

Abstract

Counterfactual thoughts inherently imply a comparison of a given reality to an alternative state of affairs. Previous research mainly considered consequences of different counterfactual types, namely focus (other vs. self), structure (additive vs. subtractive), and direction (upward vs. downward). The current work investigates whether a ‘more-than’ versus ‘less-than’ comparative nature of counterfactual thoughts alters judgments of their impact. Four experiments demonstrated that self-generated other- (Studies 1 and 3) and self-focused (Study 2) upward counterfactuals are judged more impactful when they entail ‘more-than’ rather than ‘less-than’ comparisons. Judgments include plausibility and persuasiveness, as well as counterfactuals’ likelihood to change future behavior and feelings. Self-reported ease of thought generation and (dis)fluency gauged by difficulty in thought generation was similarly affected. This more-less asymmetry reversed in Study 3 for downward counterfactual thoughts, with ‘less-than’ counterfactuals being judged more impactful and easier to generate. Further attesting to the role of ease, when spontaneously generating comparative counterfactuals, participants correctly provided more ‘more-than’ upward counterfactuals, but more ‘less-than’ downward counterfactuals (Study 4). These findings delineate one of the to date few conditions for a reversal of the more-less asymmetry and provide support for a correspondence principle, the simulation heuristic, and thus the role of ease in counterfactual thinking. They suggest that especially ‘more-than’ counterfactuals following negative events, and ‘less-than’ counterfactuals following positive events, are likely to have an important impact on people. (226 words)

Keywords: counterfactuals; more-less asymmetry; correspondence principle; comparison; simulation heuristic

Should I Have Been *More* Careful or *Less* Careless? The Comparative Nature of Counterfactual Thoughts Alters Judgments of Their Impact

1. Introduction

Thinking about what might have been, about alternatives to actual events and facts, is a key feature of human cognition (Byrne, 2016; Roese, 1997). Being able to imagine a situation having evolved differently impacts individuals' affective, judgmental and behavioral adjustments. For example, when imagining how a situation could have turned out better, we often feel regret and may decide to act differently in the future (e.g., Zeelenberg et al., 1998). Also, when reflecting on our own or someone else's problematic behavior and picturing ourselves or others instead having acted differently, we judge ourselves and others more harshly (e.g., Mandel & Dhami, 2005; Branscombe et al., 1996). Such counterfactual thoughts rely on individuals being able to readily compare an actual, factual outcome or state of affairs to a simulated alternative. Counterfactual thoughts are thus inherently comparative, and this counterfactual comparison is a crucial determinant of several effects attributed to them, including ensuing causal attributions, evaluations and emotions (Roese & Epstude, 2017).

Recent research demonstrated that presenting comparative information in 'more-than' versus 'less-than' terms gives rise to an asymmetry in participants' responses: people use more frequently, like more, and also consider more likely to be true 'more-than' comparative statements, and this stronger impact is at least in part assumed to be due to them being perceived as more fluent than 'less-than' statements (Hoorens & Bruckmüller, 2015). In light of previously established commonalities between different types of comparative thinking (i.e., counterfactual, social, and temporal; Markman & McMullen, 2003), this more-less asymmetry should also manifest itself in counterfactual thinking.

Specifically, we posit that counterfactuals comparing a current outcome or state of affairs to a better alternative (i.e., upward counterfactuals) with a ‘more-than’ comparison (e.g., “I should have been *more* attentive”, “If only I had acted *more* carefully”) rather than a ‘less-than’ comparison (e.g., “I should have been *less* distracted”, “If only I had acted *less* carelessly) are judged as more impactful. We also posit that they should be judged as easier to generate as they should be more readily available to people. These predictions can also be derived from a correspondence principle in the mental connection of cause and effect, according to which people tend to think of antecedents and outcomes in counterfactual thoughts more readily in corresponding terms (e.g., people prefer to change small antecedents to mute small outcomes, but large antecedents to mute large outcomes; Sim & Morris, 1998). Interestingly, based on this correspondence principle the proposed effects should reverse in the case of counterfactuals comparing a current outcome to a worse alternative (i.e., downward counterfactuals). Accordingly, we posit that downward counterfactuals might be one of the rare instances in which the more-less asymmetry reverses (see Zhang & Schwarz, 2020). In turn, considering the comparative nature of counterfactuals might be an effective tool in designing interventions to increase mental well-being and health behavior, to name but two areas the effects of counterfactuals have been applied to (e.g., Eisma et al., 2021; Smallman et al., 2020; Schmidt et al., 2018).

1.1 Counterfactual Thinking

Counterfactuals typically consist of an antecedent, which often is an action (the if-part; e.g., “I should have...”), and a consequence, which often is a goal state (the then-part; e.g., “...then I would...”). The type of counterfactual thoughts is crucial in determining their consequences, and the different types vary in terms of prevalence and frequency (Byrne, 2016; Epstude & Roese, 2008; Roese & Epstude, 2017). Three key types have largely been investigated: direction, structure, and focus (see Table 1 for an overview).

75 Table 1

76 *Overview on Types of Counterfactual Thoughts*

Type	Description	Examples
Direction: upward vs. downward	Comparison of an actual, given state or outcome to either a better (<i>upward</i>) or a worse (<i>downward</i>) mentally simulated alternative	“If I had paid attention, I would not have had an accident”; “I should have accepted the job with a shorter commute” (<i>upward</i>) “Had I not started exercising early, this hike would be harder”; “In a different job I’d have less free time” (<i>downward</i>)
Structure: additive vs. subtractive (also called inaction vs. action)	Comparison of an actual, given state to a mentally simulated alternative in which an aspect has been added (<i>additive</i>) or omitted (<i>subtractive</i>)	“I could have asked more friends for help on the day I moved”; “If only I had starting saving for a house years ago” (<i>additive</i>) “If only I had opted out of the personal development workshop”; “I should never have started smoking” (<i>subtractive</i>)
Focus: self vs. other	Comparison to an actual, given state to a mentally simulated alternative concerns oneself and one’s own (in)actions (<i>self</i>) or other people and their (in)actions (<i>other</i>)	“I should not have rushed”; “I could have planned the trip by public transport” (<i>self</i>) “My manager should have thought about this issue”; “If only Martin had known before agreeing to this offer” (<i>other</i>)

77 *Note.* Combinations of all types are possible and frequent, for example an upward additive self-focused counterfactual thought (e.g., “If only I

78 had done extra training, I would have a higher salary”) or a downward subtractive other-focused counterfactual though (e.g., “Had she not done

79 extra training, she would have a lower salary”).

Direction refers to whether the consequence of what is imagined is better or worse compared to what actually happened, entailing an upward or, respectively, a downward comparison. Direction is crucially tied to the function of a counterfactual. Upward counterfactuals (“If only I had studied, I would have *passed* the test”) are generally more beneficial for behavior regulation, for example preparing oneself for future coping. Contrary, downward counterfactuals (“Had I partied, I would have *failed* the test”) mainly have affective functions in terms of promoting satisfaction with the current state of affairs or reconciliation with unchangeable conditions (Markman & McMullen, 2003; Parikh et al., 2022; Roese 1997; Roese & Olson, 1995; see Epstude & Roese, 2008). Not surprisingly, upward counterfactuals constitute the majority of everyday counterfactual thinking, are more readily available to people (i.e., more frequent; Markman et al., 1993; Petrocelli et al., 2012; Roese & Olson, 1995, 1997) and are imagined more vividly (De Brigard, Addis, et al., 2013).

Structure refers to whether the antecedent of the counterfactual (i.e., the if-part) adds something to (i.e., is additive) or removes something from the situation (i.e., is subtractive)¹. To illustrate, a counterfactual thought can entail behaviors an individual could or should have engaged in (“If only I *had* studied...”) versus refrained from doing (“If only I *hadn’t* gone out...”). In the regret literature, so-called inaction regrets, akin to additive counterfactuals, tend to linger much longer than so-called action regrets, akin to subtractive counterfactuals (Morrison et al., 2012). Especially in situations involving a negative outcome people more frequently experience additive (rather than subtractive) counterfactuals, as highlighting aspects that should have happened in order to prevent negative or ensure positive outcomes is seen as beneficial for regulating future behavior (Callander et al., 2007; Gilovich & Medvec, 1995; Petrocelli et al., 2012; Roese et al., 1999; Roese & Olson, 1993). The fact that additive

¹ The same distinction is also labeled insertions versus deletions (e.g., Kahneman & Tversky, 1982), inaction versus action (e.g., Gilovich & Medvec, 1995), or omission versus commission (e.g., Kahneman & Miller, 1986).

counterfactuals are more readily available to people dovetails with recent work showing that people overwhelmingly consider additive rather than subtractive changes when trying to solve problems (Adams et al., 2021).

Finally, focus refers to whether mental simulations involve mutations of one's own ("If only *I* had...") or another person's behavior (If only *she* had..."). Whilst other-related counterfactuals generally impact social perception, for example in terms of responsibility (e.g., Alicke et al., 2008; Macrae & Milne, 1992) or intentions (e.g., Knobe, 2010; Pellizzoni et al., 2010), self-related counterfactuals impact self-inference (e.g., Roese, 1999), motivation (e.g., Markman et al., 2008) and behavior (e.g., Morris & Moore, 2000), to name but a few examples. Individuals have more knowledge about their own behavioral options and self-related counterfactuals are thus more readily available to people (Roese & Epstude, 2017).

1.2 Ease in Construing Counterfactuals

Some counterfactuals come to mind more readily and easily than others, as detailed above. According to the simulation heuristic, the easier it is to imagine an alternative trajectory of events, the more consequential and impactful a counterfactual simulation should be: A counterfactual about an event that almost happened is easy to generate and therefore impacts judgments and emotional reactions more strongly than a counterfactual about an unlikely event, which is more difficult to generate (Kahneman & Tversky, 1982).

Counterfactual alternatives could thus amplify affective, motivational, and behavioral reactions to events especially when they come to mind easily (Epstude & Roese, 2008; Kahneman & Miller, 1986). To the best of our knowledge, four different approaches have – either directly or indirectly – jointly considered impact and experienced ease with which individuals generate and/or experience counterfactuals.

Firstly, it is possible to alter the type of an event, thus making it easy or difficult to imagine an alternative. In a direct test of norm theory (Kahneman & Miller, 1986), Miller and

McFarland (1986) varied the spatial distance between an actual and a counterfactual outcome (Study 1) and the exceptionality of a person's behavior (Study 2). A spatially close event is easier to imagine than a distant one; similarly, events ensuing from exceptional behavior are mentally easier to undo than those ensuing from more habitual behavior. Consequently, easier to imagine or to undo alternatives were found to have a stronger impact (e.g., eliciting more sympathy with victims of unfortunate events).

Secondly, it is possible to alter the number of counterfactuals generated: Generating few counterfactuals is easier than generating many (cf. Schwarz et al., 1991). Using such an availability approach, Petrocelli and Dowd (2009) investigated counterfactuals' impact in terms of punitive responses to individuals. When counterfactuals were difficult rather than easy to generate, individuals who like to invest cognitive effort in a task (i.e., have a high need for cognition) tended to opt for less punitive responses. Thus, for some people variations in ease of counterfactual thought generation impacted corresponding social judgments.

Thirdly, repeated exposure is known to increase familiarity and ease (cf. Bornstein & D'Agostino, 1992). Indeed, individuals who were instructed to re-simulate counterfactuals they had previously generated perceived them as easier to imagine (but also as less plausible than at the time they first generated them; De Brigard, Szpunar et al., 2013). However, in real life the exceptionality of an event cannot be altered, generating few versus many counterfactuals is likely to result in thoughts of varying degrees of plausibility, and ease stemming from repetition but coming at the price of plausibility puts into question the potential impact of repeated counterfactual exposure. Moreover, none of the above approaches addressed whether rather subtle variations in counterfactual thoughts themselves would alter judgments related to those thoughts.

A final, fourth line of research has done this and found that counterfactuals deemed true in alternative worlds comparatively more rather than less similar to the actual one are judged as more impactful in terms of plausibility and are also deemed easier to imagine (Stanley et al., 2017; see also De Brigard et al, 2021). However, this work was confined to individual counterfactual statements (e.g., “Professor accused me of cheating” – when in fact one had received a good grade) and did not consider subjunctive counterfactual conditionals of the form “If I had done A, then B would have been the case”. We build on this work by considering the comparative nature of counterfactual if-then thoughts and posit that their comparative nature will alter judgments of their impact.

1.3 Processing of Comparative Statements

Comparative information can be conveyed using ‘more-than’ or ‘less-than’ statements, but the comparison choice is not trivial. Various pieces of research show people having a preference for ‘more-than’ comparative statements: they are deemed more appropriate in predictions (e.g., Halberg & Teigen, 2009), used more frequently (e.g., Hoorens & Bruckmüller, 2015), verified as true more quickly (Flores d’Arcais, 1970), and judged as sounding better (Segui & Fourment, 1979). People also draw upon them more strongly when generating explanations for observed group differences (Hegarty & Pratto, 2001). Moreover, sentences conveying comparisons akin to ‘more-than’ relations (e.g., what object is larger = more big) rather than ‘less-than’ relations (e.g., what object is smaller = less big) are more quickly verified (Holyoak et al., 1979). People also prefer ‘larger’ (e.g., more, taller, higher) to ‘smaller’ comparatives (e.g., less, shorter, lower; Matthews & Dylman, 2014).

Recent work suggests that differences in fluency – at least in part – sustain these findings. In a series of studies, Hoorens and Bruckmüller (2015) found that participants were more likely to evaluate favorably, consider true, and agree more strongly with ‘more-than’

rather than ‘less-than’ comparative information, presumably because the former is cognitively more fluent – a difference giving rise to what the authors coined as the more-less asymmetry in comparative communication. To illustrate, participants evaluated statements such as “Men [women] more often own pet fish than women [men] do” more likely to be true than statements such as “Women [men] less often own pet fish than men [women] do”; they also liked better texts comparing medicines regarding positive and negative (side)effects when they involved ‘more-than’ rather than ‘less-than’ statements (pointing to a valence-independent process). Suggestive of a cognitive fluency account, the asymmetry was reduced when participants were warned to expect that they would experience difficulty (i.e., disfluency) in evaluating ‘less-than’ statements (Study 7).

Cognitive fluency can be broadly defined as the ease with which a stimulus or information can be retrieved, perceived, or processed and people use such experiences as information in the construction of various judgments (e.g., of liking, truth, and familiarity; Alter & Oppenheimer, 2009; Greifeneder et al., 2011; Schwarz, 2012; Unkelbach & Greifeneder 2013). Some previous work has considered the role of fluency in comparison processes. For example, in social comparisons standards processed under experiences of ease (vs. difficulty) led to assimilation (vs. contrast; Häfner & Schubert, 2009) and believing that a target stimulus belongs to a high- (low-) entitativity group resulted in faster and easier comparisons (vs. slower and more difficult ones; Pickett & Perrott, 2004). In the present work we consider the impact and relative ease associated with counterfactual thoughts of ‘more-than’ and ‘less-than’ comparative nature.

1.4 Comparative Counterfactual Thoughts and the Correspondence Principle

Mental simulation is common to any type of comparative thinking, including counterfactuals (Markman & McMullen, 2003). The more-less asymmetry may thus provide a useful means to examine whether counterfactual simulations of different comparative

nature differently affect their perceived impact. The counterfactual comparison is a crucial determinant of several effects attributed to counterfactual thoughts (Roese & Epstude, 2017). Therefore, we reason that the ‘more-than’ versus ‘less-than’ distinction should also affect counterfactual thinking. Moreover, considering counterfactual thinking and a so-called correspondence principle in mental connection of cause and effect allows gaining further insights into the asymmetry by uncovering conditions under which it might reverse, namely for downward counterfactual thoughts.

In the causal attribution literature, not only features of causes, but also the relationship between features of causes and effects influence attributions. Nisbett and Ross (1980) proposed that tendencies to attribute to corresponding causes are pervasive and that attributers expect that “great events ought to have great causes, complex events ought to have complex causes, and emotionally relevant events ought to have emotionally relevant causes” (p. 116). Similarly, but regarding counterfactual thoughts, people more readily focus on antecedents that correspond to and are representative of a given outcome on some basic dimensions, with a corollary of this correspondence principle being that counterfactuals with corresponding antecedents and outcomes are more likely spontaneously available to them (Kahneman & Tversky, 1972, 1982). Counterfactual simulations are guided in part by such a correspondence principle, a heuristic in which outcomes are presumed to be caused by corresponding antecedents regarding normality (normal/exceptional), valence (positive/negative), magnitude (large/small), and presence (present/absent; e.g., Bouts et al., 1992; Einhorn & Hograth, 1986; Gavanski & Wells, 1989; Roese et al., 1999; Sim & Morris 1998).

For example, regarding normality Gavanski and Wells (1989) showed that individuals generally undo normal (abnormal) outcomes by mutating normal (abnormal) antecedents. For example, when considering exceptional outcomes (e.g., a good student failing an exam)

participants more strongly focused on exceptional antecedents (e.g., the student accidentally preparing with outdated materials) rather than normal antecedents (e.g., the student being nervous). Regarding magnitude, Sim and Morris (1998) showed that smaller (larger) outcomes are by and large undone by mutating smaller (larger) antecedents. For example, when asked to imagine how a protagonist with a slow, a quick, and a medium pace phase in a triathlon could have done better versus worse (i.e., upward versus downward counterfactual), participants focused on mentally undoing the slow versus quick pace phase, respectively. Regarding valence, Bouts and colleagues (1992) found that – above and beyond normality – people mentally simulate alternative outcomes (i.e., winning, respectively losing a match) by mutating corresponding (i.e., positive, respectively negative) antecedents.

To illustrate our reasoning regarding a correspondence principle in the current context: imagining how someone could have passed an exam they failed (i.e., an upward counterfactual) should bring to mind representative positive antecedents that correspond to this alternative positive outcome, such as studying or attending class, more easily compared to rather unrepresentative negative antecedents, such as partying or procrastinating. In turn, this should render thoughts such as “Had she studied more, she would have passed the exam” or “She should have attended class more regularly” more spontaneously and readily available to people than thoughts such as “She should have attended fewer parties” or “Had she procrastinated less, she would have passed”. At the same time, mentally simulating how someone could have failed in a *de facto* successful job interview (i.e., a downward counterfactual) should bring about more readily representative negative antecedent that correspond to this alternative negative outcome, such as insufficient preparation, compared to rather unrepresentative positive antecedents, such as being calm and focused, and consequently counterfactual thoughts such as “If he had gathered less detailed information, he wouldn’t have been offered the job” rather than “He should have been more anxious and

unfocused”. Moreover, and in terms of formal rather than content related correspondence, it stands to reason that for most people ‘more than’ is associated with positive outcomes and ‘less than’ with negative outcomes. Thus, thinking of an outcome that is more similar to a desired outcome (upward) should encourage thoughts involving ‘more than’, and thinking of an outcome that is less similar to a desired one (downward) should encourage thoughts involving ‘less than’.

In light of the well-documented correspondence principle, we therefore predict a reversal of the otherwise robust asymmetry for downward counterfactuals: People should spontaneously find it more intuitive and prefer to think about how doing something less (rather than more) would have led to a worse outcome. Regarding upward counterfactuals, and also in line with a correspondence principle as well as work on the more-less asymmetry, we predict that people should spontaneously find it more intuitive and prefer to think of how doing something more (rather than less) would have led to a better outcome.

2. The Present Research

In four studies we tested our hypothesis that counterfactuals’ comparative nature will alter judgments of their impact and ease. Specifically, we predict that upward ‘more-than’ counterfactuals will be evaluated as more impactful and easy to generate than upward ‘less-than’ counterfactuals, and that downward ‘less-than’ counterfactuals will be evaluated as more impactful and easy to generate than downward ‘more-than’ counterfactuals. Across studies, we considered impact in terms of counterfactuals’ plausibility, persuasiveness, and likelihood of having a future impact on behavior and feelings. Additionally, we also considered self-reported ease of thought generation and the number of correctly generated comparative counterfactuals as an indirect indicator of ease. The studies addressed

counterfactuals differing in focus and direction², mainly centring on upward and additive counterfactuals as they are more prevalent and consequential for future behavior regulation (Callander et al., 2007; De Brigard, Addis et al., 2013; Petrocelli et al., 2012; Roese & Olson, 1997; see Epstude & Roese, 2008; Roese & Epstude, 2017).

In Study 1, participants produced ‘more-than’ or ‘less-than’ counterfactuals a protagonist might have had after experiencing a negative situation. They then stated to what extent they deemed these thoughts impactful in terms of plausibility, persuasiveness, and likelihood to change behavior. They also rated their ease of producing these thoughts. In Study 2, English- and French-speaking participants produced and then evaluated comparative counterfactuals as in Study 1, but regarding a negative situation they had personally experienced. Subsequently, an upward counterfactual condition of Study 3 was a replication of Study 1, but a further condition additionally considered the rather rare case of downward counterfactuals. In Studies 1-3 we also considered the number of correctly formulated counterfactual thoughts (i.e., thoughts complying with experimental demands in terms of ‘more-than’ versus ‘less-than’ comparisons) as an indirect measure of ease in thought generation. Going beyond this, in Study 4 participants were asked to produce comparative counterfactual thoughts spontaneously and we assessed the number of correctly and spontaneously generated ‘more-than’ versus ‘less-than’ thoughts as an indicator of ease.

² In the present work we do not consider structure (additive vs. subtractive), but focus exclusively on additive counterfactuals. Whilst structure and comparative nature can conceptually be independently varied, indicating that they are not redundant but orthogonal, formulating subtractive counterfactuals in a comparative manner makes them resemble a double negative and, more importantly, stops them from being clear antecedents of a better or worse alternative outcome. To illustrate, “If I had *not* been more/less extroverted than I was, things would have turned out better/worse” implies no change to the status quo, from the actual state of affairs. As such, it is highly unlikely that people will spontaneously generate such counterfactual thoughts. Nonetheless, in the Supplementary Material on OSF (see S1) we report two additional studies suggesting that counterfactual thoughts of ‘more-than’ and ‘less-than’ comparative nature are indeed psychologically different from counterfactual thoughts differing in additive and subtractive structure. Specifically, in one study we fully replicate findings of Roese et al. (1999; Experiment 2), showing that people judge their additive counterfactuals as more strongly centering on sufficiency than their subtractive counterfactuals, whilst they judge their subtractive counterfactuals as more strongly centering on necessity than their additive counterfactuals. In a further study using the exact same procedures and materials, but asking people to instead generate ‘more-than or ‘less-than’ counterfactuals, we find no such differences regarding sufficiency versus necessity judgments.

Supplementary information for all studies including de-identified data, data analysis scripts, and materials is available via the Open Science Framework (OSF) at https://osf.io/7wcms/?view_only=f37d500328f649759a21a9028a8c4297. All studies were approved by the Human Research Ethics Committee of the second author's university.

3. Study 1: Other-related Upward Counterfactuals

The current study tested our hypothesis that 'more-than' compared to 'less-than' comparative upward counterfactuals would be judged more impactful. Participants were presented with a scenario of a protagonist experiencing a negative situation and generated, depending on experimental condition, 'more-than' or 'less-than' counterfactual thoughts the protagonist might have had. Thus, all participants generated thoughts about the same situation and the current study tested our hypothesis in the context of other-related upward counterfactuals. Impact was assessed by considering counterfactuals' plausibility, persuasiveness, and their likelihood of bringing about behavioral change in similar future situations.

3.1 Method

3.1.1 Participants and Design

To determine the sample size in this study, we considered informative the comparison effect size in a study of Hoorens and Bruckmüller (2015; Study 2) with a similar design, namely manipulating comparison between subjects and assessing various dependent variables (and not finding a comparison by dependent variable interaction). It reported an effect size of $\eta_p^2 = .09$. To obtain this effect size ($f^2 = .10$), with $\alpha = .05$ and 80% power ($1 - \beta$), G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that in a MANOVA global effects design with two groups and three response variables we would need 114 participants. We recruited a slightly larger number to account for potential dropouts.

Overall 118 native English-speaking participants (90 females, 28 males; $M_{\text{age}}=34.76$, $SD_{\text{age}}=11.32$) were recruited on Prolific Academic, completed the entire study, and were remunerated with £1.00 for their participation. They were randomly assigned to counterfactual comparison conditions (i.e., between-subjects; ‘more-than’ $n=59$; ‘less-than’ $n=59$).

3.1.2 Procedure and Materials

Participants took part online. After reading the informed consent, they were presented with a scenario about a protagonist not getting a job. The situational description detailed several things the protagonist did in the days leading up to the job interview, with some of them being more conducive to a successful interview (e.g., taking notes on projects the hiring company was working on) and other less so (e.g., being out late for family-related matters the evening prior to the interview). The scenario was taken and only slightly adapted from Roese and Olson (1993; see S2 in the Supplementary Material on OSF for materials).

Participants were subsequently asked to generate three different counterfactual thoughts about what the protagonist could have or perhaps should have done – depending on experimental condition ‘more’ or ‘less’ – for the situation to have turned out better. As in Hoorens and Bruckmüller (2015), we excluded from analyses generated counterfactual thoughts that did not comply with instructions, rather than dropping the respective participant altogether. Excluded thoughts involved 1) providing ‘more-than’ counterfactuals in the ‘less-than’ condition (or vice-versa), 2) providing mixed comparative counterfactuals (e.g., “Andrea should have done less questioning of past interviews and focused more on her strengths”), 3) reporting not being able to provide a thought (e.g., “I have no idea”) or 4) not providing any thought at all (i.e., leaving the response field empty), 5) repeating a previously mentioned thought for a second time, and 6) providing thoughts that did not entail, implicitly or explicitly, a ‘more-than’ or ‘less-than’ comparison (e.g., merely subtractive or additive

counterfactuals such as “She could have opted out of the visit”, respectively “She could have asked the friend to carry out a mock interview”). Two coders rated whether each of the three thoughts generated by participants was in line with these criteria or not ($Kappa_1=.95$; $Kappa_2=.82$; $Kappa_3=.81$) and the very few conflicts were resolved by discussion. The final set of thoughts totaled 236.

Participants then reported on a 5-point scale (1=*not at all* to 5=*very much*) for each of the three thoughts first to what extent they deemed it impactful, and specifically how plausible (plausibility) and convincing (persuasiveness) they judged the thought to be, as well as how likely it would lead to the respective change of future behavior (behavioral change). On the same scale, they also reported to what extent it had been easy for them to come up with the thought (self-reported ease). Table 2 provides an overview on means and standard deviations. After reporting demographic information participants were thanked, debriefed, and paid.

3.2 Results

3.2.1 Impact

We conducted a multivariate analysis of variance (MANOVA), with the three judgments of counterfactuals’ impact (plausibility, persuasiveness, likelihood to change future behavior) as dependent variables and counterfactual comparison (‘more-than’ vs. ‘less-than’) as between-subjects factor. The meaningful pattern of intercorrelations between the variables measuring impact suggest the appropriateness of this approach (see Table 2), which provides a powerful test of our hypothesis by reducing measurement error.

Results indicated that, as predicted, a significant effect of comparison emerged, $F(3,102)=11.25$, $p<.001$, $\eta_p^2=.25^3$. Participants judged their other-related ‘more-than’

³ For all other analyses of this as well as in all other studies we consistently checked results when excluding participants who were non-native speakers and outliers with a studentized residual of $> |3|$ (Cohen et al., 2003; Judd et al., 2011). Effects either remain unchanged or show slightly stronger effects with these exclusions.

counterfactuals more impactful ($M=4.03$, $SD=0.77$) than ‘less-than’ counterfactuals ($M=3.25$, $SD=0.78$).

Moreover, the same results emerged in follow-up ANOVAs considering all judgments individually. Participants judged their other-related counterfactual thoughts as more plausible, $F(1,104)=18.26$, $p<.001$, $\eta_p^2=.15$, more convincing, $F(1,104)=15.21$, $p<.001$, $\eta_p^2=.13$, and more likely to lead to behavioural change in the future, $F(1,104)=29.31$, $p<.001$, $\eta_p^2=.22$, when they entailed ‘more-than’ rather than ‘less-than’ comparisons (see Table 3 for means and standard deviations).

3.2.2 Ease

Participants’ mean judgment of self-reported ease were descriptively higher in the ‘more-than’ ($M=4.13$, $SD=0.83$) compared to the ‘less-than’ comparison condition ($M=3.89$, $SD=0.95$), though not significantly so, $t(104)=1.38$, $p=.171$.

As alternative measure of ease, we also considered the inclusion rate of counterfactuals thoughts in the two counterfactual comparison conditions⁴. The reasoning here is that if ‘more-than’ compared to ‘less-than’ comparative counterfactuals are easier to generate, this should entail it being more intuitive for participants to generate correct versions of the former compared to the latter. In other words, one would expect to find more correctly formulated upward comparative counterfactuals in the ‘more-than’ compared to the ‘less-than’ comparison condition, in which participants should have experienced more difficulty in generating counterfactuals complying with experimental demands, entailing the provision of several counterfactuals not using a ‘less-than’ comparison and consequently being excluded.

To test this, we calculated the number of included thoughts for each participant, and submitted this score (ranging from 0 to 3) to a t -test. In line with expectations, a significant effect emerged, $t(108.38)=2.24$, $p=.027$, $d=0.41$, indicating that – as expected – participants

⁴ We thank an anonymous reviewer for suggesting this additional way of investigating ease.

- 389 generated more correct upward counterfactuals in the ‘more-than’ ($M=2.20$, $SD=0.85$)
- 390 compared to the ‘less-than’ comparison condition ($M=1.80$, $SD=1.11$).

391 Table 2

392 *Means and Standard Deviations of Counterfactuals' Impact Judgments as well as Their Intercorrelations in Studies 1, 2, and 3*

	Study 1: Upward					Study 2: Upward					Study 3: Upward and Downward						
	Counterfactuals (Other)					Counterfactuals (Self)					Counterfactuals (Other)						
	<i>M</i>	<i>SD</i>	1.	2.	3.	<i>M</i>	<i>SD</i>	1.	2.	3.	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	
Impact Judgment																	
1. Plausibility	3.74	.93				3.95	.90				3.79	.83					
2. Persuasiveness	3.71	1.01	.85			3.95	.93	.77			3.76	.89	.76				
3. Behavior	3.55	.96	.57	.68		3.93	.98	.53	.60		3.48	1.03	.45	.58			
4. Feelings											3.34	1.06	.45	.54	.80		
Self-reported Ease	4.01	.89	.59	.65	.44	4.08	.90	.43	.54	.30	3.78	.92	.62	.58	.30	.33	

393 *Note.* All correlations are significant at $p < .001$.

394 Table 3

395 *Means and Standard Deviations of Counterfactuals' Impact Judgments for Up- or Downward Counterfactuals as a Function of Comparison*
 396 *(More- vs. Less-than) in Studies 1, 2 and 3.*

	Study 1: Upward		Study 2: Upward		Study 3: Upward		Study 3: Downward	
	Counterfactuals		Counterfactuals		Counterfactuals Condition		Counterfactuals Condition	
	(Other)		(Self)		(Other)		(Other)	
	more-than	less-than	more-than	less-than	more-than	less-than	more-than	less-than
Judgment	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Plausibility	4.07 _a	3.36 _b	4.07 _a	3.80 _b	4.00 _a	3.50 _b	3.52 _a	4.00 _b
	(0.76)	(0.96)	(0.80)	(1.00)	(0.79)	(0.78)	(0.83)	(0.79)
Persuasiveness	4.04 _a	3.33 _b	4.12 _a	3.74 _b	4.14 _a	3.52 _b	3.45 _a	3.84 _b
	(0.91)	(0.99)	(0.86)	(0.97)	(0.76)	(0.78)	(0.88)	(0.96)
Behavior	3.97 _a	3.08 _b	4.08 _a	3.75 _b	3.75 _a	3.33 _b	3.36 _a	3.37 _a
	(0.83)	(0.87)	(0.92)	(1.02)	(0.98)	(0.86)	(1.06)	(1.11)
Feelings					3.69 _a	3.12 _b	3.27 _a	3.25 _a
					(1.05)	(0.96)	(0.98)	(1.29)

397 *Note.* Means with different (similar) subscripts (do not) differ significantly.

3.3 Discussion

Fully in line with our hypothesis, participants judged their other-related upward ‘more-than’ counterfactuals to be more impactful than their ‘less-than’ counterfactuals. This more-less asymmetry held across all separate judgments of impact, namely counterfactuals’ persuasiveness, plausibility, and likelihood of bringing about future behavioral change. Whilst this asymmetry did not emerge for participants’ self-reported judgments of ease of counterfactuals’ generation, ease and impact variables were positively correlated (see Table 2). This corroborates that, while related, participants’ ratings of impact and ease do not tap in the same underlying factor. More importantly, when considering inclusion rates – the extent to which participants’ counterfactuals complied with experimental demands – as an alternative measure of ease, we found that participants generated more correct counterfactuals in the ‘more-than’ compared to the ‘less-than’ comparative condition. This indicates that ‘more-than’ upward counterfactuals came to their minds more intuitively and easily.

The asymmetry not emerging for self-reported ease might have, at least in part, been due to quite a number of thoughts having been excluded from analyses for not complying with instructions (see above). This interpretation is corroborated by our additional analysis of counterfactuals’ inclusion rates, for which results were in line with the more-less asymmetry. In the subsequent studies, we thus highlighted in bold ‘more’, respectively ‘less’ in the instructions with the hope of somewhat mitigating this issue. Furthermore, to potentially increase self-relevance, but also to generalize effects to *self*- (rather than other-) related counterfactuals, participants in the following study generated counterfactuals based on negative situations they had experienced themselves.

4. Study 2: Self-related Upward Counterfactuals

The aim of the current study was to test if effects would generalize to self-related counterfactuals (i.e., self rather than other focus). To this end, all participants recalled a personal negative situation from their past that could have turned out better and, depending on experimental condition, subsequently generated counterfactuals of different comparative nature. We expected ‘more-than’ (compared to ‘less-than’) counterfactuals to be judged as being more impactful also in the context of the current study regarding self-related upward counterfactuals.

4.1 Method

4.1.1 Participants and Design

The design of the present study was similar to Study 1, in which we obtained a comparison effect size of $\eta_p^2=.25$ for counterfactual impact. However, effect sizes for individual judgment dimensions were lower (ranging from .13-.22), for self-reported ease no significant differences emerged, and regarding ease as gauged by inclusion rates effects were rather small ($\eta_p^2=.04$). Moreover, whilst in Study 1 participants generated counterfactuals about the same person and the same situation, we expected more variance in responses, as participants in the current study generated counterfactuals about different situations they had experienced, which furthermore comes with the risk of such self-selected episodes suffering from memory and presentation bias (Teigen et al., 2011).

We consequently based power considerations on approximately one fourth of the effect size obtained in Study 1 regarding impact. To obtain an effect size of $\eta_p^2=.06$ ($f^2=.06$), with $\alpha=.05$ and 80% power ($1-\beta$), G*Power 3.1 (Faul et al., 2007) indicated that in the same MANOVA global effects design as in Study 1 (i.e., two groups, three response variables) we would need 186 participants. We again recruited a slightly larger number to account for potential dropouts.

On Prolific Academic 202 native English-speaking participants were recruited, completed the entire study, and were remunerated with £1.00. Additionally, in the context of an internship, native French-speaking participants were recruited from voluntary research participation groups and by postings on social media (Facebook). Data collection was stopped once a week with no further participation had occurred following a second call for participation. By that time, 96 French-speaking participants had completed the study. Samples were combined and two coders checked whether the situation recalled by participants corresponded with instructions (see details below), which resulted in eight participants being excluded (see details in the next section)⁵. The final sample thus comprised 290 participants (215 females, 73 males, 2 without response; $M_{\text{age}}=34.94$ $SD_{\text{age}}=12.71$). Participants were randomly assigned to counterfactual comparison conditions (i.e., between-subjects; ‘more-than’ $n=149$; ‘less-than’ $n=141$).

4.1.2 Procedure and Materials

Participants took part online. After reading the informed consent, participants were presented with information about counterfactual thoughts as follows:

After negative experiences (e.g., failing a job interview, an interpersonal quarrel, missing a train, making a mistake at work, etc.), people sometimes can't help thinking about how things might have turned out better if only they had done something differently. Oftentimes people have thoughts about how they should have acted differently to obtain a better outcome (e.g., I should have prepared more; I should have spent less time on irrelevant aspects; I should have been more confident; I should have been less anxious, etc.).

⁵ Not excluding these participants the counterfactual comparison main effects reported below remain significant, both for impact, $F(3,244)=3.47$, $p=.017$, $\eta_p^2=.04$, and for self-reported ease, $F(1,246)=6.23$, $p=.013$, $\eta_p^2=.03$, with again no sample by comparison interactions qualifying these main effects, $F_s<.1.55$, $p_s>.203$. Regarding ease assessed more indirectly by inclusion rates, effects likewise remain unchanged, with the counterfactual comparison main effect being marginal, $F(1,294)=3.86$, $p=.069$, $\eta_p^2=.01$, and no sample by comparison interaction qualifying this, $F(1,294)=.43$, $p=.513$, $\eta_p^2<.01$.

The examples of counterfactuals provided thus entailed both ‘more-than’ and ‘less-than’ comparisons for participants in both conditions (see S3 in the Supplementary Material on OSF for materials). Participants were then asked to briefly describe only the situation after which they had such thoughts in the past and the events that lead to this situation, but not any related thoughts. As mentioned above, eight participants described situations that did not comply with the above instructions and were consequently excluded. For example, they provided descriptions that did not allow to understand either the situation or if the situation indeed had been a negative experience (e.g., leaving a device connected) or recalled a situation that was clearly out of their own control and unrelated to participants potentially having acted any differently (e.g., a fatal fetal diagnosis).

Only after providing their situation descriptions participants were randomly assigned to experimental conditions and asked to report three different thoughts about what they could have or perhaps should have done, depending on experimental condition ‘more’ or ‘less’, for the situation to have turned out better (i.e., upward self-related comparative counterfactuals). These counterfactual thoughts were rated by two coders as to whether or not they were in line with the same criteria detailed in Study 1 or not (English-speaking sample and coders: $Kappa_1=.89$; $Kappa_2=.77$; $Kappa_3=.80$; French-speaking sample and coders: $Kappa_1=.88$; $Kappa_2=.71$; $Kappa_3=.85$). The very few conflicts were resolved by discussion. The final set of thoughts totaled 520.

On the same 5-point scale as in Study 1 participants then reported for each of the three thoughts to what extent they deemed it impactful (i.e., judgments of plausibility, persuasiveness, likelihood for behavioral change) and to what extent it had been easy for them generate it (self-reported ease; see Table 2 for all means and standard deviations). They then reported demographic information, were thanked, debriefed, and paid.

4.2 Results

4.2.1 Impact

We conducted a MANOVA, with the three counterfactual impact judgments as dependent variables. The meaningful pattern of all correlations between judgments again suggest the appropriateness of this approach (see Table 2). Apart from counterfactual comparison ('more-than' vs. 'less-than'), we also considered sample (English-speaking vs. French-speaking) as between-subjects factor in order to be able to detect any potential influence⁶.

An unexpected but uninteresting main effect of study emerged, $F(3,239)=6.98$, $p<.001$, $\eta_p^2=.08$, indicating that overall impact judgments were higher in the English-speaking Prolific Academic sample ($M=3.99$, $SD=0.82$) than in the French-speaking sample of voluntary participants ($M=3.83$, $SD=0.80$). Importantly, there was no comparison by sample interaction, $F=1.41$, $p=.242$, $\eta_p^2=.02$. However, as predicted, a significant main effect of comparison, $F(3,239)=3.80$, $p=.011$, $\eta_p^2=.05$, indicated that participants judged their self-related 'more-than' counterfactuals more impactful ($M=4.09$, $SD=0.74$) compared to their 'less-than' counterfactuals ($M=3.76$, $SD=0.86$).

Moreover, the same results emerged in follow-up ANOVAs considering all judgments individually. Participants judged their self-related counterfactual thoughts as more plausible, $F(1,241)=7.82$, $p=.006$, $\eta_p^2=.03$, more convincing, $F(1,241)=11.12$, $p<.001$, $\eta_p^2=.04$, and more likely to lead to behavioural change in the future, $F(1,241)=5.75$, $p=.017$, $\eta_p^2=.02$, when they entailed 'more-than' rather than 'less-than' comparisons (see Table 3 for means and standard deviations).

4.2.2 Ease

⁶ Ignoring sample, results do not substantially differ, with the counterfactual comparison main effects remaining significant, both for impact (global effects MANVOA as in the previous study), $F(3,241)=3.70$, $p=.012$, $\eta_p^2=.04$, and for self-reported ease (t -test as in the previous study), $t(243)=2.52$, $p=.012$, $d=.33$. For ease assessed more indirectly by inclusion rates, the marginal counterfactual comparison main effect turned significant, $t(280.92)=2.29$, $p=.023$, $d=0.27$, when ignoring sample as factor.

Participants' mean judgments of ease were subjected to an ANOVA with counterfactual comparison (more vs. less) and sample (English-speaking vs. French-speaking) as between-subjects factor. There was no main effect of sample, $F=2.04$, $p=.155$, $\eta_p^2=.01$, nor a sample by comparison interaction, $F=0.70$, $p=.405$, $\eta_p^2<.01$. However, as expected a significant comparison main effect emerged, $F(1,241)=7.17$, $p=.008$, $\eta_p^2=.03$. Participants judged 'more-than' counterfactuals as easier to generate ($M=4.21$, $SD=0.87$) than 'less-than' counterfactuals ($M=3.92$, $SD=0.92$).

We again also considered inclusion rates of counterfactuals thoughts as an indirect measure of ease and subjected them to the same ANOVA as self-reported ease above. Again, there was no main effect of sample, $F=0.09$, $p=.768$, $\eta_p^2<.01$, nor a sample by comparison interaction, $F=0.60$, $p=.441$, $\eta_p^2<.01$. The expected comparison main effect emerged again, albeit only marginally so, $F(1,286)=3.51$, $p=.062$, $\eta_p^2=.01$, with participants tending to generate more correct counterfactuals in the 'more-than' ($M=1.93$, $SD=1.01$) compared to the 'less-than' comparison condition ($M=1.65$, $SD=1.12$).

4.3 Discussion

Participants judged 'more-than' compared to 'less-than' self-related upward counterfactuals to be more impactful, in line with our hypothesis, and this also held when considering each counterfactual impact judgment separately (i.e., persuasiveness, plausibility, likelihood to change future behavior). They also reported that it was easier for them to generate 'more-than' compared to 'less-than' upward counterfactuals. Moreover, the more indirect measure of ease (i.e., the number of correctly formulated counterfactual thoughts) also indicated that 'more-than' compared to 'less-than' upward counterfactual thoughts tended to more intuitively come to participants' minds. Whether participants were English- or French-native speakers did not qualify these effects, suggesting that they generalize to ordinal 'more-than' versus 'less-than' comparisons in other languages. Effect sizes were smaller than

in the previous studies, presumably because in the current study participants generated counterfactuals about different situations they had personally experienced, rather than about one specific situation someone else had experienced.

Both previous studies considered upward counterfactuals. Thus, a systematic variation of upward versus downward counterfactuals in relation to the impact of their comparative nature was implemented in the next study.

5. Study 3: Other-related Upward vs. Downward Counterfactuals

Relying on the same procedures and materials as Study 1, the aim of the current study was to test how the comparative nature of counterfactual thoughts would affect *downward* counterfactuals. To this end, half of all participants were presented with a scenario outcome entailing the protagonist experiencing a *positive* event, namely being hired – instead of not getting the job, as in Study 1, which was the case for the other half of participants. Subsequently, they again generate, depending comparison condition, ‘more-than’ or ‘less-than’ counterfactual thoughts the protagonist might have had (i.e., upward other-related counterfactuals as in Study 1 for the negative situation; downward other-related counterfactuals for the positive situation) and judged them as before, but we added counterfactuals’ likelihood to change feelings as a further variable assessing their impact.

In light of earlier research showing that upward compared to downward counterfactuals are more readily available to people (Markman et al., 1993; Petrocelli et al., 2012; Roese, 1997; Roese & Olson, 1995, 1997), we expected upward counterfactuals to be judged as more impactful, and presumably also to be experienced as easier to generate. More importantly, we expected direction and the comparative nature of counterfactuals to interact, with ‘more-than’ counterfactuals being judged more impactful in the case of upward counterfactual thoughts, but with ‘less-than’ counterfactuals being judged more impactful in the case of downward counterfactual thoughts. As outlined in the introduction, this prediction

is based on a *correspondence principle* in mentally connecting cause and effect according to which people tend to think of antecedents and outcomes more readily in corresponding terms (Bouts et al., 1992; Einhorn & Hograth, 1986; Gavanski & Wells, 1989; Sim & Morris 1998; cf. Roese et al., 1999). Accordingly, thinking of how doing something more (rather than less) should be more readily available to people and preferred when mentally simulating better outcomes; but thinking of how doing something less (rather than more) should be more readily available to people and preferred when mentally simulating worse outcomes.

5.1 Method

5.1.1 Participants and Design

We again based our power considerations on the smallest effect size we considered theoretically interesting (Lakens, 2021), namely $\eta_p^2 = .04$ ($f^2 = .04$; cf. Study 1), also in light of our predicted interaction potentially not fully crossing over. To obtain this effect size for $\alpha = .05$ and 80% power ($1 - \beta$), G*Power 3.1 (Faul et al., 2007) indicated that in a MANOVA special effects and interaction design with four groups, four response variables, and two predictors we would need 192 participants. We again recruited a slightly larger number to account for potential dropouts.

Overall, 210 native English-speaking participants (135 females, 74 males, 1 other; $M_{\text{age}} = 35.69$, $SD_{\text{age}} = 12.15$) were recruited on Prolific Academic, completed the entire study, and were remunerated with £1.00 for their participation. They were randomly assigned to conditions in a 2 (counterfactual comparison: ‘more-than’ vs. ‘less-than’) by 2 (counterfactual direction: upward vs. downward) design, with both factors varying between participants (‘more-than’/upward: $n = 53$; ‘less-than’/upward: $n = 53$; ‘more-than’/downward: $n = 52$; ‘less-than’/downward: $n = 52$).

5.1.2 Procedure and Materials

Participants took part online and procedures and materials were identical to Study 1 except for the following two changes. First, in the downward counterfactual direction condition the scenario ended with the protagonist being selected and getting the job. Here participants thus thought about what the protagonist could have done – depending on counterfactual comparison condition – ‘more’ or ‘less’ for the situation to have turned out *worse*. Second, we added one item that asked participants on the same 5-point scale (1=*not at all* to 5=*very much*) as for the other judgments of impact in Study 1 (i.e., plausibility, persuasiveness, likelihood to lead to future behavioral change) how likely they thought it was for each thought they had generated that it would change the protagonist’s future feelings (feeling; see S4 in the Supplementary Material on OSF for materials). Table 2 provides an overview on means and standard deviations.

The three up- or downward and ‘more-than’ or ‘less-than’ comparative counterfactual thoughts participants generated were again coded by two coders as in the previous studies, but with excluded thoughts now additionally pertaining to thoughts with a direction that did not correspond with instructions (i.e., providing an upward counterfactual thought in the downward condition or vice-versa). Coders largely agreed ($Kappa_1=.87$; $Kappa_2=.88$; $Kappa_3=.83$) and the few conflicts were again resolved by discussion. The final set of thoughts totaled 388. Participants reported demographic information before being thanked, debriefed, and paid.

5.2 Results

5.2.1 Impact

We conducted a MANOVA, with the four impact judgments as dependent variables and counterfactual comparison (‘more-than’ vs. ‘less-than’) as well as direction (upward vs. downward) as between-subjects factor. The meaningful pattern of all correlations between judgments again suggests the appropriateness of this approach (see Table 2). No main effects

of comparison, $F=1.00$, $p=.408$, $\eta_p^2=.02$, or of direction emerged, $F=1.45$, $p=.221$, $\eta_p^2=.04$.

As expected, however, the comparison by direction interaction was significant,

$F(4,161)=4.37$, $p=.002$, $\eta_p^2=.10$ (see Figure 1).

Replicating Study 1, in the upward direction condition ‘more-than’ counterfactuals were judged more impactful ($M=3.99$, $SD=0.70$) than ‘less-than’ counterfactuals ($M=3.45$, $SD=0.69$), $F(4,161)=2.85$, $p=.026$, $\eta_p^2=.07$.

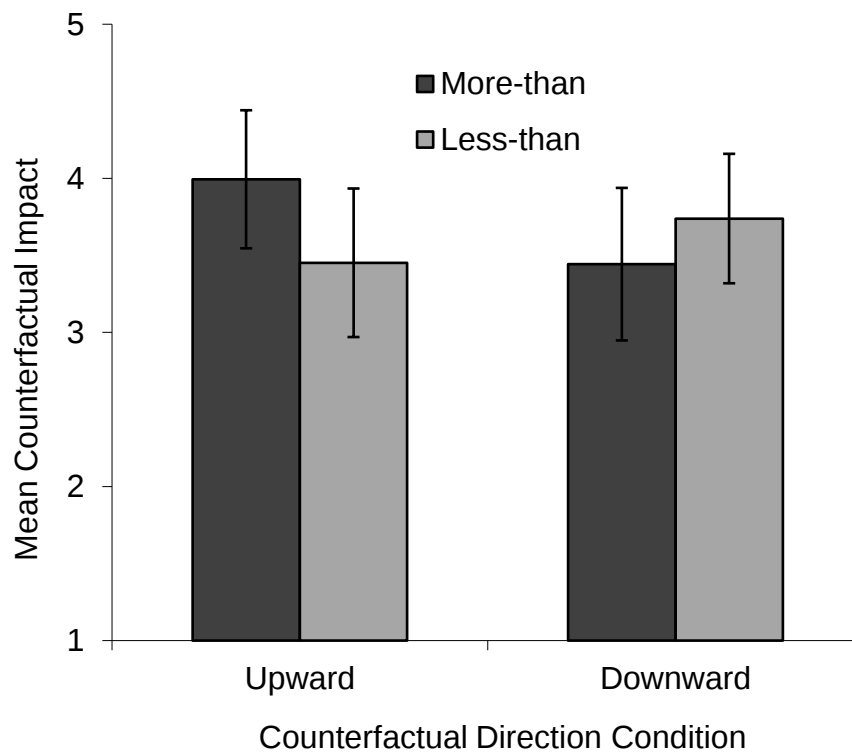
In follow-up ANOVAs regarding all judgments individually, participants judged their other-related counterfactual thoughts as more plausible, $F(1,164)=8.05$, $p=.005$, $\eta_p^2=.05$, more convincing, $F(1,164)=10.82$, $p=.001$, $\eta_p^2=.06$, and more likely to lead to behavioural change in the future, $F(1,164)=5.03$, $p=.026$, $\eta_p^2=.03$, as well as to influence feelings, $F(1,164)=5.55$, $p=.020$, $\eta_p^2=.03$, when they generated ‘more-than’ rather than ‘less-than’ comparative thoughts (see Table 3 for means and standard deviations).

In line with our prediction, effects reversed in the downward direction condition. Here ‘less-than’ counterfactuals were judged more impactful ($M=3.74$, $SD=0.80$) than ‘more-than’ counterfactuals ($M=3.44$, $SD=0.81$), $F(4,161)=2.52$, $p=.043$, $\eta_p^2=.06$.

Follow-up ANOVAs regarding all judgments individually indicated that participants judged their other-related counterfactual thoughts as more plausible, $F(1,164)=7.62$, $p=.006$, $\eta_p^2=.04$, and more convincing, $F(1,164)=4.39$, $p=.038$, $\eta_p^2=.03$, when they generated ‘less-than’ rather than ‘more-than’ comparative thoughts. This was not the case, however, for behavioral change, $F=0.01$, $p=.939$, $\eta_p^2<.01$, and feelings, $F=0.01$, $p=.923$, $\eta_p^2<.01$ (see Table 3 for means and standard deviations).

636 Figure 1

637 *Participants' Mean Judgment of Counterfactuals' Impact (Plausibility, Persuasiveness,*
638 *Likelihood to Lead to Behavioral Change and to Impact Feelings) in Study 3 as a Function of*
639 *Counterfactual Direction (Up- vs. Downward) and Comparison (More- vs. Less-than)*



640

641 *Note.* Error bars represent 95% confidence intervals; scale range 1-5.

5.2.2 Ease

Participants' mean judgments of ease were subjected to an ANOVA with counterfactual comparison (more vs. less) and direction (upward vs. downward) as between-subjects variables. There was no main effect of comparison, $F(1,164)=0.26$, $p=.608$, $\eta_p^2<.01$, nor a main effect of direction, $F(1,164)=1.88$, $p=.172$, $\eta_p^2=.01$. However, as expected a significant comparison by direction interaction emerged, $F(1,164)=19.97$, $p<.001$, $\eta_p^2=.11$. Whilst this had only descriptively been the case in Study 1, in the upward direction condition 'more-than' counterfactuals were now evaluated as significantly easier to generate ($M=4.11$, $SD=0.87$) than 'less-than' counterfactuals ($M=3.57$, $SD=0.74$), $F(1,177)=7.72$, $p=.006$, $\eta_p^2=.05$. As expected, this reversed in the downward direction condition, with 'less-than' counterfactuals being evaluated as easier to generate ($M=3.99$, $SD=0.86$) than 'more-than' counterfactuals ($M=3.31$, $SD=1.00$), $F(1,164)=12.58$, $p=.001$, $\eta_p^2=.07$.

The inclusion rates of counterfactuals thoughts were subjected to the same ANOVA as self-reported ease above. As was the case for self-reported ease, there was no main effect of comparison, $F(1,206)=0.74$, $p=.390$, $\eta_p^2<.01$, nor a main effect of direction, $F(1,206)=0.89$, $p=.347$, $\eta_p^2<.01$. The expected comparison by direction interaction was again significant, $F(1,206)=4.21$, $p<.041$, $\eta_p^2=.02$. In the upward direction condition, the pattern of means descriptively followed that for self-reported ease, with more correct counterfactuals generated in the 'more-than' ($M=1.87$, $SD=1.06$) compared to the 'less-than' comparison condition ($M=1.69$, $SD=1.31$), though this was not significant, $F(1,206)=0.72$, $p=.398$, $\eta_p^2<.01$. At the same time, as expected and as was the case for self-reported ease, this reversed – and significantly so – in the downward direction condition, with more correct counterfactuals generated in the 'less-than' ($M=2.15$, $SD=0.92$) compared to the 'more-than' comparison condition ($M=1.68$, $SD=1.27$), $F(1,206)=4.20$, $p=.042$, $\eta_p^2=.02$.

5.3 Discussion

The current results replicated Study 1. Participants again judged upward counterfactuals they generated regarding a protagonist's negative experience more impactful when these thoughts entailed 'more-than' rather than 'less-than' comparisons. As in the previous studies, this was the case for all impact judgments considered individually (i.e., plausibility, persuasiveness, likelihood to change future behavior – and here additionally regarding likelihood to change future feelings). Moreover, participants also judged 'more-than', compared to 'less-than' counterfactual thoughts as easier to generate, though the number of correctly generated comparative counterfactual thoughts did not significantly differ.

Going beyond Study 1, and in line with predictions based on a correspondence principle in mental connection of cause and effect in counterfactual thinking, this reversed for participants generating downward counterfactuals: They instead judged 'less-than' compared to 'more-than' comparative counterfactuals as more impactful and also as easier to generate; they also generated more correct 'less-than' compared to 'more-than' counterfactual thoughts. Here, however, it transpired that for impact the effect was driven by judgments of counterfactuals' plausibility and persuasiveness, not by judgments of their likelihood to change future behavior and feelings. In hindsight this might be explained by downward counterfactuals generally not serving future behavior regulation (Roese & Epstude, 2017).

6. Study 4: Spontaneously Generated Comparative Other-related Counterfactuals

The previous studies considered the number of correctly formulated comparative counterfactuals as a proxy for ease. The rationale behind this was that if indeed 'more-than' (versus 'less-than') comparative counterfactuals are more readily available to people when generating upward (downward) counterfactuals, they should have less difficulty to produce them. The aim of the current study was thus to provide further evidence that ease affects people's spontaneous responses when generating comparative counterfactuals, even when not

elicited by *specific* comparative prompts. To this end, participants were presented with one of the two versions of the scenario used in Study 3, were again asked to provide three counterfactual thoughts, but were free to generate ‘more-than’ and ‘less-than’ counterfactuals in both counterfactual direction conditions. Instructions about counterfactual thought generation varied as to whether ‘more-than’ was mentioned prior to ‘less-than’ or vice-versa. We expected that when generating upward comparative counterfactual thoughts, participants would spontaneously provide more correct ‘more-than’ compared to ‘less-than’ counterfactuals. We expected this to reverse for downward comparative counterfactual thoughts. This study was preregistered (https://aspredicted.org/TYL_KBK).

6.1 Method

6.1.1 Participants and Design

As before, we based our power considerations on the same smallest effect size we considered theoretically interesting (Lakens, 2021) in the previous studies, namely $\eta_p^2=.04$. To obtain this effect size for $\alpha=.05$ and 80% power ($1-\beta$), G*Power 3.1 (Faul et al., 2007) indicated that in an ANOVA design with four groups, we would need 191 participants. We again recruited a slightly larger number to account for potential dropouts.

After excluding seven non-native English-speakers (see our pre-registration), the final sample comprised 244 participants (166 females, 78 males; $M_{age}=37.27$, $SD_{age}=11.19$) recruited on Prolific Academic, who completed the entire study and were remunerated with £1.00 for their participation. They were randomly assigned to conditions in a 2 (counterfactual direction: upward vs. downward) by 2 (order: instructions mentioning ‘more-than’ before ‘less-than’ vs. vice-versa) design, with both factors varying between participants (upward/‘more-than’ mentioned first: $n=62$; upward/‘less-than’ mentioned first: $n=62$; downward/‘more-than’ mentioned first: $n=57$; downward/‘less-than’ mentioned first: $n=63$).

6.1.2 Procedure and Materials

Participants took part online. Procedures and materials were identical to Study 3 except for the following changes: Participants were not instructed to generate either ‘more-than’ or ‘less-than’ counterfactual thoughts. Instead, they were randomly assigned to the counterfactual direction conditions asking them to provide three comparative counterfactual thoughts about what the protagonist could have done both ‘more’ and/or ‘less’ for the situation to have turned out better (upward direction) or worse (downward direction). Additionally, we systematically varied between participants whether instructions mentioned ‘more-than’ or ‘less-than’ first (e.g., “Please write about what Andrea should have or could have done either more or less...” vs. “...could have done either less or more...”). Participants were instructed not to provide thoughts containing both types for comparisons in one thought (see S5 in the Supplementary Material on OSF for materials).

The three up- or downward comparative counterfactual thoughts participants generated were again coded by two coders regarding reasons for exclusion (see pre-registration and Study 3; for example, providing an upward counterfactual in the downward condition or vice-versa) and as to whether the included thoughts entailed a ‘more-than’ or ‘less-than’ comparison ($Kappa_1=.93$; $Kappa_2=.91$; $Kappa_3=.90$). The very few conflicts were again resolved by discussion leading to a final set of 532 thoughts. Participants reported demographic information before being thanked, debriefed, and paid.

6.2 Results

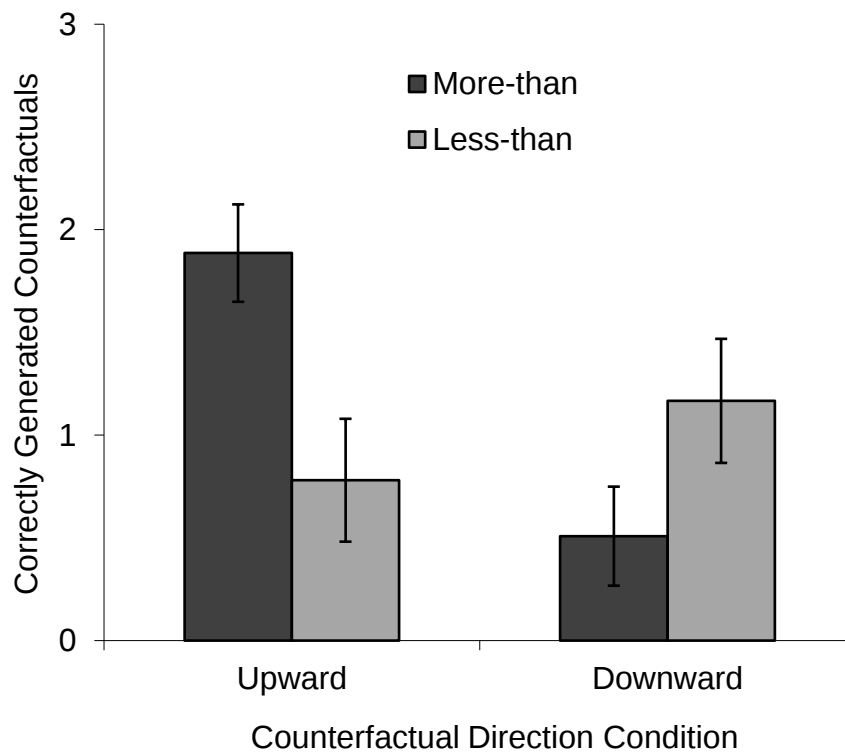
To test our hypotheses as pre-registered, we computed a difference score (number of ‘more-than’ minus number of ‘less-than’ counterfactuals generated), which could thus range from 3 (all correctly generated counterfactuals of ‘more-than’ comparative nature) to -3 (all correctly generated counterfactuals of ‘less-than’ comparative nature). We conducted a 2 (counterfactual direction) x 2 (order) ANOVA on this difference score.

There was no main effect of order, $F=0.01$, $p=.905$, $\eta_p^2<.01$, and no order by direction interaction, $F<0.01$, $p=.994$, $\eta_p^2<.01$. However, as predicted a significant counterfactual direction main effect emerged, $F(1,239)=155.33$, $p<.001$, $\eta_p^2=.39$ (excluding one outlier with a studentized residual $> |3|$: $F(1,238)=170.17$, $p<.001$, $\eta_p^2=.42$). Participants generating upward counterfactuals spontaneously produced more ‘more-than’ counterfactuals ($M=1.11$, $SD=1.20$), whereas participants generating downward counterfactual spontaneously produced more ‘less-than’ counterfactuals ($M=-0.66$, $SD=0.98$).

Alternatively conducting a repeated measures ANOVA, with number of correctly generated ‘more-than’ and ‘less-than’ counterfactuals (response) as within-subjects factors and direction and order as between-subjects factors, the significant response by direction interaction, see above: $F(1,239)=155.33$, $p<.001$, $\eta_p^2=.39$, indicated that participants in the upward counterfactual condition produced more ‘more-than’ ($M=1.89$, $SD=0.72$) than ‘less-than’ counterfactuals ($M=0.78$, $SD=0.66$), $F(1,239)=123.68$, $p<.001$, $\eta_p^2=.34$, and this reversed for participants in the downward counterfactual condition, who produced more ‘less-than’ ($M=1.17$, $SD=0.99$) than ‘more-than’ counterfactuals ($M=0.51$, $SD=0.62$), $F(1,239)=43.72$, $p<.001$, $\eta_p^2=.15$ (see Figure 2).

Figure 2

Average of Participants' Spontaneously Correctly Generated Counterfactuals in Study 4 as a Function of Counterfactual Direction (Up- vs. Downward) and Chosen Comparison (More- vs. Less-than)



Note. Error bars represent 95% confidence intervals; range 0-3.

6.3 Discussion

The present findings structurally replicated the results for self-reported ease and ease as indirectly assessed via inclusion rates in Study 3. They go beyond the previous findings based on participants' (in)correct thought generation when explicitly instructed to generate either 'more-than' or 'less-than' counterfactuals. Here, participants spontaneously produced more correct 'more-than' compared to 'less-than' upward counterfactuals and at the same time they spontaneously produced more correct 'less-than' compared to 'more-than' downward counterfactuals. As such, the present results provide further evidence

corroborating a correspondence principle and a fluency account regarding the differential ease of counterfactuals differing in their comparative nature.

7. General Discussion

The distinction between ‘more-than’ and ‘less-than’ comparative information has been demonstrated to entail an asymmetry regarding people’s responses: people like more, agree more strongly with, and more likely consider to be true ‘more-than’ compared to ‘less-than’ statements, presumably at least in part because they are more fluent (Hoorens & Bruckmüller, 2015). In the present work, we aimed to demonstrate that upward counterfactual thoughts, comparing a factual state of affairs to a simulated better alternative, are similarly affected when they are of comparative nature. Across three studies, including an internal replication of Study 1 in Study 3 and considering English- and French-speaking participants in Study 2, we found that self-generated upward ‘more-than’ compared to ‘less-than’ counterfactual thoughts about how things could have turned out better than they in fact did were judged to have more impact. Impact was assessed across studies in terms of plausibility, persuasiveness, and thoughts’ likelihood of changing behavior in the future. Self-reported and more indirect measures of ease were similarly affected, with participants generally judging such ‘more-than’ counterfactuals as easier to generate, and generally providing more correct ‘more-than’ compared to ‘less-than’ comparative thoughts. These findings were similar for self- and other-focused counterfactuals. Regarding direction, in line with a correspondence principle in mental connection of cause and effect in counterfactual thinking, effects reversed for downward counterfactuals (imagining how things could have turned out worse than they actually did; Study 3). Here, thoughts about what one could have done ‘less’ than what one actually did were judged to be more impactful and to more easily come to mind; they were also provided with less errors than thoughts about what one could have done ‘more’. Considering spontaneously generated comparative counterfactuals, Study

4 further corroborated a correspondence principle and the role of ease by demonstrating that when asked to produce comparative counterfactual thoughts, participants spontaneously generated more ‘more than’ compared to ‘less than’ upward counterfactual thoughts, but they spontaneously generated more ‘less than’ compared to ‘more than’ downward counterfactual thoughts.

Our results are noteworthy because they contribute to the very scarce research demonstrating conditions under which the otherwise robust more-less asymmetry reverses. To the best of our knowledge the only existing work delineating such conditions demonstrated that people more rapidly and correctly categorize small (vs. large) numbers when primed by an upper-bound, ‘less-than’ (vs. lower-bound, ‘more-than’) modifier (Zhang & Schwarz, 2020). These authors also found that people more likely accept as true quantitative factual claims when ‘less-than’ modifiers preceded smaller numbers (e.g., “Less than 5% of all tax returns are audited by the IRS”) and when ‘more-than’ modifiers preceded larger numbers (e.g., “More than 80% of mass in our solar system is composed of gasses”) than vice-versa. Thus, the asymmetry reverses for small quantities, which are more fluently processed in the context of ‘less-than’ claims. Presumably this is the case because ‘less-than’ (versus ‘more-than’) modifiers are deemed more representative of smaller (larger) numbers and quantities. Similar reversals have been discussed for small entities (Skylark, 2021).

Supplementary studies suggest that the comparative nature of counterfactual thoughts is indeed qualitatively different from their structure. These studies successfully replicated established effects showing different consequences of additive versus subtractive counterfactuals regarding expressions of sufficiency versus necessity, whilst at the same time not finding such differences for ‘more-than’ versus ‘less-than’ counterfactuals (see S1 in the Supplementary Material on OSF).

7.1 Contributions

The value in understanding how come certain counterfactuals are more or less plausible and convincing is underscored in light of the broad range of their consequences regarding judgments on regret, causation, affect, and responsibility (e.g., Petrocelli et al., 2011). Introducing the more-less distinction into counterfactual research provides a novel way of categorizing counterfactuals and examining their effects. This ordinal comparison distinction is different from established counterfactual type distinctions and allows for expressing the same difference in distinctive, yet equivalent ways (e.g., being more careful versus less careless). As such, the current work provides further support for the simulation heuristic, according to which the easier an alternative course of events is to imagine, the more impact such counterfactual thoughts should have (Kahneman & Miller, 1986; Kahneman & Tversky, 1982; see Stanley et al., 2017). Whilst we only considered likelihood of behavioral change, the present results suggest that ‘more-than’ counterfactuals might more strongly guide people’s future behavioral choices after negative outcomes, and in that sense might indeed be more functional (Epstude & Roese, 2008; Roese & Epstude, 2017).

Our work is the first to examine a more-less asymmetry in the domain of counterfactual thinking. At the same time, it should be noted that previous research applied a related logic, albeit regarding the consequences of counterfactuals – rather than counterfactuals themselves. Also, this work did not considering ease. Specifically, based on earlier findings (Dunning & Parpal, 1989) Dunning and Maddey (1995) proposed that even after a counterfactual alternative has been selected, simple changes in the focus of the outcome variable may significantly impact the simulation’s consequences. To illustrate, participants were asked to imagine the impact a preparatory test may have on their Graduate Record Examination (GRE) score. Half of the participants answered items focusing on how much more prepared they would be when lecture notes were available; the other half answered items focusing on how much less they would be prepared when notes were not

available. Participants in the first experimental condition perceived a larger impact of notes being available on various exam-related outcomes compared to those referring to notes not being available (Dunning & Maddey, 1995). However, more versus less simulated preparation involved present versus absent elements. Moreover, these effects are tied to a specific type of comparison regarding the assessment of the *consequences* of a mental simulation, not to the type of comparison within the construed counterfactual itself. Therefore, they do not answer the question of whether different ordinal comparisons of the counterfactual simulation *itself* differently affect ensuing judgments. As such, the present work makes a novel contribution to the relatively scarce research on the impact of different foci in counterfactual simulations (see Sparks, 2020).

Previous work has considered several aspects that render counterfactuals more or less plausible, and especially so-called counterfactual fault lines – aspects of the representation of reality that people focus on when imagining alternatives to it (Byrne, 2016). These fault lines include imagining an alternative by changing an exceptional (rather than a normal) event; by changing a controllable (rather than an uncontrollable) event; by changing an action (rather than an inaction); and by changing the most recent event (rather than an earlier one). These fault lines are present across cultures and emerge already at an early age (e.g., Nyhout & Ganea, 2020; Payir & Guttentag, 2019), though the specific domains of life counterfactuals tend to focus on shows some cultural priorities (Chen et al., 2006). However, they can be eliminated if within the representation of reality there already exist different alternative possibilities: Counterfactuals are understood to be plausible “when semantic and pragmatic knowledge ensures that the representation of the facts, upon which the counterfactual is based, includes alternative possibilities” (Byrne, 2016, p. 150). The present findings suggest that the ease of ‘more-than’ compared to ‘less-than’ comparative counterfactuals contributes to their larger plausibility, influence and thus impact. As mentioned before, this indirectly

provides further support for an availability perspective (Kahneman & Tversky, 1982), whilst not discounting alternative explanations, for example from the perspective of a correspondence principle or from probability and causal model perspectives (e.g., Petrocelli et al., 2011; Over et al., 2007; Pearl, 2013). This said, whilst research has demonstrated that regarding normality, valence, presence, and magnitude people prefer antecedents and consequences of counterfactuals to correspond (Bouts et al., 1992; Einhorn & Hograth, 1986; Gavanski & Wells, 1989; Sim & Morris 1998; cf. Roese et al., 1999), to the best of our knowledge no work has demonstrated cognitive ease to be implicated.

In the tradition of research on the simulation heuristic, the examples used in our studies were designed in a way that participants would see a *causal link* between antecedents and consequences. However, these studies were not designed to investigate how the more-less distinction might impact participants' judgments of *causal responsibility*. This topic received substantial attention in research on counterfactual simulations (e.g. Gerstenberg et al., 2021; Lagnado et al., 2013). The situations considered in this literature, however, differ from the ones considered in the present research. For example, Lagnado and colleagues (2013) were interested in situations in which multiple agents could potentially be the cause of a negative outcome. In their analysis, they describe how counterfactuals might inform judgments of responsibility (and possibly blame), as they can be used to gauge the extent to which the actions of a single agent caused an outcome. When such counterfactual simulations allow for gradual – rather than binary – shifts in responsibility judgments (e.g. Halpern, 2016), the more-less distinction might also contribute to their impact. Halpern (2016) details the processes contributing to such a more gradual approach to judging causality in which alternative causes are not eliminated altogether. To the extent that counterfactuals do affect such judgments, they may help to rank potential causes, and in these ranking processes the

ease of counterfactuals' generation may have an impact. This assumption is of course speculative since our research was not designed to test this.

To the extent that our additional findings regarding indirect measures of ease and self-reported ease of counterfactual thought generation are indicative of cognitive fluency, our work also contributes to this literature. First, counterfactuals are simulated alternatives to the factual status quo. As such, the present findings add to the rather scarce literature on the specific instantiation of fluency in terms of imagery. The ease with which individuals create mental representation of events is used to estimate their likelihood (Sherman et al., 1985); it also influences product evaluations and purchase intentions (Dahl & Hoeffler, 2004; Petrova & Cialdini, 2005). Moreover, simply imagining engaging in both socially desirable and undesirable actions is associated with an increased likelihood of subsequently indeed engaging in the respective behavior, but only if this is easy to mentally represent or to imagine in the first place (Levav & Fitzsimons, 2006). Similarly, participants in our studies indicated that the easier to imagine 'more-than' upward counterfactual thoughts would more likely lead others and themselves to act in accordance with these thoughts in future situations. Overall, the current results thus support the notion that ease of imagery constitutes one of the so-called 'tribes of fluency' (Alter & Oppenheimer, 2009).

Second, Hoorens and Bruckmüller (2015) only provide one study suggestive of a cognitive fluency account, showing that the more-less asymmetry was reduced when participants were told to expect to experience difficulty (i.e., disfluency) in their evaluations of 'less-than' statements. Ease was never directly assessed in their or similar work (cf. Skylark, 2021; Zhang & Schwarz, 2020). In the present work participants judged 'more-than' upward counterfactuals as easier to generate than 'less-than' upward counterfactuals and produced them with less errors and more spontaneously, thus further supporting the notion

that cognitive fluency is one “of a number of other mechanism (that) may be at play” in sustaining the asymmetry (Hoorens & Bruckmüller, 2015; p. 764f).

7.2 Strengths and limitations

Power considerations in our studies were based on effect sizes in previous work, conservative adjustments of such effect sizes especially in cases of potential or predicted interactions (when instead we based power considerations on our smallest effect of interest; Lakens, 2021), and on effect sizes emerging in our own work. The package of studies suggest that effects are not limited to specific sets of stimuli, as consistent findings emerged for counterfactuals about various scenarios and different situations participants recalled. Contrary to the work on the more-less asymmetry in comparative information (Hoorens & Bruckmüller, 2016), we systematically assessed self-reported ease in all studies, and our findings are supportive of – though by no means conclusive regarding – a fluency account (see below). Finally, the MANOVA approach employed throughout not only reduces measurement error, but compared to an ANOVA approach it also protects against an inflated Type I error (O’Brian & Kaiser, 1985; Tabachnick & Fidell, 2007).

Several aspects of the present work attest to the generalizability and robustness of the current findings: Focus and direction of counterfactual thinking were systematically considered across various situations (i.e., different scenarios and autobiographically recalled events); an internal replication is provided; and one study relied on a linguistically diverse sample.

At the same time, several caveats should be acknowledged. First and foremost, the current studies are limited in the sense that they considered counterfactuals likelihood to change future behavior – and thus behavioral intentions. Whilst behavioral intentions do predict actual behavior (Ajzen & Fishbein, 1977), future research will need to test if people indeed more likely change their behavior in line with ‘more-than’ rather than ‘less-than’

comparative counterfactuals, especially in light of variables intervening in creating an intention-behavior gap (Sheeran & Webb, 2016).

Second, apart from impact we also systematically assessed ease of counterfactual thought generation. Although our results are in line with a fluency account, it is important to bear in mind that they did not emerge consistently for self-reported and indirect measures, and that especially self-reports have obvious limitations. One might also question to what extent cognitive fluency is adequately captured by a 1-item measure of perceived ease, especially given that this assessment was made retrospectively and after participants had generated their thoughts (but see Stanley et al., 2017). At the same time, we also considered the number of correctly formulated comparative counterfactuals as an indirect measure of ease, for which rather consistent results in line with what was found for judgments of self-reported ease emerged. Nonetheless, future research might consider using other measures, such as reaction times (see Zhang & Schwarz, 2020).

Third, the current results are limited by the fact that studies focused exclusively on a ‘more-than’ versus ‘less-than’ comparative distinction. It thus remains an open question for future research whether counterfactuals involving semantically similar comparatives entail similar judgmental consequences. This said, other comparatives similarly provide comparative information in ascending or descending order and research shows that statements containing ‘larger’ (e.g., taller) compared to ‘smaller’ (e.g., shorter) comparatives are preferred and more readily accepted as true (Matthews & Dylman, 2014; Holyoack et al., 1979). It thus seems reasonable to assume that the present effects would also emerge for such comparatives.

7.3 Future Directions

The ‘more-than’ versus ‘less-than’ distinction may have important implications for other outcome variables of counterfactual thinking. The assignment of blame (e.g., Nario-

Redmond & Branscombe, 1996) in relation to negative outcomes is a prime examples. In line with the simulation heuristic (Kahneman & Tversky, 1982), individuals assign more blame after someone engaged in rather unusual compared to common or habitual behavior (e.g., Alicke et al., 2008; Catellani et al., 2004). If a related counterfactual is easy to construct and readily available, which is the case if the person in question behaved in an unusual manner, more blame is assigned (Miller & McFarland, 1986). A more detailed analysis of such situations indicates that the underlying counterfactuals largely focus on how the actor could have prevented the negative outcome (Mandel & Lehman, 1996). In line with the current work, we posit that counterfactuals about what actors could have done ‘more’ (rather than ‘less’) to this end should produce higher blame assignments. Importantly, some findings suggest that counterfactuals’ ease affects victims of crimes in a similar manner. Rape victims who engaged in upward, self-focused counterfactual thinking about the incident were found to feel worse compared to when they generated other, less common and available types of counterfactuals (Branscombe et al., 2003). It might be the case that the more-less comparative distinction investigated here provides an additional way to identify cognitions that are more or less (dys)functional or harm- versus helpful for individuals depending on specific circumstances.

According to the functional theory of counterfactual thinking (Epstude & Roese, 2008; Roese & Epstude, 2017), apart from a content-specific pathway counterfactual thoughts can also influence behavior through a content-neutral pathway, with implications for mental health and cognition. This content-neutral pathway “involves the way information is handled, as opposed to the particulars of the information itself” (Epstude & Roese, 2008, p. 175) and according to the theory this pathway “may influence behavior independently of any semantic content of the respective counterfactual” (p. 176). Content-neutral effects have been demonstrated to include mind-sets, motivation and self-inference. Based on the current

results we would posit that counterfactuals' comparative nature might constitute a further element of the content-neutral pathway. For example, in contexts where the impact of counterfactual communication on judgments is of key interest, this distinction might indeed be crucial. Previous research showed how subtle variation of counterfactual content in political debates changes the impressions observers have (e.g., Bertolotti & Catellani, 2018). Considering the more-less distinction in such contexts may deliver insights on how to design particularly potent counterfactual messages.

Moreover, the experiential quality of ease involved in the more-less distinction provides an interesting avenue for examining the impact on the person generating the message. In situations where the counterfactual impacts the person who generated it, reframing the thought comparison might be a way to alter its impact. Examples of such situations are the experience of guilt and shame (Niedenthal et al., 1994), including following a criminal offense (e.g. Mandel & Dhami, 2005), or regret following risky behavior (Epstude & Jonas, 2015). In such situations, distinct counterfactual patterns seem to drive the affective consequences, and not always in a way beneficial for individuals. It would be interesting to see whether changing thought patterns in a way that considers the more-less distinction also changes individuals' affective experiences.

8. Coda

The comparative nature of upward counterfactual thoughts alters people's perceived impact of these mental simulations. Specifically, 'more-than' upward counterfactuals are seen as more plausible, persuasive, and likely to change future behavior than 'less-than' counterfactuals. They are also perceived as easier to generate, and thus as more readily available – as also attested by 'more-than' compared to 'less-than' counterfactuals more spontaneously being provided. For downward counterfactuals this reverses, with 'less-than' counterfactuals being deemed more impactful, judged as more easily coming to mind, and

1021 being generated more spontaneously. The present research shows that differences in
1022 counterfactuals' comparative nature entail important consequences. Our results support both
1023 a fluency-based account of a more-less asymmetry in comparative communication (in the
1024 case of counterfactual thoughts, generally with oneself) as well as a correspondence principle
1025 in mental connection of cause and effect when considering antecedents to change
1026 consequences. Future work might consider implications for behavior change and mental
1027 health.

1028

1029 **Supplementary Material**

1030 For all studies, deidentified and cleaned data, the data-analysis scripts, and supporting
1031 information including materials are available via the Open Science Framework:
1032 https://osf.io/7wcms/?view_only=f37d500328f649759a21a9028a8c4297.

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