.g. Epstude & Roese, 2008; Kahneman & Tversky, 1982; see also Begeer, Terwogt, Lunenburg, & Stegge, 2009).
(3) *Intentions to emulate based on specific plans or general aspirations*. Counterfactual thoughts about how things could have been different in the past can help people to prepare for the future, by providing the details of a 'roadmap' to implement a plan of what to change to be different in the future (e.g. Epstude & Roese, 2008; Markman, McMullen, & Elizaga, 2008; Smallman & Roese, 2009; see also Ferrante, Girotto, Stragà, & Walsh, 2013). Intentions to change can be *specific* action plans, e.g. 'I will help any child I see who falls', that make particular reference to the details of a past event, or they may be more *general* aspirations, e.g. 'I will be a better person', that do not make reference to a past event.

The five experiments we report aim to test the proposal that the experience of moral elevation can lead to the formation of intentions to emulate in part because of counterfactual thoughts about how things could have

been different. The proposal leads to three predictions, which are derived from discoveries about the counterfactual imagination (see Byrne, 2016 for a review).

Predictions about counterfactuals in moral elevation and emulation

The first prediction is that there will differences in the *counterfactual comparison to a better or worse alternative* in the counterfactuals that people create for an episodic memory of a morally good act compared to those they create for a morally bad act. When people recall a morally good act, they can imagine how things could have been *worse*, e.g. 'if Anne hadn't run into the traffic, the little girl would have been killed', or how things could have been *better*, e.g. 'if Anne had caught the little girl before she fell, she wouldn't have cut her knee'. Similarly, when people recall a morally bad act, they can imagine how things could have been *worse*, e.g. 'if the boy had thrown a brick when a car had been driving under the bridge, the driver would have been killed' or how things could have been *better*, e.g. 'if the boy's parents had disciplined him, he wouldn't have been throwing bricks off the overpass bridge'. We predict that when people recall a morally *good* act, they will imagine how things could have been *worse*; whereas when they recall a morally *bad* act, they will imagine how things could have been *better* (in Experiments 1 and 2). We refine this prediction further, that when people recall a morally good act that has a *good* outcome, they will imagine how things could have been *worse*, whereas when they recall a morally good act that has a *bad* outcome, they will imagine how things could have been *better* (in Experiments 3, 4, and 5).

We derive the prediction from observations about the counterfactual comparisons to a better or worse alternative that people make for non-moral everyday events such as taking an exam, which can subsequently affect whether they feel better or worse. For example, people imagine how things could have been *better* for an event with a good outcome, such as passing an exam, and *worse* for an event with a bad outcome, such as failing an exam (Markman, Gavanski, Sherman, & McMullen, 1993; see also Roese, 1997; De Brigard, Addis, et al., 2013). Such thoughts about how things could have been worse help people to feel *better* (e.g. Roese & Epstude, 2017), and since morally good acts lead people to feel elevation, it is plausible to suppose they are associated with thoughts about how things could have been worse. We extrapolate from these findings about counterfactual comparisons in non-moral situations, to make predictions about counterfactual comparisons in moral ones, based on the suggestion that thinking about moral matters may rely on the same sorts of cognitive process as thinking about non-moral matters (e.g. Rai & Holyoak, 2010; Royzman & Baron, 2002; Shenhav & Greene, 2010; Timmons & Byrne, 2018).

The second prediction is about *counterfactual constructions based on additive or subtractive changes*. When people recall a morally good act, they can mentally *subtract* some aspect from their mental representation of the event, e.g. 'if the woman hadn't run into the road … ' or they can mentally *add* some new extra aspect to their mental representation of the event, e.g. 'if the little girl had been crossing the road with her parents … '. Similarly, when they recall a morally bad act, they can mentally *subtract* some aspect of the event, e.g. 'if the boy hadn't gone to the overpass bridge with his friend … ' or they can mentally *add* some new aspect to the event, e.g. 'if the boy had gone to play football … '. We predict that when people recall a morally *good* act, they will mentally *subtract* some aspect of the event from their mental representation, whereas when they recall a morally *bad* act, they will mentally *add* some aspect (in Experiments 1 and 2). We refine this prediction further, that when people recall a morally good act that has a *good* outcome, they will mentally *subtract* some aspect of the event from their mental representation, whereas when they recall a morally good act that has a *bad* outcome, they will mentally *add* some aspect (in Experiments 3, 4, and 5).

Once again, we derived the prediction from observations about counterfactual constructions based on additive or subtractive changes that people make for non-moral everyday events such as taking an exam. People tend to make subtractive changes to successful good outcomes, such as passing an exam, whereas they tend to make additive changes to unsuccessful bad outcomes, such as failing an exam (e.g. Kahneman & Tversky, 1982; Roese, Hur, & Pennington, 1999; Roese & Olson, 1993; Sanna & Turley, 1996). Since morally good events may be considered a type of successful event, we extrapolate the prediction that they are likely to be associated with subtractive counterfactuals, again based on the suggestion that thinking about moral matters relies on the same sorts of cognitive process as thinking about non-moral matters. And since morally good acts with bad outcomes may be considered a type of unsuccessful event, we expect that they will be associated with additive counterfactuals.

The third prediction is about *intentions to emulate based on specific plans or general aspirations*. When people recall a morally good act, they can create a specific intention to emulate, e.g. 'I will make sure any children I see at junctions cross the road safely' or a general aspiration 'I will help children'. Similarly, when they recall a morally bad act, they can create a specific intention, e.g. 'I will tell any children I see throwing stones to stop'

or a general aspiration 'I will inform children about dangers'. We predict that when people recall a morally *good* act, their intention to emulate will be a general aspiration, whereas when they recall a morally *bad* act, their intention will be a specific plan (in Experiments 1 and 2). We refine this prediction further, that when people recall a morally good act that has a *good* outcome, their intention to emulate will be a general aspiration, whereas when they recall a morally good act that has a *bad* outcome, their intention will be a specific plan (in Experiments 3, 4, and 5).

This prediction is a consequence of the two previous predictions about the sorts of counterfactuals people will construct: when people recall a *good* act, they will create *subtractive* counterfactuals about how things could have been *worse*, and when they recall a *bad* act, they will create *additive* counterfactuals about how things could have been *better*. *Additive* counterfactuals about how things could have been *better* can provide specific and detailed preparatory blueprints for the future, for non-moral, everyday matters (e.g. Roese & Epstude, 2017). They may help in the formulation of intentions for the future by identifying some of the causal relationships between events. For example, an aviation pilot following a near-accident who creates an *additive* counterfactual about how things could have been *better*, such as, 'If I had understood the controller's words accurately, I wouldn't have initiated the inappropriate landing attempt' can readily formulate a specific plan for the future based on it, 'I will make sure I understand the controller's words accurately before I make a landing attempt next time' (e.g. Morris & Moore, 2000). Hence, when participants recall a morally *bad* act and create an *additive* counterfactual about how things could have been *better*, it follows that they will formulate *specific* plans to change. For example, when they imagine, e.g. 'if the boy had gone to play football instead of going to the overpass bridge, things would have been better', they can formulate a specific plan for the future, e.g. 'the boy should join a football team'. Conversely, when participants recall a morally *good* act and create a *subtractive* counterfactual about how things could have been *worse*, it follows they will formulate a *general* aspiration to emulate. For example, when they imagine, e.g. 'if Anne hadn't run into the road to save the little girl, things would have been worse', no specific plan for the future is readily available. Subtractive counterfactuals about how things could have been worse may provide little help to formulate intentions for the future. Accordingly, participants can create only a non-specific aspiration, e.g. 'Adults should help children'. Hence, the sorts of counterfactuals prompted by the recall of a morally good act may not lead to specific preparations for the future. Counterfactuals about how things could have been *worse* lead people to experience positive emotions such as relief and consolation whereas counterfactuals about how things could have been *better* help people to identify the causes of an event (e.g. Roese & Epstude, 2017). When people think about a morally good act and imagine how things could have been worse, they may experience the positive emotion of moral elevation, but their counterfactual thoughts may not help them to identify the causal pathways that led to the morally good act.

The creation of different sorts of intentions, specific and general, may be an important component of the cognitive processes that underlie the pathways by which elevation inspires emulation. Hence, this counterfactual imagination theory of moral elevation and emulation also predicts that the different counterfactuals and intentions will be followed by differences in the tendency to spontaneously help others, a point to which we will return later. Table 1 summarises the predictions.

Our aim in the experiments we report is to test these three predictions, that people will create different sorts of counterfactuals for morally good and bad acts, and accordingly, they will form different sorts of intentions following morally good and bad acts. We focused on episodic counterfactuals, that is, thoughts about how things could have turned out differently for remembered events in one's own life (e.g. De Brigard, Szpunar, & Schacter, 2013; Roese & Epstude, 2017; Schacter, Benoit, De Brigard, & Szpunar, 2015). Episodic memories of morally good and bad acts from one's own life provide a rich source of information, and such episodic richness may be essential for the genuine experience of the emotion of elevation.

Table 1. The predicted occurrence of the different sorts of counterfactuals and intentions examined in the experiments as a function of the recall of different sorts of morally good and bad acts.

	Memory	
Exp 1–2/ Exp 3–5	Morally good action/ Morally good action with good outcome	Morally bad action/ Morally good action with bad outcome
Counterfactual Comparison: Better/Worse	Worse *. . . it would have been worse*	Better *. . . it would have been better*
Counterfactual construction: Additive/ subtractive	Subtractive *If she hadn't . . .*	Additive *If she had . . .*
Intentions to emulate: *Specific/General*	General *Broad aspiration*	Specific *Detailed plan*

Experiments 1 and 2

In Experiment 1, we tested whether people create different sorts of episodic counterfactuals and different types of future intentions for memories of a morally good act compared to a morally bad one. The counterfactual theory of the link between moral elevation and emulation predicts that when participants recall an episodic memory about a morally good act they will create *subtractive* counterfactuals about how things could be *worse* and their intentions will be *general* aspirations to change, whereas when they recall an episodic memory about a morally bad act they will create *additive* counterfactuals about how things could be *better* and their intentions will be *specific* plans to change. In Experiment 2, we examined episodic memories about morally good and morally bad acts, recalled from the recent past or the remote past. People create different counterfactuals about regretted experiences in the remote past compared to the recent past (e.g. Davison & Feeney, 2008; Gilovich & Medvec, 1995), and so we wished to check whether our predictions held for the counterfactuals and emulation intentions that people construct for morally good acts and bad ones in the remote past compared to the recent past.

Method

Participants and procedure

The participants in both experiments were volunteers from the general public attending a 'Lab in the Gallery' exhibition at the Science Gallery in Trinity College Dublin. Visitors at the 'Happy?' exhibition had the opportunity to take part in several different experiments and demonstrations and could choose how many experiments they wished to take part in and in what order to do so. If visitors chose to take part in our experiments, they were assigned at random to one of a set of conditions, such as one of the 2 conditions in Experiment 1, or one of the 4 conditions in Experiment 2. Sample size for the two experiments was based on the number of visitors to the Science Gallery willing to participate in the experiments during the five-week period of the exhibition. Data collection stopped when the exhibition was completed.

In Experiment 1, 83 members of the general public took part, 33 men and 49 women and one person who did not record their gender, and their ages ranged from 19 to 73 years (M = 33.45, SD = 12.54). An additional 29 participants failed to follow the instructions (they wrote a counterfactual thought on the back of the card that was unrelated to the episodic memory they had written on the front of the card) and they were excluded prior to any data analysis. Participants were randomly assigned to recall either a morally good act (n = 31) or a morally bad act (n = 52). The participants in Experiment 2 were a different set of 150 members of the general public, 62 men, 84 women and 4 who did not report their gender, aged between 19 and 70 years (M = 37.09, SD = 12.55). An additional 78 participants were excluded prior to any data analysis for failing to follow the instructions (that is, their counterfactual thought was not related to their episodic memory). Participants were randomly assigned to recall either a morally good act from the recent past (n = 32), or the remote past (n = 37), or a morally bad act from the recent past (n = 39) or the remote past (n = 42).

All of the experiments received prior approval from the School of Psychology ethics committee. We report all of our manipulations and measures. The participants were tested individually in a quiet seated area of the Science gallery and they were given a single hardboard card that contained questions on the front and back and on which they wrote their answers (see the Supplemental Material for full details). The experiment took about 15 minutes to complete.

Design and materials

In Experiment 1, the design was a between-participants one with two groups. Participants in the morally good act condition were prompted to recall a memory of a good experience in which they witnessed someone 'demonstrating humanity's higher or better nature … someone did something good, honorable, or charitable for someone else' (adapted from Algoe & Haidt, 2009). Participants in the morally bad act condition recalled a memory of a bad experience – 'humanity's lower or worse nature … something bad, dishonorable, or uncharitable'. As a manipulation check, their mood was also measured before and after recalling their memory, by asking them to report how happy they were on a scale from 1 to 10.

After they had recorded their memory, participants completed a standard counterfactual sentence stem task in response to the following prompt (adapted from Markman et al., 1993):

> People sometimes imagine how an event could have turned out differently 'if only … ' Please think about the experience and about how it could have turned out differently. Complete the following sentence: 'It could have turned out differently if … '

They were asked a question about their future emulation intentions:

> Did you think about changing your own behavior after the event? (Yes/No)
>
> If so, describe what you thought about changing.

Participants recorded their memory on the front of a card, and wrote their answers to the counterfactual and emulation questions on the back of the card. They also answered questions about characteristics of the remembered event, including whether it was expected, intended, an action or inaction, specific or general, and they described their feeling at the time. For all materials and measures, see the Supplemental Material.

In Experiment 2, the design was a between-participants one with four groups: 2 (memory: morally good act vs. morally bad act) x 2 (recency: recent past vs. remote past). The materials were the same as Experiment 1, and participants were instructed to recall a memory of a good or bad moral act, but this time participants in the good and bad 'recent' conditions were instructed to 'please look back on your experiences in the past month or so … ' whereas participants in the good and bad 'remote' conditions were asked to 'please look back on your experiences in your whole life … '. As a manipulation check, participants were asked to estimate their age at the time of the experience, which was subtracted from their current age to determine how remote the memory was.

Scoring

Counterfactuals were scored for their comparison to better or worse alternatives; and for their construction based on additive or subtractive changes, and Table 2 provides some examples from the responses of the participants. Thoughts about intentions to emulate were first scored as indicating an intention to change behavior or not, and then the reported intentions were categorized as either specific, that is, a particular plan for action (which may or may not be related to the domain of the witnessed event), or as general, that is, a non-specific aspiration, see Table 2.

Responses in all of the experiments were scored by 2 independent raters who were blind to all hypotheses, and by the first and second authors (EG in Experiments 1 and 2 and ST in Experiments 3, 4 and 5). Inter-rater agreement was high in each of the five experiments, for the three dependent measures: (a) counterfactual comparisons to better or worse alternatives (which ranged in the five experiments from 86% to 96% agreement), (b) counterfactual constructions based on additive or subtractive changes (68% to 80% agreement), and (c) specific or general intentions to emulate (65% to 84% agreement), as Table 3 shows, and all Kappa's were significant at the 1% level. The data archive for all of the experiments is available at https://reasoningandimagination.com/ and at the *Open Science Framework* at https://osf.io/etmzg/.

Results and discussion

Manipulation checks

Participants' happiness decreased more after recalling a morally bad act, compared to a morally good act, in Experiment 1, Mann-Whitney $U = 562$, $p = .019$, $r = .26$, and in Experiment 2, $U = 1642$, $p < .001$, $r = .36$, and there was no difference in the change in mood for remote

Table 2. Examples of counterfactuals and intentions from Experiments 1 and 2.

	Memory	
	Morally good act	Morally bad act
Counterfactual comparisons		
Better alternative	A participant saw a woman offer a helping hand to a homeless man. They thought about how things could have been better if *'I had stopped and cared more.'*	A participant knew a woman who found another woman in her boyfriend's apartment. They thought about how things could have been better if *'my friend had left before the doorbell rang, she never needed to know'*.
Worse alternative	A participant's father helped a motorcyclist who had crashed. They thought about how things could have been worse if '*we had just driven on past the accident to our destination*'.	A participant saw a teenager snap a balloon and it hit a woman in the head. They thought about how things could have been worse if '*he had hit the woman in the eye*'.
Counterfactual constructions		
Additive	A participant's neighbors took her elderly mother in when she locked herself out. They created an additive counterfactual about if '*she had wandered off and got lost*'.	A participant remembered the 9/11 New York twin towers being attacked. They created an additive counterfactual about if '*my grandmother had decided to go … on the first plane*'.
Subtractive	A participant knew of a local group that volunteered at a school for children with Down syndrome. They created a subtractive counterfactual about if *'an effort was not put in by the group'*.	A participant saw people acting selfishly during a sale. They created a subtractive counterfactual about if *'greed was not hardwired into society*'.
Intentions to emulate		
Specific plan	A participant recalled her brother as a child returning cash he found to an elderly man. The participant created a specific plan: '*Always returning lost property, or bringing it somewhere for the owner to claim it.'*	A participant recalled girls in school bullying a new girl. The participant created a specific plan: *'to integrate new girls to our years'*.
General aspiration	A participant knew a man who donated a kidney to a relative. The participant created a general aspiration: '*I will be more giving*'.	A participant saw a wealthy person sneer at a homeless man. The participant created a general aspiration: *'to aim to treat people equally regardless of background.'*

Table 3. Mean agreement between independent raters.

Experiment	1	2	3	4	5
Counterfactual comparisons *Better/Worse*	.91	.96	.89	.87	.86
Counterfactual constructions *Additive/Subtractive*	.69	.68	.80	.70	.79
Intentions to emulate *Specific/General*	.84	.74	.71	.77	.65

Note. All Kappas are significant at the 1% level.

memories compared to recent ones, $U = 2078$, $p = .153$, $r = .12$, see the Supplemental Material for details. Participants who were instructed to recall a remote memory in Experiment 2 recalled an event further in the past ($M = 8.15$ years, $SD = 10.46$) than those asked to recall a recent memory ($M = 0.20$ years, $SD = 0.51$), Welch's t-test for unequal variances, t (73.42) = 6.53, $p < .001$, $d = 1.52$.

Counterfactual comparisons about better and worse alternatives

Participants created counterfactuals about how things could have been worse rather than better for a morally good act, but not for a morally bad act, in Experiment 1, χ^2 (1, $N = 83$) = 39.64, $p < .001$, $V = .69$, and in Experiment 2, χ^2 (1, $N = 150$) = 106.01, $p < .001$, $V = .84$, as Figure 1 shows. The recency of the memory examined in Experiment 2 had no effect on whether a participant imagined how things could have been better or worse: 58% imagined how things could have been better in the recent memory condition and the same percentage of participants did so in the remote memory condition, χ^2 (1, $N = 150$) = .001, $p = .952$, $V < .01$.

Counterfactual constructions based on additive or subtractive changes

Participants created subtractive counterfactuals rather than additive ones for a morally good act but not for a morally bad act, in Experiment 1, χ^2 (1, $N = 83$) = 21.40, $p < .001$, $V = .51$, and in Experiment 2, χ^2 (1, $n = 149$) = 24.61, $p < .001$, $V = .41$, as Figure 2 shows (three participants were excluded from the analysis because their counterfactual was ambiguous and could not be coded as subtractive or additive). The recency of the memory examined in Experiment 2 had no effect on whether a participant created a subtractive or additive counterfactual, 70% created additive counterfactuals in the recent memory condition and 65% created additive counterfactuals in the remote memory condition, χ^2 (1, $n = 149$) = 0.26, $p = .611$, $V = .04$.

Intentions to emulate

Participants created intentions to emulate that were general aspirations rather than specific plans for a morally good act, but not for a morally bad one (for those participants who indicated they intended to change) in Experiment 1, χ^2 (1, $n = 52$) = 4.44, $p = .035$, $V = .29$, and

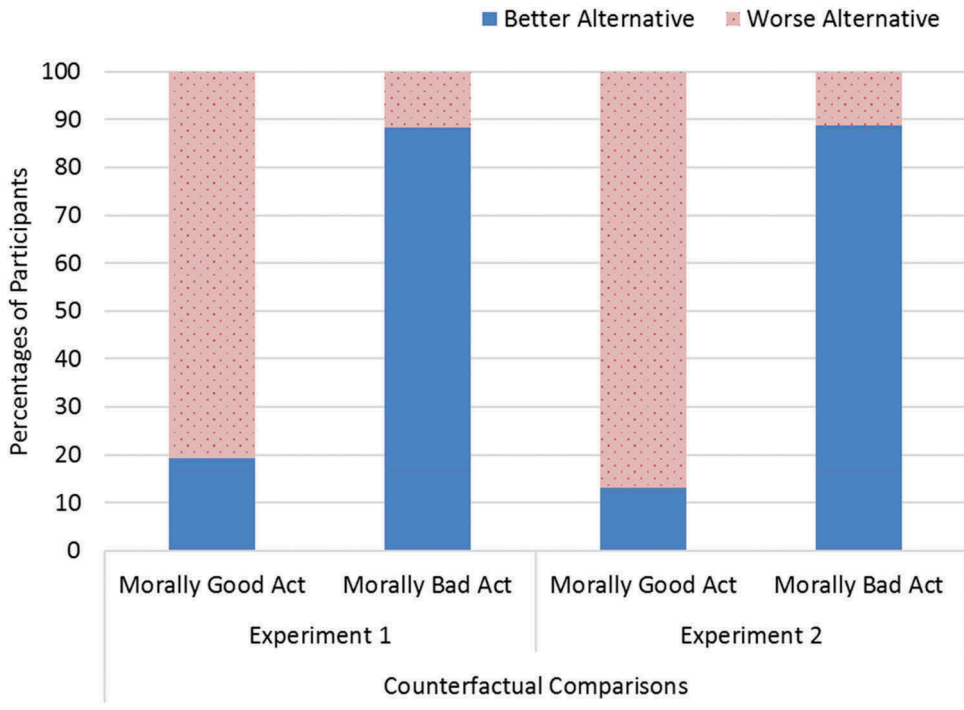

Figure 1. The types of counterfactual comparisons of better alternatives or worse alternatives created by participants in Experiment 1 and Experiment 2 when they recalled a morally good act or a morally bad act. No counterfactual comparisons were ambiguous and so none needed to be coded as 'other'.

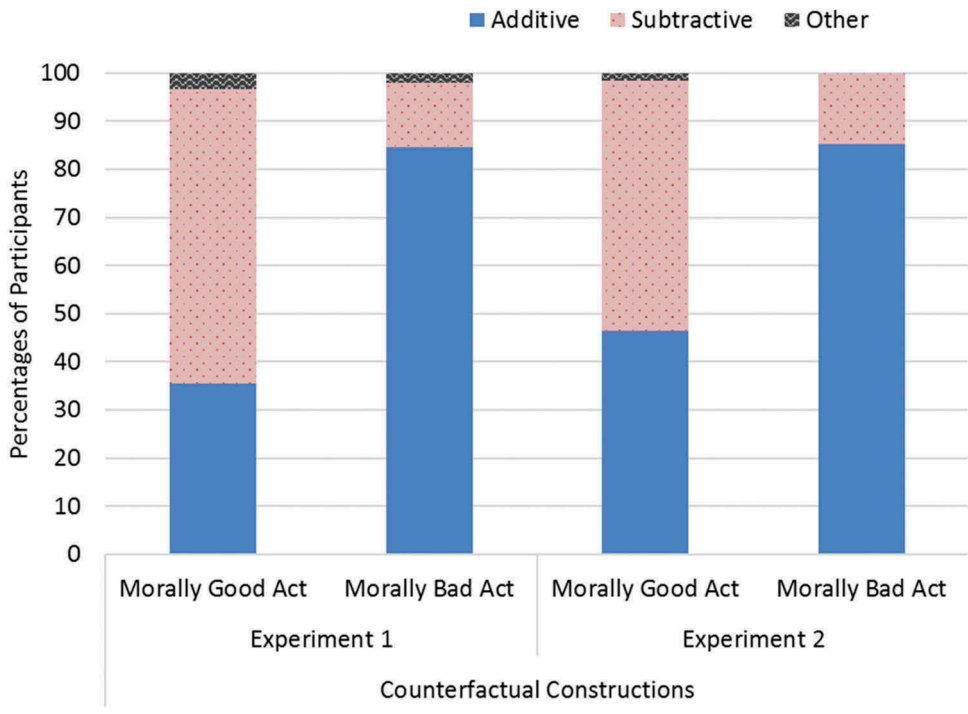

Figure 2. The types of counterfactual constructions based on additive or subtractive changes created by participants in Experiment 1 and Experiment 2 for a morally good act or a morally bad act. Counterfactuals that were ambiguous were coded as 'other'.

in Experiment 2, χ^2 (1, n = 91) = 4.30, p = .038, V = .22, as Figure 3 shows. Participants who recalled a good act were more likely to report an intention to change than participants who recalled a bad one, in Experiment 2, 79% vs. 50%, χ^2 (1, n = 145) = 13.16, p < .001, V = .30, although not significantly in Experiment 1, 74% vs. 63%, χ^2 (1, n = 77) = 1.05, p = .305, V = .12. Participants who recalled a remote memory were more likely to report an intention

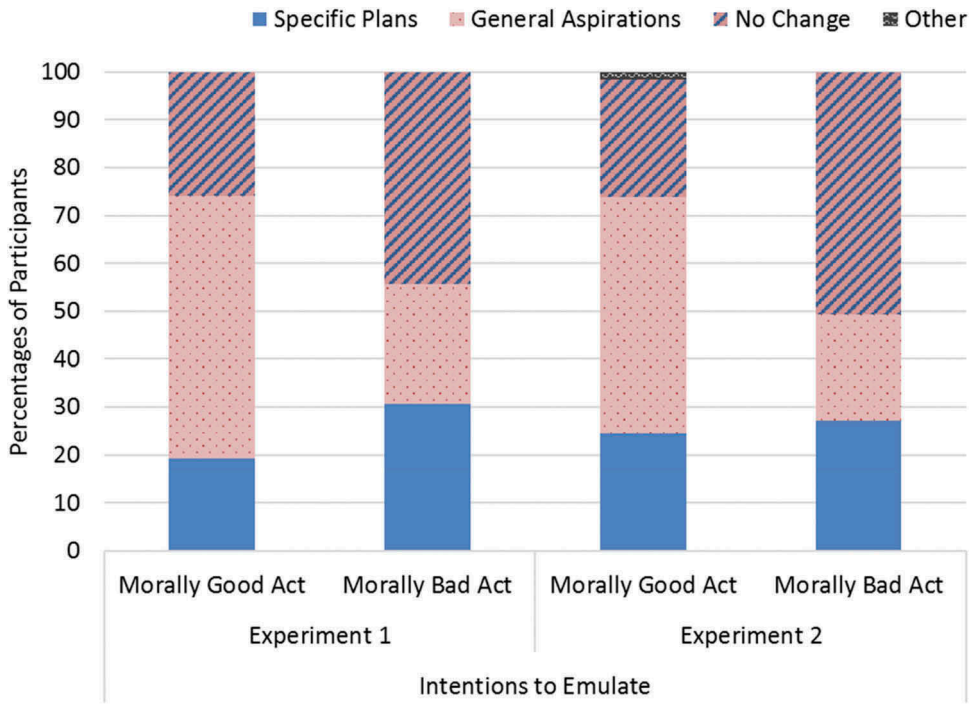

Figure 3. The types of intentions to emulate based on specific plans or general aspirations created by participants in Experiment 1 and Experiment 2 for a morally good act or a morally bad act. Participants who indicated they did not intend to change were coded as 'no change'. Intentions that were ambiguous were coded as 'other'.

to change compared to participants who recalled a recent one, 72% vs. 53%, χ^2 (1, n = 145) = 5.67, p = .017, V = 0.20, but there was no difference between remote and recent memories in whether the intentions were specific or not, 45% vs. 40%, χ^2 (1, n = 91) = 0.19, p = .663, V = .05.

Participants also made judgments about various characteristics of their episodic memories (for details see the Supplemental Material). Overall, they judged that the acts they recalled were expected rather than unexpected, more often for good acts than bad acts, and they described their feeling at the time with a word that was positive, more often for good acts than bad acts. For good acts and bad acts, they judged that the acts were intentional rather than unintentional, they were actions rather than failures to act, and they were specific rather than general. There were no differences between remote and recent memories. For details see the Supplemental Material.

The experiments contribute two new discoveries. First, they show striking differences in counterfactual thoughts about episodic memories of morally good acts compared to memories of morally bad acts, and differences in the intentions to emulate that follow such thoughts. For memories of morally good acts, people created counterfactual alternatives that *subtracted* aspects of reality to imagine how things could have been *worse*, and they formed intentions to emulate that were *general aspirations*. For memories of morally bad acts, people created counterfactual alternatives that *added* something to reality and imagined how things could have been *better*, and they formulated intentions to change that were *specific plans* for the future. Second, the differences are observed not only for memories in the recent past few months but also for remote memories that endure from previous years of one's life.

Most people remembered a morally good act that led to a good outcome, and a morally bad act that led to a bad outcome. The next experiments aim to tease apart the effects of the moral goodness of the act, from the goodness of the outcome. Experiments 3 and 4 focus on morally good acts, and compare morally good acts that lead to a good outcome to morally good acts that lead to a bad outcome.

Experiments 3 and 4

The first aim of the experiments was to examine counterfactual thoughts and intentions to emulate for memories of a morally good act that led to a good outcome, compared to memories of a morally good act that led to a bad outcome, to test whether the differences observed in the previous experiments reflect the goodness of the moral act, or the goodness of the outcome of the moral act. Outcome knowledge affects judgments about morally *bad* acts (e.g. Baron & Hershey, 1988; Fleischhut, Meder, & Gigerenzer, 2017; Oeberst & Goeckenjan, 2016), perhaps because of negativity biases (see Rozin & Royzman, 2001; also Royzman & Landy, 2018); or causal inferences about whether the outcome could have been foreseen (e.g. Baron & Hershey, 1988; Timmons & Byrne, 2018). For example, people judge that a boy who threw a brick from an overpass bridge and killed the driver of a car underneath should be blamed and punished more, compared to a boy who threw a brick from the bridge without accomplishing the intended harm, even though both boys carried out the same action with the same knowledge and intention (e.g. Lench et al., 2015; Parkinson & Byrne, 2017). A similar moral hindsight effect occurs for morally good acts: people judge that a woman should indeed have run out into traffic to save a child who had fallen in front of an oncoming truck when they know that they both escaped unharmed, compared to when they do not know the outcome, or when the child is seriously injured (Byrne & Timmons, 2018).

We expected to replicate the finding from Experiments 1 and 2 that when people recall a morally good act that led to a good outcome, they create *subtractive* counterfactuals about how things could have been *worse*, and they form intentions that are *general* aspirations. We hypothesized that if the discovery reflects the goodness of the moral act, then people will create the same sorts of counterfactuals and intentions to emulate for a morally good act that had a good outcome and for a morally good act that had a bad outcome. But if the discovery reflects the goodness of the *outcome* then they will create *subtractive* counterfactuals about how things could have been *worse*, and form intentions that are *general* aspirations, only for a morally good act that had a good outcome, and instead they will create *additive* counterfactuals about how things could have been *better*, and form intentions that are *specific* plans, when they recall a morally good act that led to a bad outcome.

The second aim of the experiments was to examine not only intentions to emulate but also *behavior* that emulates. After participants had recalled their episodic memory, created a counterfactual, and described their intentions, and so had ostensibly finished the experimental tasks, the experimenter 'accidentally' knocked a cup of pens that was placed on the edge of the desk between the participant and the experimenter and it was noted whether the participant spontaneously engaged in helping behavior, that is, whether they began picking up the pens (adapted from Van Baaren, Holland, Kawakami, & Van Knippenberg, 2004; see also

Macrae & Johnston, 1998). We hypothesized that if emulation depends not only on the goodness of an act, but also on the goodness of the outcome, then participants will help more often when they have recalled a morally good act that led to a good outcome, compared to a morally good act that led to a bad outcome.

In Experiment 3 we examined counterfactuals about how things could have turned out differently in the past, and in Experiment 4 we examined *pre-factuals* about how things could turn out differently in the future (e.g. Byrne & Egan, 2004). Pre-factuals may help people to prepare intentions for the future even more so than counterfactuals (e.g. Ferrante et al., 2013; Roese & Epstude, 2017). For example, people focus on things outside their control when they create counterfactuals about the past to explain poor past performance, say, when they fail to solve a difficult puzzle, e.g. 'things would have been better for me if the allocated time had been longer', whereas they focus on things within their control when they create pre-factuals to prepare for a future attempt, e.g. 'things will be better for me next time if I concentrate more' (e.g. Ferrante et al., 2013; Ferrante & Stragà, 2014; Hammell & Chan, 2016; Mercier et al., 2017). Hence, we hypothesized that the differences between thoughts about a morally good act with a good outcome and a morally good act with a bad outcome would be even more pronounced for pre-factuals.

Method

Participants and procedure

Sample size for both experiments was predetermined using effect sizes from the helping behavior literature (e.g. Van Baaren et al., 2004), calculated to be approximately 32 participants per group. In Experiment 3, the participants were 64 students from Trinity College Dublin, 23 men, 40 women and one person who indicated their gender as other, whose ages ranged from 18 to 48 years (M = 23.05, SD = 6.60). They were randomly assigned to the good outcome (n = 32) or bad outcome (n = 32) groups. In Experiment 4, the participants were a different set of 68 students from Trinity College Dublin, 18 men and 50 women, whose ages ranged from 18 to 40 years (M = 21.60, SD = 4.82). They were randomly assigned to the good outcome (n = 35) or bad outcome (n = 33) groups. Some participants opted to receive €10 as reimbursement for participation (Experiment 1, n = 50; Experiment 2, n = 32) and others opted to receive course credits (Experiment 1, n = 14; Experiment 2, n = 36). One person from each of the experiments (in the bad outcome groups in each case) was excluded from the analyses because they failed to recall a previous memory.

Participants were tested individually in a small testing room. They completed the experiments via SurveyGizmo on a MacBook Pro (Retina, 13-inch, Mid 2014). Each experiment took about 15–20 minutes, and they were each completed as part of a larger set of studies that took about 50 minutes and that required reading unrelated vignettes. The position of our experiments in the set was randomised between participants.

Design and materials

The design in both experiments was between-participants with two groups: morally good act with a good outcome and morally good act with a bad outcome. The participants' first task was to recall a memory of a morally good act. They were given the same good memory prompt as in the previous experiments, but participants in the good act with a good outcome group were given the further instruction:

> But please think of a situation that resulted in a good outcome – a situation where the person's actions were successful in helping another person.

Participants in the good act with a bad outcome group were instructed instead:

> But please think of a situation that did not result in a good outcome – a situation where the person's actions were not successful in helping another person.

As a manipulation check they provided a moral elevation judgment of their recalled episode, by answering three questions: 'How much did you think or feel the following when thinking about your memory? (1) Inspired, (2) I want to be more like the person I thought of who did something good/honourable/charitable, and (3) People are really good', on a scale from 1 (not at all) to 7 (very much), adapted from previous research (e.g. Aquino et al., 2011).

Their second task was to provide a counterfactual or pre-factual thought about their recalled memory. Participants in Experiment 3 were given the same counterfactual thought prompt as in the previous experiments, whereas participants in Experiment 4 completed a pre-factual thought prompt:

> People sometimes think about how an event could turn out differently in the future 'if only … ' Please think about the experience you wrote about and about how it could turn out differently in the future. Please complete the following sentence. *Things could be different in the future if …*

They typed their recollection into a text box on-screen.

Their final task was an intention to emulate question. Participants were asked whether they thought about changing their own behavior. (They were also asked whether they would agree to be contacted for a short,

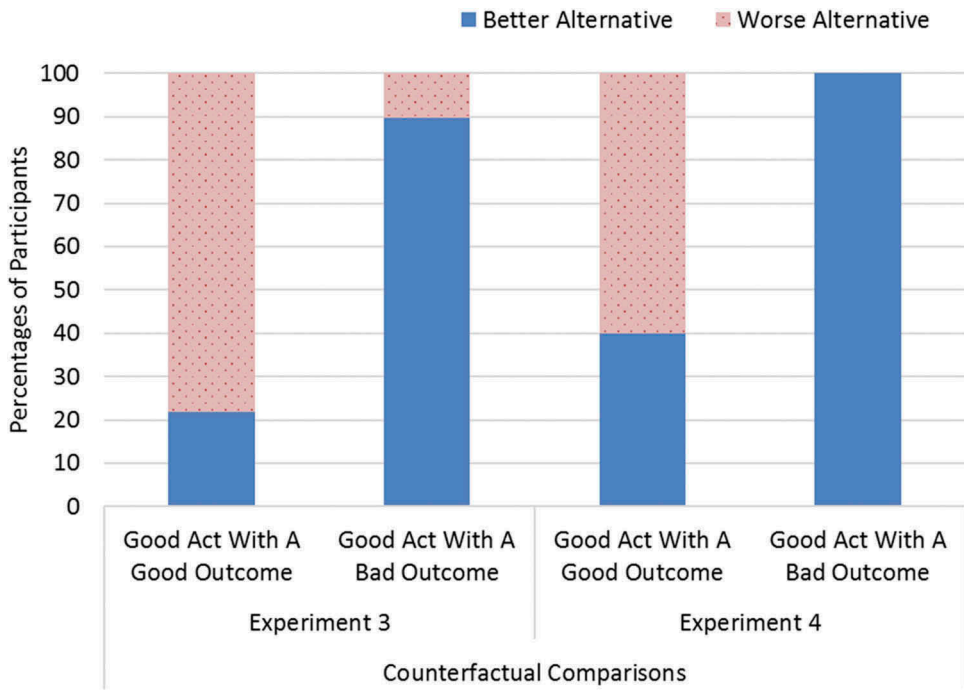

Figure 4. The types of counterfactual comparisons of better alternatives or *worse alternatives* created by participants in Experiments 3 (counterfactual) and 4 (pre-factual) when they recalled a morally good act with a good outcome or a good act with a bad outcome. No counterfactual comparisons were ambiguous and so none were coded as 'other'.

online follow-up study, see the Supplemental Material for details). When the participant indicated that they had reached the end of the computer-controlled study, the experimenter (who was blind to whether the participant had been assigned by the experimental software to the good-outcome or bad-outcome condition) stood up and knocked a cup of 12 pens that was situated on the edge of the desk between the experimenter and participant. The experimenter apologized, paused briefly, and then began to pick up the pens. Whether the participant helped to pick up the pens was noted (adapted from Van Baaren et al., 2004). At the end of the experiment, participants were asked whether they had any suspicions about what was being tested in the study; just one participant queried whether the pens were knocked intentionally and this participant was excluded from the helping behavior analysis.

Results and discussion

Manipulation checks

Participants who had recalled a morally good act with a good outcome were more elevated than those who had recalled a morally good act with a bad outcome, in Experiment 3 (M = 5.23, SD = 1.19 vs. M = 4.55, SD = 1.27), t (61) = 2.20, p = .032, d = 0.56, and in Experiment 4 (M = 5.66, SD = 0.72 vs. M = 4.19, SD = 1.08), Welch's t (53.09) = 6.50, p < .001, d = 1.60, see the Supplemental Material for details.

Counterfactual comparisons about better and worse alternatives

Participants imagined counterfactuals about how things could have been worse rather than better, for a morally good act with a good outcome, but not for a morally good act with a bad outcome when they created counterfactuals in Experiment 3, χ^2 (1, N = 61) = 28.15, p < .001, V = .68, and pre-factuals in Experiment 4, χ^2 (1, N = 66) = 27.28, p < .001, V = .64, as Figure 4 shows.

Counterfactual constructions based on additive or subtractive changes

Participants imagined counterfactuals that *subtracted* something that happened, rather than ones that *added* something to what happened, for a morally good act with a good outcome but not for a morally good act with a bad outcome, when they created counterfactuals in Experiment 3, χ^2 (1, N = 61) = 16.36, p < .001, V = .52, and when they created pre-factuals in Experiment 4, χ^2 (1, N = 66) = 9.64, p = .002, V = .38, as Figure 5 shows.

Intentions to emulate moral goodness

Participants' intentions to change tended to be general aspirations rather than specific plans, for a morally good act that led to a good outcome, but not for a morally good act that led to a bad outcome, and this pattern occurred for participants who formed an intention to change after counterfactual thoughts in Experiment 3,

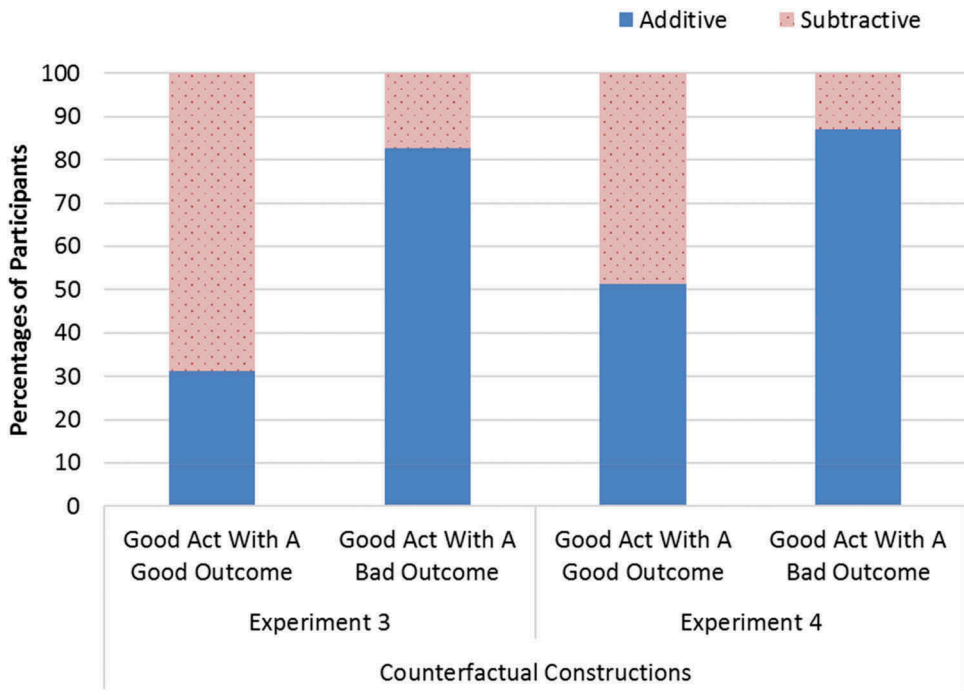

Figure 5. The types of counterfactual constructions based on additive or subtractive changes created by participants in Experiments 3 (counterfactual) and 4 (pre-factual) when they recalled a morally good act with a good outcome or a good act with a bad outcome. No counterfactual constructions were ambiguous and so none were coded as 'other'.

χ^2 (1, n = 42) = 4.97, p = .026, V = .34, and after pre-factual thoughts in Experiment 4, χ^2 (1, N = 45) = 6.28, p = .012, V = .37, as Figure 6 shows. They indicated an intention to change their own behavior in the future more often when they recalled a morally good act that led to a good outcome rather than a morally good act that led to a bad outcome, when they created pre-factuals in Experiment 4, 80% vs. 52%, χ^2 (1, N = 67) = 5.48, p = .019, V = .29, although not reliably when they created counterfactuals in Experiment 3, 57% vs. 77%, χ^2 (1, n = 63) = 3.18, p = .075, V = .23.

Behavior that emulates moral goodness

Participants tended to help spontaneously in the pick-up-pens task more often when they had recalled a morally good act with a good outcome, rather than a morally good act with a bad outcome, as Figure 7 shows, for pre-factuals in Experiment 4, 82% vs. 34%, χ^2 (1, N = 65) = 15.06, p < .001, V = .48, and somewhat for counterfactuals in Experiment 3, 72% vs. 52%, χ^2 (1, N = 63) = 2.74, p = .098, V = .21, although the latter difference was not significant.

The experiments contribute two discoveries. First, they show that people create a *subtractive* counterfactual about how things could be *worse* and they form a *general* aspiration, for episodic memories about a morally good act that leads to a good outcome (replicating Experiments 1 and 2), but the pattern is dramatically different for a morally good act that leads to a bad outcome. For a morally good act that leads to a bad outcome, people create an *additive* counterfactual about how things could be *better* and they form a *specific* plan, just as they do for morally bad acts. Hence, a new contribution of the experiments is the finding that the types of counterfactuals and intentions that people formulate when they think about morally good acts depend on the goodness of the outcome, and not only the goodness of the act.

Strikingly, the second discovery is that when people recalled an episodic memory of a morally good act that led to a good outcome, they tended to spontaneously engage in helping behavior, more often than when they recalled a morally good act that led to a bad outcome. The result extends the moral hindsight effect – the tendency to make different moral judgments about whether an individual should have carried out a morally good act depending on whether the outcome was known to be good (Byrne & Timmons, 2018; see also Fleischhut et al., 2017). It shows for the first time a moral hindsight effect in pro-social behavior, that is, differences in the tendency to help another person following thoughts about a morally good act that led to a good outcome compared to one that led to a bad outcome.

In this regard, it is also important to note that participants indicated that they were morally elevated more often when they recalled a morally good act that led to a good outcome, rather than a morally good act that led to a bad outcome. The result provides the important

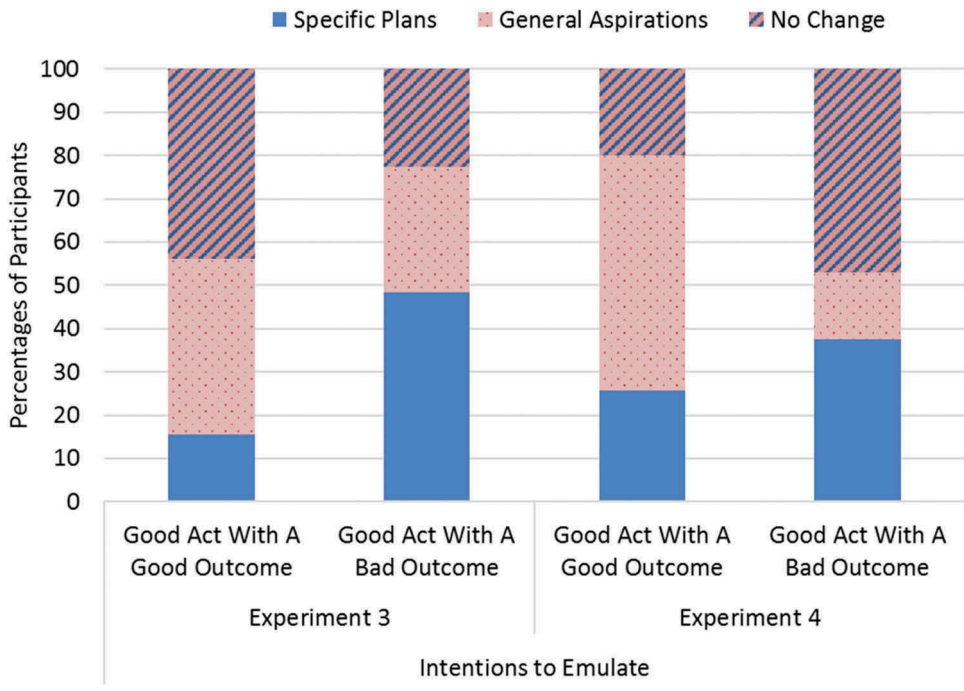

Figure 6. The types of intentions to emulate based on specific plans or general aspirations created by participants in Experiments 3 (counterfactual) and 4 (pre-factual) when they recalled a morally good act with a good outcome or a good act with a bad outcome. Participants who indicated they did not intend to change were coded as 'no change'. No intentions were ambiguous and so none were coded as 'other'.

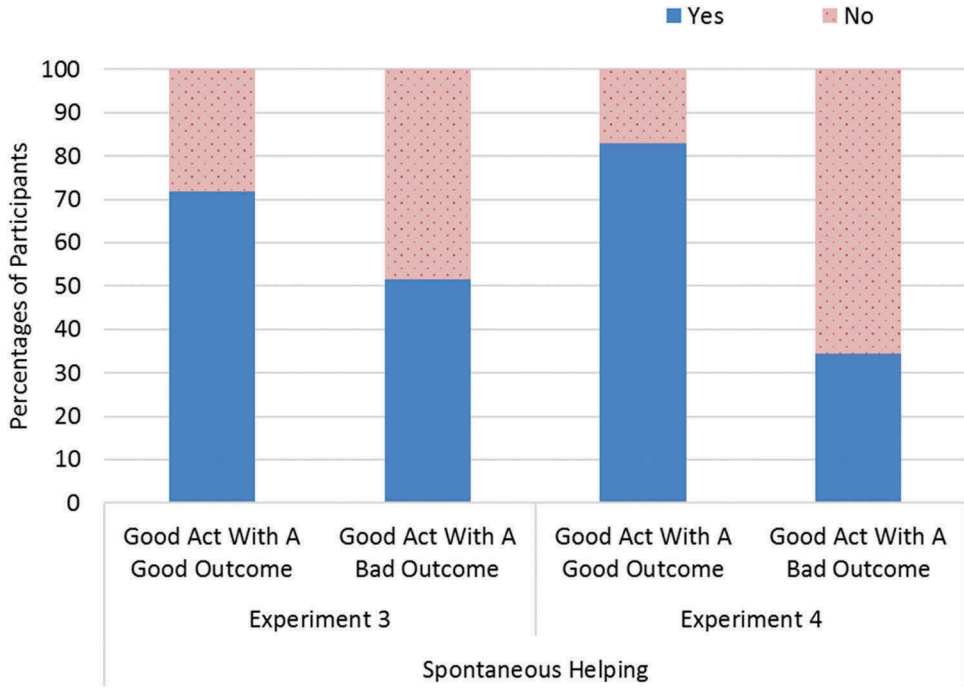

Figure 7. Spontaneous helping in the pick-up-pens task by participants in Experiments 3 (counterfactual) and 4 (pre-factual) when they recalled a morally good act with a good outcome or a good act with a bad outcome. Behavior was categorized as either helping or not helping and so there is no 'other' category.

new contribution that moral elevation itself is related not only to the moral goodness of an act, but also to the goodness of its outcome, that is, whether the morally good act succeeded or not, and hence moral emulation is affected by the goodness of the outcome as well as the act.

In the final experiment we address whether the observed effects for intentions to emulate and helping behavior arise directly from remembering morally good acts that led to good or bad outcomes, or whether counterfactual thoughts about imagined alternatives to what happened are essential to their observation.

Experiment 5

The aim of the experiment was to compare factual thoughts, counterfactual thoughts, and pre-factual thoughts, about memories of a morally good act that led to a good outcome, and a morally good act that led to a bad outcome. Participants recalled a time when someone did something good for someone else and the outcome was either good or bad, and they then reflected on the facts as they happened, or they thought about how things could have been different in the past, or how they could be different in the future. We examined their intentions to emulate, and their helping behavior, this time by the more stringent measure of whether the participant opted to donate some portion of their experimental payment to charity. This type of helping measure may be a particularly strong test of emulation because it is financially costly and it is anonymous (e.g. Aquino et al., 2011).

Our predictions concerned the difference in the frequency of *general aspirations* to emulate moral goodness following morally good actions that led to good outcomes, compared to *specific plans* to emulate moral goodness following morally good actions that led to bad outcomes. We expected that if counterfactual and pre-factual thoughts affect intentions to emulate, then the difference would be greater following counterfactual and pre-factual thoughts, compared to factual thoughts. We also expected to replicate the findings from the previous experiment that participants who thought about a morally good act with a good outcome would engage in spontaneous helping more than participants who thought about a morally good act with a bad outcome, even for the more stringent test of anonymous financial donations. Finally, we expected to replicate the findings from the previous experiments that for episodic memories about a morally good act that led to a good outcome, participants will create a *subtractive* counterfactual about how things could have been *worse*, and they will form a *general aspiration* to emulate; whereas for memories about a morally good act that led to a bad outcome, they will create *additive* counterfactuals about how things could have been *better* and they will form *specific plans* to emulate.

Method

Participants and procedure

Sample size per group was set to 50 per condition on the basis of a small effect size. The participants were 299 volunteers recruited from the online platform Prolific (www.prolific.ac). There were 107 men, 190 women and 2 who reported their gender as other and their ages ranged from 18 to 73 years, with an average age of 35.91 years (SD = 12.04). Another 49 participants were excluded from Experiment 5 prior to analysis for failing a standard online attention check measure (to choose option 1 on a scale from 1 to 7 if they were paying attention). An additional participant was excluded because they could not think of a memory, and one withdrew their data from participation immediately after taking part. Recruitment was restricted to countries with English as a first language, and the participants were from the United Kingdom (n = 248), the United States (n = 45), Canada (n = 4) and Ireland (n = 2). Participants were assigned at random to six groups: good act with good outcome, counterfactual (n = 55), pre-factual (n = 55) and factual (n = 41); and good act with bad outcome, counterfactual (n = 55), pre-factual (n = 47) and factual (n = 46).

Participants accessed the experiment through a SurveyGizmo link on Prolific. Each task was presented on a separate screen and participants were restricted from going back to the previous screen throughout. Participation took an average of 6 minutes and participants were paid 50p (GBP) for taking part.

Design and materials

The design was a 2 (outcome: good vs. bad) × 3 (thought generation: counterfactual vs. pre-factual vs. factual) between-participants design. Participants were given the same episodic memory prompts as the previous experiments and asked to recall a time when someone did something good for someone else and it turned out well, or did not turn out well. They completed the elevation scale and were prompted to think about a counterfactual or a pre-factual as in the previous experiments, or to reflect on the facts:

> People sometimes think back on events exactly as they happened. Please think about the experience you wrote about and think about the facts of the event. Please write here any further thoughts you have about the event as it happened.

Participants were asked if they thought they might change their own behavior in the future and if they responded yes, they were asked to describe their intentions. At the end, participants were thanked for taking part and informed that Prolific allows

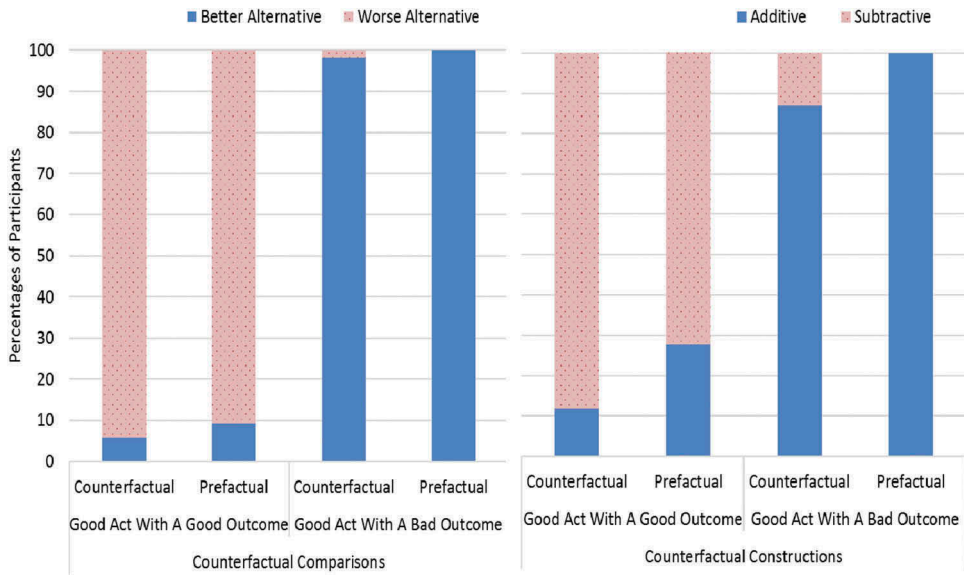

Figure 8. The types of counterfactual comparisons of better alternatives or worse alternatives, and the types of counterfactual constructions based on additive or subtractive changes, created by participants in Experiment 5 when they recalled a morally good act with a good outcome or a good act with a bad outcome and thought about a counterfactual or prefactual. No counterfactuals were ambiguous and so none were coded as 'other'.

participants to allocate some amount of their payment to one of their chosen charities, Cancer Research UK and Save the Children, and they were given the opportunity to allocate any amount of their payment, from 0p to 50p in 5p increments, to either of the charities and they could choose which charity they would like their donation to go to. At the end of the study, they were informed that this question was one of the experimental measures in the study and if they wished to actually donate they would be offered the opportunity to do so when they were returned to the Prolific website.

Results and discussion

Manipulation check

Participants who had recalled a morally good act with a good outcome (M = 5.64, SD = 1.00) were more elevated than those who had recalled a morally good act with a bad outcome (M = 4.55, SD = 1.32), as shown by the main effect of outcome, F (1, 293) = 65.05, p < .001, η_p^2 = .18, in a 2 (outcome: good, bad) x 3 (thought: counterfactual, pre-factual, factual) ANOVA on mean elevation scores. There was no main effect of type of thought generated, F (2, 293) = 0.58, p = .563, η_p^2 < .01, and no interaction, F (2, 293) = 0.97, p = .381, η_p^2 < .01, see the Supplemental Material for details.

Counterfactual comparisons about better and worse alternatives

Participants in the good act with a good outcome conditions created counterfactuals about how things could be *worse*, more often than those in the good act with a bad outcome conditions, χ^2 (1, N = 202) = 168.45, p < .001, V = .91, as Figure 8 shows.

There were no differences between the counterfactual and pre-factual groups in the creation of thoughts about how things could be *worse*, χ^2 < 1, replicating the previous experiments. Participants in the factual conditions were not required to create counterfactuals and very few did. The results were observed in each of the conditions, see the Supplemental Material for further details.

Counterfactual constructions based on additive or subtractive changes

Participants in the good act with a good outcome conditions created counterfactuals that *subtracted* something from reality, more often than those in the bad outcome conditions, χ^2 (1, N = 202) = 107.90, p < .001, V = .73, as Figure 8 also shows. There were no differences between the counterfactual and pre-factual groups in the creation of *subtractive* counterfactuals, χ^2 (N = 202, 1) = 1.77, p = .184, replicating the previous experiments. The results were observed in each of the conditions, see the Supplemental Material for further details.

Intentions to emulate

Participants' intentions to change tended to be *general aspirations* rather than *specific plans* when they had recalled a morally good act that led to a good outcome, but not a good act that led to a bad outcome, χ^2 (1, N = 168) = 7.44, p = .006, V = .21, as Figure 9 shows, and there was no evidence for an interaction between the counterfactual, pre-factual, and factual conditions, χ^2 (1, N = 168) = 0.30, p = .860, V = .04. As expected, participants created more general aspirations than specific plans when they had recalled a morally good act that led to a good outcome than a good act that led to a bad outcome, when they created counterfactual thoughts (31% general, 20% specific vs. 18% general, 42% specific), and pre-factual thoughts (27% general, 22% specific vs. 21% general, 40% specific), but not factual thoughts (32% general, 27% specific vs. 26% general, 33% specific). Hence, as we predicted, the difference in the types of intentions to emulate after participants created a counterfactual for a morally good act with a good outcome versus a good act with a bad outcome, was greater than the difference when they generated a factual thought, χ^2 (1, N = 197) = 10.60, p = .001, V = .02, and the difference was greater for pre-factuals than the difference for factual thoughts, χ^2 (1, N = 189) = 4.46, p = .035, V = .01.

Helping, as indicated by ostensible donations of some of the experimental payment to charity, was lower than in the pick-up-pens task in the previous experiment, only 27% of participants, perhaps because in this case helping was anonymous and required a financial cost. Nonetheless, participants who thought about a morally good act with a good outcome showed a greater tendency to donate compared to participants who thought about a good act with a bad outcome, 33% vs. 22%, χ^2 (1, N = 299) = 4.96, p = .026, V = .13, as Figure 10 shows, and there was no difference between the counterfactual, pre-factual, and factual groups, χ^2 (2, N = 299) = 2.94, p = .231. The greater tendency to help that participants exhibited after they had recalled a morally good act that led to a good outcome compared to a good act that led to a bad outcome was observed when they created a counterfactual thought (36% vs 22%), a pre-factual thought (35% vs 28%), and a factual thoughts(27% vs 15%), and hence there were no differences between counterfactuals and factual thoughts, χ^2 (1, N = 197) = 0.17, p = .680, or between pre-factuals and factual thoughts, χ^2 (1, N = 189) = 1.38, p = .239.

Participants who recalled a morally good act that led to a good outcome donated more money than those who recalled a good act that led to a bad outcome (M = 29.11 pence sterling, SD = 2.50 vs. M = 19.68 pence, SD = 2.89), F (1, 76) = 6.97, p = .010, η_p^2 = .08, as shown by a 2 (outcome: good, bad) x 3 (thought: factual, counterfactual, pre-factual) ANOVA on the amount donated (for the reduced sample size of the 82 participants who decided to donate). There was no evidence for a difference between the counterfactual, pre-factual, and factual thought groups, F (2, 76) = 0.08,

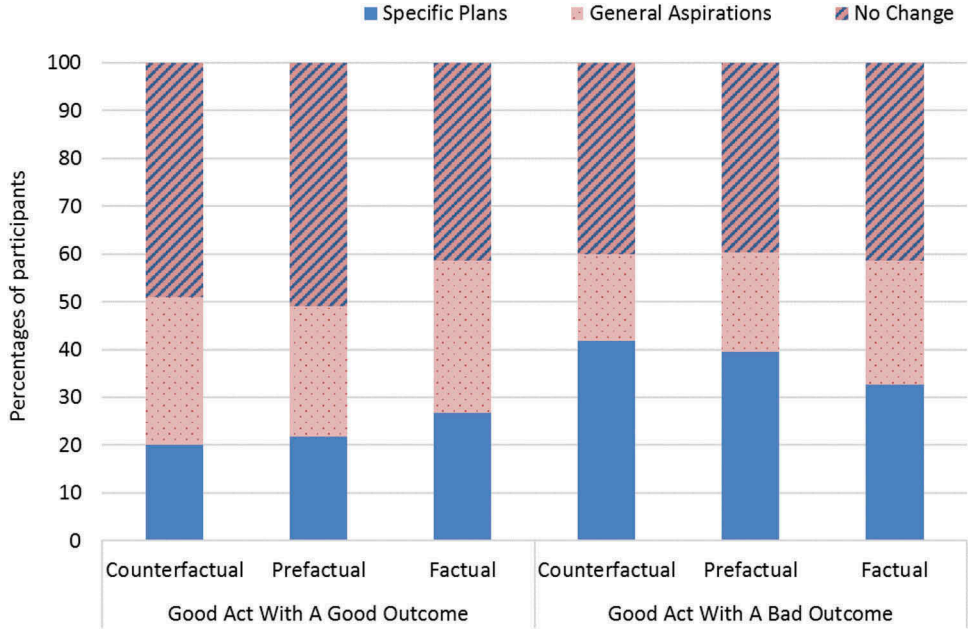

Figure 9. The types of intentions to emulate based on specific plans or general aspirations by participants in Experiment 5 when they recalled a morally good act with a good outcome or a good act with a bad outcome and thought about a counterfactual, prefactual, or the facts. Participants who indicated they did not intend to change are coded as 'no change'. No intentions were ambiguous and so none were coded as 'other'.

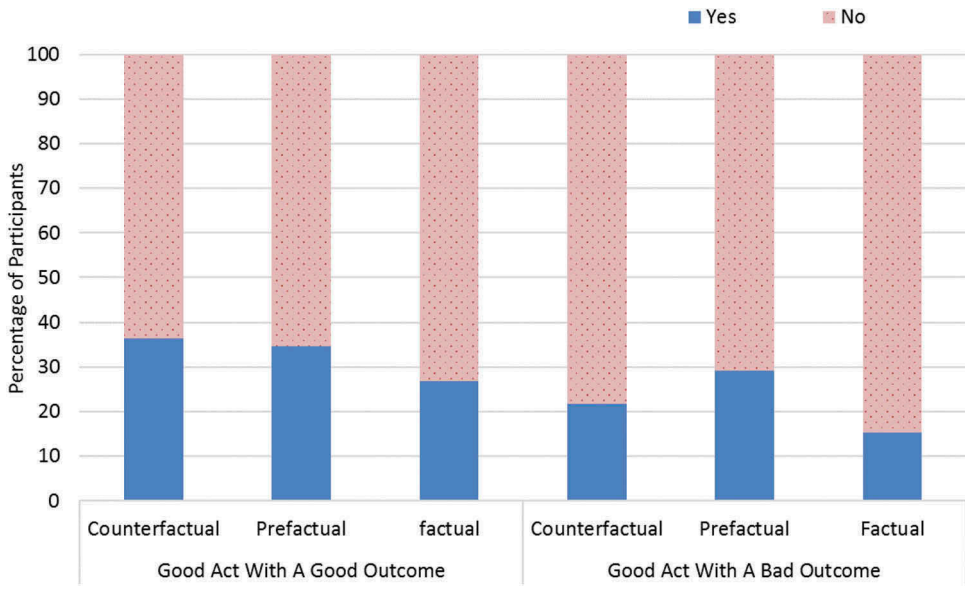

Figure 10. The helping by donations in Experiment 5 when participants recalled a morally good act with a good outcome or a good act with a bad outcome and thought about a counterfactual, prefactual or the facts. Behavior was categorized as either helping or not helping and so there is no 'other' category.

$p = .926$, $\eta_p^2 < .01$, and there was no interaction between the two factors, F (2, 76) = 0.92, $p = .405$, $\eta_p^2 = .02$.

The experiment replicates the previous ones and yields two novel results. First, it shows that the tendency to form a general aspiration to emulate rather than a specific plan occurred more often when people recalled a good act that led to a good outcome, rather than a good act that led to a bad outcome, replicating the previous experiments. Importantly, it shows that the difference occurs when people imagine how things could have turned out differently (in the counterfactual and pre-factual groups), but not when their thoughts focus on what actually happened (in the factual groups).

Second, the experiment shows that the tendency to engage in helping occurred more often when people recalled a good act that led to a good outcome rather than a good act that led to a bad outcome, extending the findings of the previous experiments even to anonymous financial donations. It also showed that people donated more money when they recalled a good act that led to a good outcome, rather than a good act that led to a bad outcome. The difference occurs when people imagine how things could have turned out differently, and also when their thoughts focus on what actually happened.

The experiment provides some support for the idea that imagined alternatives to reality play an important role in the translation of elevation to emulation, at least in the formation of different sorts of intentions, if not in the exhibition of pro-social behavior – the difference in the tendency to form general aspirations or specific plans occurs when people imagine how things could have turned out differently, but not they think about what actually happened. The experiment also shows for the first time, along with Experiments 3 and 4, and in a wider online sample, that pro-social behavior is evoked more effectively when people recall a morally good act that had a good outcome, compared to when they recall a morally good act that had a bad outcome.

General discussion

The experiments contribute five new discoveries about cognitive processes related to moral elevation and emulation. First, when people recall an episodic memory of a morally good act – when someone did something good for someone else – and they imagine how things could have been different, they tend to imagine how things could have been *worse*, and they mentally *subtract* something that happened. For example, in one of the experiments a participant recalled a friend who gave another friend money for a deposit on an apartment, and she imagined that things would have been different if her 'friend had not given her the money, she would have found it difficult to study in college'. Importantly, the results show that when people think about morally good acts, they form *general* aspirations to be good in the future, for example, the participant resolved to 'do more for others'. In contrast, when people recall a morally bad act – when someone did something bad to someone else – they imagine how things could have been *better*, they mentally *add* something to what

happened, and they form *specific* plans for the future, as Experiment 1 showed. The second finding is that these differences in counterfactuals and in intentions occur both for recent and remote episodic memories, as Experiment 2 showed.

The third discovery is that the differences in counterfactuals and intentions depend on the goodness or badness of the outcome, and not only on the goodness or badness of the moral act. When people recall an episodic memory of a morally good act that led to a *good* outcome, they imagine how things could have been *worse*, by mentally *subtracting* something, and they form *general* aspirations to be good; in contrast, when they recall a morally good act that led to a *bad* outcome, they imagine how things could have been *better*, by mentally *adding* something, and they form *specific* plans, just as they do for morally bad acts, as Experiments 3 and 4 showed.

The fourth finding is that participants who recalled a morally good act that led to a good outcome engaged in spontaneous helping – assisting the experimenter to pick up pens – more than those who recalled a morally good act that led to a bad outcome, as Experiments 3 and 4 showed. Participants did so even when the helping was anonymous and incurred a financial cost, as Experiment 5 showed, and they also donated more of their experimental payment to charity.

The fifth and final discovery is that the difference in the formation of general aspirations or specific plans when people recalled a good act that led to a good outcome, rather than a good act that led to a bad outcome, was greater when they had imagined how things could be different, compared to when they focused only on what happened, as Experiment 5 showed. The result provides some support for the idea that counterfactual thoughts play a role in the link between elevation and emulation intentions.

These discoveries have been replicated in the five experiments and observed in a diverse range of participants and methods, including museum studies with members of the general public, laboratory studies with university students, and online studies with individuals from a range of different countries.

The temporal characteristics of the episodic memory (i.e. remote vs. recent) and the temporal characteristics of the imagined alternative (i.e. past counterfactual vs. future pre-factual) had little impact. People create the same sorts of imagined alternatives and intentions to emulate whether they recall a recent episodic memory from the past month, or a remote episodic memory from their entire lifetime, as Experiments 1 and 2 show, and whether they think about how things could have been different in the past, or how they could be different in the future, as Experiments 3, 4 and 5 show. It is noteworthy that they spontaneously helped in the pick-up-pens task more when they recalled a morally good act with a good outcome compared to a good act with a bad outcome, when they imagined how things could have been different in the past, in Experiment 3, but even more so when they imagined how things could be different in the future, in Experiment 4. The result is consistent with previous research that pre-factual thoughts about how the future could be different may be even more effective than counterfactual thoughts about how the past could have been different, in preparing blueprints for intentions (e.g. Ferrante et al., 2013; Mercier et al., 2017).

These discoveries may have potential consequences for aids to encourage more frequent acts of moral goodness. Thoughts about a remembered morally good act lead people to form an intention to emulate, and to spontaneously help others, as previous research has shown, but our experiments add that thoughts about a morally good act that succeeded and led to a good outcome are more effective in doing so than those about a morally good act that failed and led to a bad outcome. Moreover, recalling a morally good act with a good outcome and imagining how things could be different, especially in the future, leads people to form general aspirations to emulate, more so than thoughts that focus on what happened. The results suggest that emulation of moral goodness may require not only a rich emotionally uplifting experience to inspire the immediate desire to be better, but eventual change through a set of cognitive processes that translate elevation emotions to emulation intentions, and develop emulation intentions into pro-social behavior. Our experiments indicate that imagined alternatives to reality may assist, at least in the formulation of future intentions to engage in moral goodness.

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