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Learning from what might have been – judgments and evaluations of counterfactual outcomes

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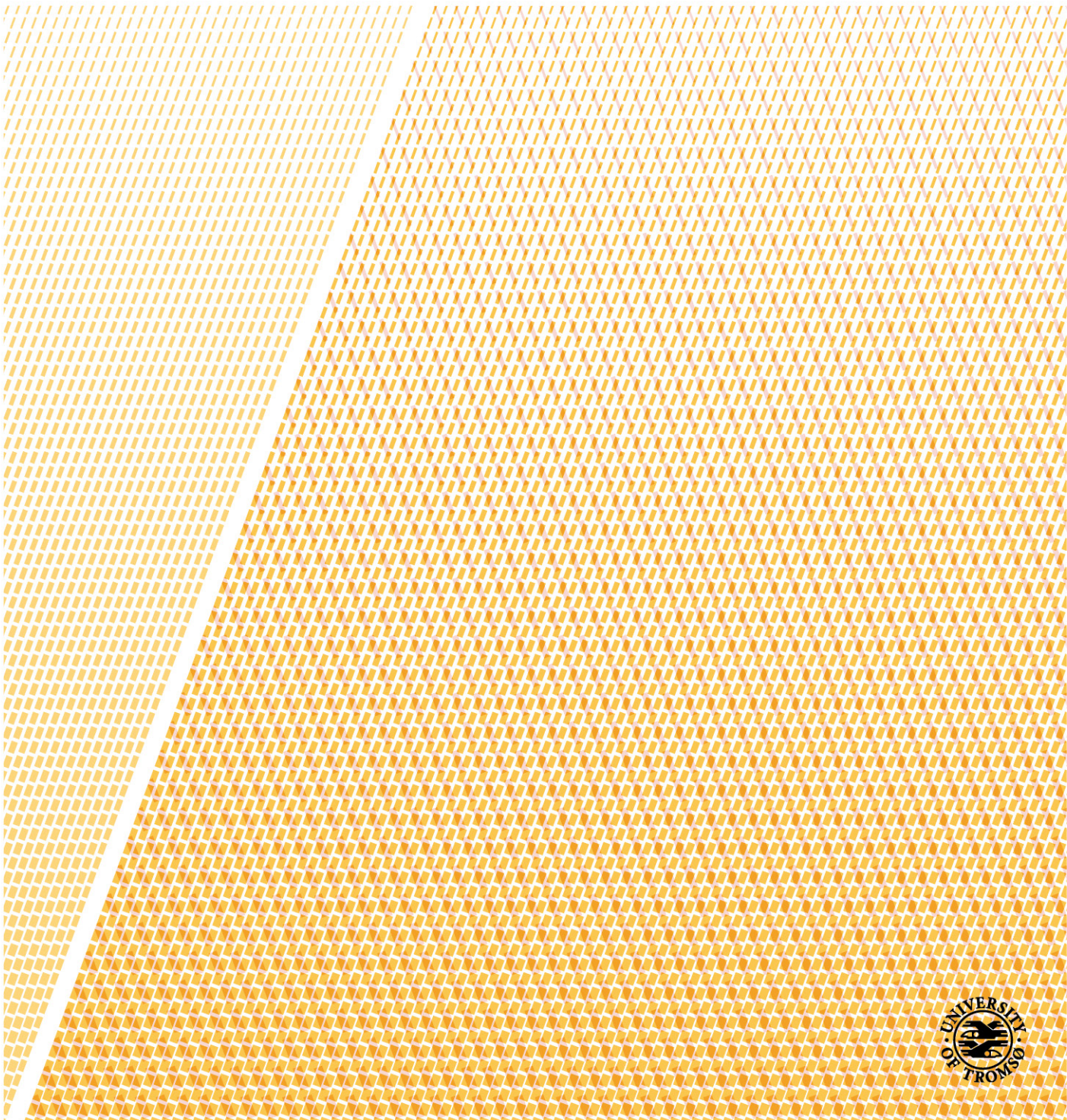*A dissertation for the degree of Philosophiae Doctor – November 2017*

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Summary

The aim of the present thesis is to contribute to the understanding of how people construct hypothetical alternatives to past events, and further explore the role of such counterfactual thinking in learning from accidents and near-accidents.

In Paper 1 we introduced the notion that counterfactual thinking is a form of mental simulation that relies on abstract, gist based representations of the world, and therefore promotes a focus on schematic and prototypical outcomes. For events with a clear valence, this should lead counterfactual speculations to be more extreme, or unambiguously good or bad, compared to ordinary predictions. In line with our expectation, people evaluated the consequences of an unexpected turn of events to be more extreme, when it was presented as a counterfactual possibility rather than an actual occurrence.

Paper 2 replicated the main finding in Paper 1, and extended the investigation to include affective evaluations. Consistent with the previous finding, participants exaggerated consequence estimates, but affective evaluations indicated an opposite effect: factual events were evaluated as more emotionally impressive than the same events presented as counterfactual, for both positive and negative outcomes. These apparently contradictory findings were discussed within the framework of Construal Level Theory, and it is suggested that both findings are compatible with an abstract, high – level account of counterfactual thinking.

In Paper 3 we investigated learning from accidents and near-accidents. By asking people about their thoughts and feelings following accidents and near-accidents, we examined the degree to which these experiences had inspired caution. The results indicated that accidents inspired more caution than near-accidents. Furthermore, repeated experience with

near accidents appeared to have inspired caution, but we observed no change in caution following repeated experience with near-accidents. Learned carefulness did not seem to be associated with reported emotional intensity of the counterfactual outcomes imagined. However, learned carefulness was strongly associated with self-focused upward counterfactuals and the specific emotions of unpleasantness and regret, implicating the role of deliberate reflection.

In sum, the thesis contributes to research on counterfactual thinking by showing that counterfactuals promote a focus on extreme consequences, but attenuated affective reactions, consistent with the idea that counterfactual thinking is more abstract and schematic than future oriented thinking. One implication may be that learning from near-misses and close escapes is more contingent on deliberate reflection rather than affective assimilation.

Introduction

Counterfactual thinking (CFT) involves comparing actual outcomes to imagined alternative versions of the past or present. It is thinking about how a course of events could have played out differently or how it could have led to other consequences. Research within experimental social psychology and social cognition have attempted to identify the precursor, underlying processes and consequences of counterfactual thinking for more than 40 years. The aim of the present thesis is to contribute to the understanding of how such counterfactuals are constructed, and further explore possible consequences of such thoughts.

Counterfactual thinking is by most theoretical accounts conceived of as a form of mental simulation of events that are outside of the perceiver's direct experience (e.g., Kahneman & Miller, 1986; Markman, Gavinsky, Sherman & McMullen, 1993; Roese & Olson, 2017; Trope, Liberman & Wakslak, 2007; Wakslak, Trope, Liberman & Alony, 2006). Consequently, the cognitive processes involved in constructing counterfactuals may be similar to the process involved in other forms of hypothetical thinking (e.g., Gilead, Liberman & Maril, 2012, Markman et. al., 1993). Proponents of Construal Level Theory have proposed that the key mechanism that allows people to mentally transcend the immediate experiencing self, and thus form mental representations of events and objects that are removed in time, space, social distance and degrees of hypotheticality, is the use of increasingly abstract mental models (Liberman & Trope, 2008; Trope & Liberman, 2010). A key research question to be explored in Paper 1 and 2 of the present thesis is whether counterfactual possibilities are painted in broader strokes, and are more abstract, general and schematic than thoughts about factual events and outcomes. Paper 3 in this thesis explores the role of counterfactual thoughts in learning from accidents and near-accidents.

In the following, I will first present the basics of theoretical accounts of counterfactual thinking and related research, and then go in depth into the specific research questions pursued in this thesis. The introductory section on counterfactual thinking includes past research directly relevant to the present thesis as well as previous research on the consequences of counterfactual thinking for evaluations and performance improvement more generally. This broad approach was chosen as it serves to clarify how the papers in this thesis contribute to the rich research tradition on counterfactual thinking.

1.1 Counterfactual thinking

Counterfactual thoughts plays an important role when people assess their satisfaction with various aspects, events and outcomes in their lives. Such thoughts can be controlled and elaborative, as when people contemplate what life might have been like had they chosen a different career, lived in a different city, or married their high-school sweetheart (Kray et al., 2010; Roese, 1997; Roese & Summerville, 2005). Counterfactual thoughts can also be quick and automatic (Kahneman & Miller, 1986), like the sudden surge of relief one might experience when realizing that the bus caught at the last minute could easily have been missed. In either case, people engage in a form of comparative thinking where actual outcomes are evaluated in comparison to imagined alternatives. Thinking that one *could have been* a professional tennis player (an upward comparison) might make one's current profession seem bleak; contemplating that one *might have been* out of work altogether (a downward comparison) promotes satisfaction (Roese 1997; Markman et al., 1993). However, reflecting too much on the hardship of a penniless life on the dole or the virtues of life in the limelight can also lead to an opposite pattern of emotional responses through a process of assimilation (Markman & McMullen, 2003). Research over the past decades has shown that

counterfactual thinking is common and frequent (Summerville & Roese, 2008), and potentially have both beneficial (Roese, 1997; Epstude & Roese, 2008) and dysfunctional (Loomes & Sugden, 1982; Zeelenberg, Beattie, van der Pligt, & de Vries, 1996) consequences for how people understand the past, evaluate the present and prepare for the future (Byrne, 2016).

1.2 Norms, exceptions and (biased) evaluations

Much early research on the psychological phenomenon of counterfactual thinking, inspired by Norm theory (Kahneman & Miller, 1986), recognized the importance of counterfactual thinking for evaluations of causality and thus for adaptation and learning. However, as a comparative judgments theory, it emphasized the importance of judgmental anchors for predicting various cognitive and affective reactions. Norm theory suggested that outcomes are not interpreted and evaluated according to precomputed, global a priory standards. Rather, judgmental benchmarks, or norms, are constructed on-line in response to specific outcomes, partly based on expectancies derived from memories of previous experience, and partly based on constraints on the stability or mutability of knowledge categories. For example, seeing a girl brings to mind both schematic information about girls, but also memories of specific exemplars encountered previously. Together this information constitutes the frame of reference, or evoked norm, that determines how the event or outcome is interpreted and evaluated. Normal events and outcomes are those that approximately match the norm; abnormal outcomes are those that evoke a norm that is dissimilar to the experienced outcome, and that brings readily available counterfactual alternatives to mind. The contrast between experienced outcomes and evoked norms thus drive various judgments and evaluations, such as whether the exemplar encountered, for example a girl, was particularly tall, friendly or intelligent.

Norm theory thus described counterfactual thinking as a bottom-up process, where immediate experiences momentarily activate expectancies or norms, and where counterfactual thoughts tend to focus on bringing aspects of experienced events and outcomes that deviate from the norm back to normality. For instance, a negative experience that occurs after taking an unusual route home might make one think: "If only I had taken my normal route...". One consequence of this mental *normalization* process is that counterfactual thoughts tend to be realistic rather than absurd, and contributes to the general usefulness of counterfactual thinking (Kahneman & Tversky, 1982). However, the aim of Norm theory was mainly to describe the cognitive process governing reactions to specific events, and as it was framed within the heuristic and biases approach (Kahenman & Tversky, 1982), the focus was perhaps more on the possible dysfunctional than on beneficial consequences of counterfactual reasoning. Consequently, much of the research it inspired focused on discovering which aspects of the world are most changeable or mutable (e. g., Gleicher et al, 1990; Miller & Gunasegaram, 1990), and subsequently whether and how counterfactual thoughts, or judgmental anchors, affect (and perhaps bias) other types of judgments (e.g., Sherman & McConnell, 1995).

A central concept in Norm theory was *mutability*, describing how some aspects of the world are easier to mentally alter or mutate than others, and are therefore more likely to become the center of counterfactual speculation. It is for example easier to mentally mutate effects than causes, such that it is more intuitive to think of a particular girl that she is "tall for her age" than the reverse, that she is "young for her height" (Kahneman & Miller, 1986). While the above example perhaps points to an unproblematic inference, other work demonstrated how the mutability of various situational factors could bias judgments by affecting counterfactual thinking. For instance, if your colleague suffers an allergic reaction after the meal you just treated her to, you might be held causally more responsible if there was

another menu option that did not contained the allergen than if all dishes contained the allergen, regardless of the fact that you were entirely unaware of her allergies (Wells and Gavinsky, 1989). Thus, whereas causal reasoning tend to be rooted in counterfactual propositions, the reverse does not always hold and counterfactual speculations sometimes lead causal reasoning astray and fail to isolate the causally most relevant outcome factors (e.g., Mandel & Lehman, 1996). If the causal inferences made from counterfactual thoughts are incorrect, and lead to errors in how events are interpreted and understood, the functionality of counterfactual thought can be questioned.

Counterfactuals do not only affect perceptions of causality, but also emotional reactions. Missing a plane is upsetting, but more so if one misses the plane by narrow as opposed to larger margins (Kahneman & Tversky, 1982). Anything that makes a counterfactual alternative more available and vivid as a comparison standard, tend to intensify the emotional reaction to the factual event. This emotional "amplification effect" may subsequently affect other judgments and evaluations. For instance, breaking and entering is naturally frowned upon, but a jury might be particularly unforgiving if the burglary occurred the night before (as opposed to weeks before) the owner returned from vacation (Macrae, Milne & Griffiths, 1993). Other factor that can influence the availability of counterfactual alternatives are perceived control, serial position, actions vs inactions, which again may influence for instance judgments on victim compensation claims (Miller & McFarland, 1986), assignments of responsibility and blame (Miller & Gunasegaram, 1990), regret (Kahneman & Tversky, 1982), problem gambling (Wohl and Enzle, 2003), stereotype thinking (Miller, Turnbull & McFarland, 1989) and more.

Thus, early research viewed counterfactual thinking as a form of simulated comparison process, triggered by discrepancies between immediate experiences and expectancies, or norms, formed partly by memory retrieval and partly by constraints on mental simulations,

that subsequently affects how experiences are interpreted and evaluated. Importantly, although counterfactuals were found to strongly impact (and sometimes bias) judgments and evaluations, the counterfactual alternatives people typically imagine appears to be heavily constrained by the situation that triggered them, bringing abnormal features back to its more normal state.

1.3   Counterfactuals are for betterment

A more resent approach to the study of counterfactual thinking (Epstude & Roese, 2008; Roese, 1997; Roese & Epstude, 2017; Roese & Olsen, 1997) presents a predominantly functional perspective, suggesting that such thoughts are best understood in terms of its role in the regulation of behavior and improvement of performance. The starting point is that most spontaneous counterfactual thoughts seem to be reflections on goals, and are typically triggered by the negative affect associated with blocked goal progress (e.g., Roese & Olsen, 1997). Goal directed behavior can then be brought back on track by one of two different routes. Either via a content-specific pathway, where the negative affect associated with a blocked goal activates upward counterfactual thoughts specifying how a better possible outcome could have been achieved (Roese, 1994), or via a content-neutral pathway, where performance is improved via a more general activation of enhanced attentional, cognitive or motivational processes (Epstude & Roese, 2008, Roese & Epstude, 2017).

Whereas norms, as discussed, appear to be the product of both semantic (i.e., general knowledge categories) and episodic (i.e., specific experienced events) memory, the functional perspective has focused on the spontaneous counterfactuals people elicit after personally relevant episodic experiences (Roese & Epstude, 2017). The general picture painted in this framework is that counterfactual thoughts tend to be upward, self-focused, and additive. The starting point of the regulatory loop is the negative affect stemming from a discrepancy

between an actual and a desired goal state (e.g., Roese & Olsen, 1997). Further counterfactual analysis may then provide a causal inference, indicating an action that could have been taken in order to reach the desired state (e.g., Roese, 1997), which again is transferred into a corresponding behavioral intention (e.g., Roese, 1994; Morris and Moore, 2000; Smallman & Roese, 2009). Support for this content specific pathway is further found in the direction, structure and focus of spontaneously generated counterfactual thoughts. Upward counterfactuals generally outnumber downward counterfactuals, as they are more beneficial for performance improvement (e.g., Roese & Hur, 1997; Roese & Olson, 1997; Summerville & Roese, 2008). Downward counterfactual may be useful in regulating emotions, and are primarily activated when the window for future possibilities have closed (e.g., Gilbert & Ebert, 2002; Roese & Olsen, 2007; Roese & Summerville, 2005). This last point is theoretically important, as it predicts and explains downward counterfactuals in situations where the primary goal is to feel better about a bad outcome. Furthermore, additive counterfactuals, where an action is introduced in a counterfactual conditional specifying what should have been done, are more beneficial than subtractive counterfactuals (e.g. regret of inactions), at least for performance goals (e.g., Markman, McMullen & Elizaga, 2008). For example, realizing that one should have spent Easter holiday in preparation for upcoming exams, provides a recipe for future success; regretting the time spent skiing, simply removes one option from the menu preventing one from making the same mistake twice. For prevention goals, downward counterfactuals specifying what not to do, thus avoiding deterioration from the status quo, have been found to be both useful and common (Pennington & Roese, 2003).

Counterfactual thinking may also improve performance, irrespective of the lessons learned from the specific event that triggered them, by influencing the way information is processed. This content-neutral pathway benefits future performance either by inducing a

particular mindset (e.g., Galinsky & Moskowitz, 2000), or by influencing motivation (Markman & McMullen, 2003; McMullen & Markman, 2000). For instance, there mere act of generating alternatives to reality may induce a mind-set that facilitates considering a broader range of solutions to problems (Galinsky & Kray, 2004; Kray, Galinsky & Wong, 2006). This may in turn improve pattern recognition (Kray, Galinsky & Wong, 2006), and reduce groupthink (Galinsky & Kray, 2004) and the confirmation bias (Galinsky & Moskovitz, 2000; Kray & Galinsky, 2003). There is also evidence suggesting that the structure of counterfactuals may differentially impact future thinking, in that additive counterfactuals facilitate creative thinking, whereas subtractive counterfactuals enhances analytic thinking (Markman Lindberg, Kray and Galinsky, 2007). Counterfactual thinking may also impact future performance indirectly by providing a motivational boost (McMullen & Markman, 2002). Improved motivation seems to be rooted in negative affect, either stemming from the contrast between reality and a better possible outcome, or from an assimilation effect in downward counterfactual comparison (Markman & McMullen, 2003). Furthermore, motives might interact with strategic thinking, so that generating upward counterfactuals tend to induce a promotion focus, which again seem to improve perceived control and self-efficacy, whereas downward counterfactuals induce a prevention focus (McMullen, Markman & Gavinsky, 1995).

To sum up, the functional perspective takes a top - down approach to the understanding of counterfactual thinking, as counterfactual thoughts are triggered and formed in relation to goals. Furthermore, as counterfactual thoughts address situational needs, connecting episodic counterfactuals to specific goal-directed cognition and action, they tend to be constrained by the immediate reality from which they arose.

1.4   Counterfactuals that deviate from the norm

From the two main theoretical depictions of counterfactual thinking, Norm theory (Kahneman & Miller, 1986) and the functional perspective (Epstude & Roese, 2017; Roese, 1997; Roese & Olsen, 1997), counterfactual thoughts should be realistic, constrained by the situations that trigger them, and typically address minor adjustments to factual events. Furthermore, upward counterfactuals should outnumber downward counterfactuals, except for situations where the possibility for future action is closed. As reviewed, ample evidence supports both these claims. However, other lines of research has found that people frequently engage in rather dramatic downward counterfactuals, perhaps particularly in situations characterized by risk and dangers.

Following an accident that could easily have had more severe consequences, there might be room for both upward and downward comparisons. On the one hand, the outcome of the accident could have been worse; on the other hand, the accident could perhaps have been avoided all together. Research has found that people that have been in accidents and near accidents seem to be predominantly concerned with rather dramatic downward comparisons and therefore see themselves more as lucky rather than unlucky (Teigen, 1995, 1996, 1997, 1998, 2005). Furthermore, people tend to report that such accidents were avoided against all odds, and appear to think that the accident was a very likely outcome (Teigen, 1998b). This may in part be because people appear to assess the probability of factual and counterfactual outcomes in different ways.

The subjective probability of counterfactual outcomes appear to be estimated based on a "closeness heuristic" that does not seem to be equally applicable to factual outcomes (Teigen, 1998b; 2005). Whereas the probability of factual outcomes might be estimated by thinking about how predictable or expected the outcome was at some earlier point in time, the

probability of counterfactual outcomes seems to be estimated "after the fact" based on how close, for instance in inches or seconds, it came to occurring (Teigen, 1998b; 2005). As subjective probabilities for factual and counterfactual outcomes are computed in different ways, the subjective probability of an event seems to vary depending on whether the event actually occurred or not (Teigen, 1998b, 2005). The subjective probability estimate for a particular counterfactual outcome may be inflated if a situation contains information that makes it easy to mentally simulate this possibility (Kahneman & Tversky, 1982). This may even reverse the hindsight effect (Hawkins & Hastie, 1990) for outcomes that are perceived as having a high propensity for occurring (Roese, Fessel, Summerville, Kruger & Dilich, 2006), or if an event came very close to occurring (Teigen, 2005).

However, if a judgment of closeness is used as a proxy for a judgment of probability, it is interesting to ask the question: "probability for what?" Following a traffic accident that was avoided in the last second, one might be justified in saying that the accident had a high probability of occurring, but it does not automatically follow that one has been at a high risk of being badly injured or killed. Most car accidents do not have fatal consequences. Taken together, these results suggest that people may overestimate the risk potential in near-miss situations. Not only because they overestimate the probability of a counterfactual outcome (Teigen, 2005), but perhaps also because they exaggerate the potential consequences. Such a response could be consistent with a preparative function of counterfactual thinking, in that near accidents represents a "close call" that one should try to avoid in the future. However, it runs counter to the idea that counterfactual speculations focus on "the closes of all possible worlds" (e.g., Byrne, 2002; Seelau, Seelau, Wells, & Windschitl, 1995), and thus tend to make small rather than large adjustments to factual outcomes.

1.5   Counterfactuals as abstract mental representations

Counterfactual thinking is a form of mental simulation where we go back in time, alter some antecedent feature, and then imagine the unfolding of a sequence of events from that starting point to an outcome. Although we may know a lot about what actually happened, our speculations about what might have happened carry elements of uncertainty. Could I have aced the exam if had spent Easter studying instead of skiing? Would I have gotten the job if I had prepared for the interview? The outcome may feel highly improbable if all imagined possibilities end in failure, or almost inevitable if it is hard to imagine it could have gone any other way. However, the various scenarios imagined are arguably not played out in minute detail, covering every eventuality, but are rather simple and schematic, structured and constrained by our previous experiences and general knowledge of the world, testing out the significance of meaningful hypothetical possibilities. Arguably, much in the same way as we anticipate and prepare for future events.

According to Trope and Liberman (2003), the same basic cognitive process is involved in transcending various forms of psychological distance, such as temporal, spatial, social or degrees of hypotheticality, and it is rooted in our ability to form and process abstract representations of the world. Proponents of construal level theory have shown the that psychological distance to events affects how concretely or abstractly these events are represented, which again has a wide range of consequences for how we evaluate, predict and plan for near vs distant situations (Liberman & Trope, 2008; Trope & Liberman, 2010). Mental representations of events and objects that are psychologically close tend to be concrete, contextualised and complex, rich with incidental and situation specific details. As psychological distance increase, for instance when we try to imagine future events or consider

alternatives to our immediate experienced reality, our mental representations become increasingly more abstract, schematic and decontextualized.

Any action, event or object can be represented at different levels of abstraction. Lower level representation of events focus on how an action is performed, whereas high level construals focus why the action is performed and convey the overall meaning of the action (Trope & Liberman, 2003; Vallacher og Wegner, 1987). The act of "writing a text message" can for instance be represented more concretely as "typing on my phone" or more abstractly as "keeping in touch with friends". While the abstract construal involves loss of incidental details and lack a specific context, the overall meaning of the action is preserved as it connects the action to goals. This enables abstract construals to stay relatively invariant across various dimensions of psychological distance, and thus be meaningfully applied in for instance counterfactual analysis or in making predictions about the future. I may intend to keep in touch with friends in the future, and suspect that I wold regret it if I do not, but exactly how I will do it is more uncertain. Research has shown that people tend to think more schematically about events expected to happen in the far future compared to more imminent events (e.g., Liberman, Sagristano, & Trope, 2002). Furthermore, they are concerned with the details in incidents happening nearby, but think more schematically about events happening in distant locations (e.g., Fujita, Henderson, Eng, Trope, & Liberman, 2006).

Although psychological distance has typically been operationalized as either physical distance, temporal distance, or social distance, degrees of hypotheticality can also be conceived of as a psychological distance dimension (Trope, Liberman & Wakslak, 2007; Wakslak, Trope, Liberman & Alony, 2007. For instance, manipulating probability (or hypotheticality) across conditions as either high or low has been shown to have the same effect on general processing style and various judgment and evaluation as manipulating

temporal distance (e.g., Wakslak, Trope, Liberman & Alony, 2007), supporting the notion that hypotheticality maps onto the more general concept of psychological distance. This indicates that differences between thoughts around factual and counterfactual events may be understood along the same lines, as a continuum ranging from the real or very likely to the unlikely or purely hypothetical. For the purpose of the present thesis, however, a particularly interesting question is whether the association between psychological distance and abstraction can be useful in explaining the observation that counterfactuals in some situations appear to be dramatic and extreme rather than realistic and minimally different from factual outcomes.

Since counterfactual possibilities are inherently hypothetical, such thoughts may facilitate high-level construals. It therefore stands to reason that counterfactual thoughts might be more schematic and stereotypical than thoughts about factual events. Such prototypical events are in many instances characterized as the "ideal" or extreme case. For instance, Liberman, Sagristano & Trope, 2002 reported that a "good day" described from a temporally distant perspective was construed more schematically and represented as an "ideal" good day, where as participants would paint a more nuanced picture from a more proximal perspective. Thus, for events with a clear valence, such as accidents and near-accidents, counterfactual alternatives may by schematically represented, highlighting significant and meaningful possibilities without attention to details and moderating circumstances.

2   Research question and methodology

The present thesis systematically investigates: 1) whether the consequences of counterfactual alternatives are exaggerated compared to comparable factual events, and then 2) examines affective reactions to comparable factual and counterfactual outcomes. Finally,

3) the possible role of emotions and counterfactual thinking in learning from accidents and near-accidents is explored.

Through three papers, the present thesis extends past research on counterfactual thinking. Paper 1 examines whether there are systematic differences in the strength and power of imagined consequences of factual versus identical counterfactual events. Paper 2 aims to replicate the main finding in Paper 1, and extend the investigation to include affective reactions, comparing both consequence estimates and affective evaluations of factual and counterfactual outcomes. Paper 3 investigates learning from accidents and near-accidents, and investigates the role of counterfactual thoughts and emotions involved in learning from such experiences. In the following, I will first introduce the rationale behind each of the papers, then outline the methodological approach.

2.1 Paper 1: Going to the other extreme: counterfactual thinking leads to polarized judgements

Counterfactual thoughts are in principle only constrained by ones imagination, yet psychological research has shown that there are certain regularities in which aspects of events and outcomes that become the center of counterfactual speculation. For instance, unusual or unexpected events are more likely to be mentally mutated than events that played out in line with expectations (e.g., Wells & Gavinsky, 1989), and counterfactual thoughts typically focus on restoring normality (Kahneman & Varey, 1990). Thus, psychological research suggests that people tend to think counterfactually about elements that are easily "mutable" (e.g., Byrne, 2002), and that people tend to make minimal alternations to reality when generating counterfactuals (Seelau, et. al., 1995).

However, there are situations where people appear willing to entertain rather extreme counterfactuals as likely alternatives. As mentioned, accidents and near-accidents appear to often trigger thoughts about how the outcome could have been much worse rather than just a little different (Teigen, 1995, 1998, 2005). Similarly, in an unpublished study by Teigen and Kobbeltvedt, participants were first asked about events and circumstances they felt thankful for in life, and then invited to consider how life could be different. Interestingly, many participants went to the other extreme, considering how life could have been dramatically (rather than minimally) different. Both these observations could be motivated by a wish to emphasize positive emotional states such as luck or gratitude. Alternatively, it could reflect a more general tendency for people to consider counterfactual outcomes that are polar opposites rather than just minor adjustments from reality.

Since counterfactuals are more distant on the hypotheticality dimension than factual events (e.g., Wakslak, et. al., 2007) they should be modelled on a higher level of construal. Accordingly, as high level construals tend to be schematic and decontextualized, we suggest that thoughts about avoided losses and missed successes are likely to be conceived in terms of prototypical (catastrophic) losses and (triumphant) successes. We explored the hypothesis that counterfactual thinking promotes a focus on extreme or prototypical outcomes in five experiments.

2.2 Paper 2 – Judgments vs affective evaluations of counterfactual outcomes

Counterfactual thinking is inherently comparative in that the counterfactual alternatives people construct are in some evaluative sense better or worse than reality. Such comparisons between actual outcomes and counterfactual alternatives have affective as well as cognitive consequences. Much of the research on the psychological consequences of counterfactual

thinking has focused on how it influences people's affective reactions (e.g., McMullen, Markman & Gavinski, 1995; Medvec, Madey & Gilovich, 1995; Miller & McFarland, 1986; Teigen, 1995, 1997, 1998). A frequently used experimental approach has been to hold the factual outcome constant, manipulate the salience of different counterfactual alternatives, and examine how counterfactuals influence the evaluation of the factual outcome. The results have often demonstrated contrast effects, showing that counterfactual alternatives, better or worse, tend to amplify the affective reaction to a given outcome. More generally, counterfactual alternatives have been shown to have consequences for how we think and feel about factual outcomes.

Interestingly, thoughts about what actually happened are, at least to some degree, constrained by reality, whereas thoughts about what could have happened are more malleable. It is therefore reasonable that outcome evaluations depend to a considerable degree on how people think and reflect around counterfactual alternatives. The psychological blow of spraining ones finger after haphazardly closing the trunk of one's car may be ameliorated by thinking that it could have been broken, but perhaps alleviated altogether by contemplating how the finger might have been lost. Building on Paper 1, that demonstrated that participants rated the potential consequences of counterfactual events as more extreme than comparable factual events, the present paper investigates how people perceive the valence of events presented as counterfactual compared to the same events presented as factual. Two lines of research suggested that counterfactual thoughts could be subject to an overestimation bias. First, previous research on counterfactual thinking has established that people who have been involved in accidents and near accidents appear to conjure up rather dramatic downward counterfactual comparisons (Teigen, 1995, 1998, 2005). Furthermore, Paper 1 in this thesis demonstrated a tendency for people to "go to the extreme" when evaluating potential

consequences of counterfactual compared to factual events. If people tend to exaggerate the potential consequences of a counterfactual turn of events, it was reasonable to expect that the affective evaluations of those counterfactuals should also be exaggerated. Secondly, the literature on affective forecasting has shown that people tend to overestimate both the duration and intensity of future emotional experience (e.g. Buehler & McFarland, 2001; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998. Thus, if counterfactual thinking is conceived of as a form of mental simulation, transcending the here and now in order to imagine something outside of one's direct experience, it could be reasoned that predictions about the future share important similarities to generating alternative versions of the past. Both these lines of research support an overestimation hypothesis, where the affective impact of counterfactuals is stronger than the affective impact of factual events. However, an alternative line of argument would indicate that counterfactual events, or hypotheticality more generally, should attenuate rather than strengthen emotional responses, as it is commonly assumed that the intensity of affective responses to an object or situation diminishes as the psychological distance increases (e.g., Frijda, 1988). Using various scenario outcome descriptions that manipulated identical outcomes as either factual or counterfactual, we compared how participants evaluated the affective impact of outcomes in two experiments, expecting counterfactual (and presumably more abstract) outcomes to be less affectively impressive.

2.3   Paper 3 - Lessons learned (or not learned) from accidents and near-accidents

What do we learn from accidents and near-accidents? There is an inherent ambiguity in such events, as one can imagine both better and worse possible outcomes. This is especially the case after near-accidents. Consequently, near-accidents may signal both resilience (McMullen & Markman, 2000) and vulnerability (Dillon & Tinsley, 2008, Plous, 1991;

Tinsley, Dillon & Cronin, 2012). As near-accidents are far more common than accidents, and have less severe consequences, they potentially represent a potent source for learning.

We expect that people learn from accidents, as such events are clearly negative, tend to trigger negative thoughts and emotions, and motivate cognitive activity aimed at understanding why the accident occurred (Epstude & Roese, 2008; Smallman & Roese, 2009). Presumably, such counterfactual analysis is utilized in order to make appropriate behavioral change.

We suspect that learning from near-accidents is less straightforward. First, near-accident might trigger both upward and downward counterfactual comparisons, and how people ultimately respond to the accident is likely impacted by the alternative to which the factual outcome is compared (Epstude & Roese, 2008; Roese, 1997; Roese & Epstude, 2017). Negative outcomes can promote satisfaction via a contrast effect, if compared to an even more negative outcome (McMullen & Markman, 2002), but also scare us straight via an assimilation effect (McMullen& Markman, 2000). Near-accidents may also fail to trigger counterfactual thinking altogether. As people sometimes pay more attentions to final outcomes than the events leading up to them, near-accidents may simply be labeled a success (Baron & Hershey, 1988). Finally, near-accidents may not only fail to act as a warning signal, but may even promote risky decision-making, if not experience as a vulnerable near-miss (Dillon & Tinsley, 2008; Tinsley, Dillon & Cronin, 2012).

We investigated this dilemma by asking people about thoughts and emotions following accidents and near-accidents in traffic, and explore whether the experiences affect future carefulness.

2.4   Methodological approach

In most of the studies reported in this thesis, participants were students attending courses in psychology at the University of Oslo or UiT – The Arctic University of Norway. In Studies 2 - 5 in Paper 1, participants were invited to respond to the questionnaires in the intermission between lectures. In all other studies participants were invited to participate in web-based questionnaires created using survey software from Surveymonkey.com (Paper 2) and Qualtrics.com (Paper 3). In the studies in Paper 2, participants were recruited via invitation from a closed web-portal for Bachelor-level students in psychology. In Paper 3, participants were recruited from various social media platforms (Reddit, Facebook) and via a university mailing list. From the demographic information collected in the study in Paper 3, it would appear that participants were mainly recruited from a student population in the north of Norway.

Most studies, with the exception of Study 1 in Paper 1 and the study in Paper 3, used an experimental approach where participants were randomly allocated to conditions in a between-group design. Study 1 in Paper 1 and the Study in Paper 3 employed a correlational design. Standard and widely used statistical techniques, like different variants of Analysis of Variance and Multiple Regression Analysis, were used to analyze the data. Specific methodological considerations were discussed in each study respectively. However, there are some general considerations that should be addressed.

2.4.1   Methodological considerations.

Participants received the questionnaires either in a classroom setting or via a link to an online-survey. An advantage with such strategies is that it facilitates collecting responses from a large amount of participants in a short time. However, there are also disadvantages.

With both collection methods, it is difficult to assure that participants take the study seriously, are paying attention to the task, and answer questions conscientiously. In classroom setting, an additional concern is that participants may check and copy each other responses. However, in all classroom studies participants sitting together received different versions of the questionnaires, to avoid systematic error. Furthermore, participants were instructed to focus on their own questionnaire and at least two experimenters were present during the data collections. When data were collected using web surveys, we have little control over when participants take the survey and in what type of environment. Presumably, participants take it when they are motivated, which may mean they are more attentive than when approached in a classroom setting. It has been demonstrated that web surveys and traditional classroom collection methods produce similar results (Paolacci, Chandler and Ipeirotis, 2010). Although the lack of control in collection of data may be a disadvantage, these challenges should be more likely to produce random than systematic error, and is therefore considered tolerable.

In Paper 1 and Paper 2 we chose a scenario-based methodology, where different levels of the independent variable were manipulated by randomly assigning participants to reading and responding to different versions of a vignette. This approach has been frequently used in research on counterfactual thinking (e.g., Epstude & Roese, 2008), and as it benefits from the high internal validity offered by experiments and the efficiency of survey research, it may be well suited to test specific questions about thought processes involved in imagining alternatives to reality. Especially when the aim is to understand how such thought processes are influence by factors that are not easily accessible in real life situations (Atzmüller & Steiner, 2010). The scenarios used are not intended to re-create the real world and do not have to be equivalent to real life situations, but should aim to activate thought processes in a manner similar to what would happen in real life under the conditions of interest (Atzmüller

& Steiner, 2010). Furthermore, the results should also be interpreted as predictive rather than representative of how people would respond under similar situation in "the wild". Efforts were made to develop scenarios that consistently followed the same simple and concise narrative structure, were clear and well written, and were relatable and plausible to participants. In addition all scenarios contained an introductory part that was held constant in each condition to eliminate extraneous variance and allow for comparison between conditions, and an experimental aspect that was manipulated systematically between conditions, as recommended by for instance Alexander and Becker (1978 (see also, Evans et al. 2014). This experimental approach makes it possible to conclude that changes in the independent variable are causally related to changes in the dependent variable, but as we did not include any mediating variable, we cannot be certain of the specific mechanism that connects them.

Although using scenario studies have some advantages, concerns are often raised that the artificiality of scenarios do not accurately reflect how people respond to "real" events (e.g., Cullen, 2010). This concern has specifically been raised in relation to research on counterfactual thinking, as much of this research is based on scenario studies, and as resent evidence suggest that responses to scenarios may differ from responses to actual experiences (Girotto, Ferrante, Pighin & Gonzales, 2007). Whereas active failures, close calls, and near misses are highly salient when described in a vignette, they may be harder to detect in real life (Kühberger, Großbichler & Wimmer, 2011). Comparative thinking requires cognitive resources, and while these resources are readily available to vignette readers, people who are immersed in the details of an ongoing task appear to have their attention directed towards the challenge at hand (Girotto, Ferrante, Pighin , & Gonzales, 2007; Pighin, Byrne, Ferrante, Gonzales & Girotto, 2011). We found two arguments sufficiently convincing to use scenarios

in the first two papers. First, the general conclusions we challenge, that people tend to make small rather than large counterfactual modifications of reality, were largely established using scenario type studies and we therefore considered it appropriate to rely on similar methodology. Secondly, research on accidents and near-accidents had already established that people often imagine counterfactual outcomes that are dramatically different from factual outcomes "in the wild" (e.g., Teigen, 1995). As the purpose of the present studies were to investigate this phenomenon more systematically, the control offered by scenario studies were viewed as an advantage.

In paper 3, where the aim was to investigate whether people utilize potentially important lessons from near-accidents in making appropriate behavior change, we preferred the gain in external validity offered by having people reflect on personal experiences. However, it must be noted that these data are correlational and does not permit us to draw any conclusions about causality. Furthermore, we only ask people to provide a self-report measure on the degree to which they have become more careful drivers as a consequence of their experiences with accidents and near-accidents, and do not have any data on actual behavior.

Finally, most of the study participants were recruited from the student population, which raises concerns about generalizing to other populations. This is a limitation shared with much if not most research on counterfactual thinking specifically, and much psychological research generally (e.g., Henrich, Heine, & Norenzayan, 2010). The overreliance on college educated participants from democratic and industrialized countries in the western hemisphere is generally problematic, and perhaps particularly when the aim is to reach conclusions about how people in general think and feel.

3   Summary of results

3.1   Paper 1 – Going to the other extreme: counterfactual thinking leads to polarized judgements

A series of five experiments tested the hypothesis that moving from the factual to the counterfactual promotes a focus on extreme or prototypically good and bad outcomes. In experiment 1, participants came up with examples of incidents that could have turned out otherwise in their own life. The results indicated that people imagined counterfactuals that were polar opposites of what actually happened, in the sense that highly positive factual outcomes had highly negative counterfactual outcomes, and vice versa. In the subsequent studies, participants were presented with scenarios describing situations that could easily take a turn for the better or worse, and were asked to evaluate the potential consequences of both the factual and the counterfactual outcomes. Studies 2 and 3 showed that consequences of positive and negative counterfactual events were perceived as better and worse respectively, than the same events presented as factual. To take one example, a protagonist is on his way to a job interview and because of heavy traffic, he may or may not make it to the interview on time. Participants who were told that he actually arrived late rated the consequences as quite negative. In comparison, those who were told that he arrived in time, but were asked to rate the consequences of the counterfactual outcome (i.e., what if he had arrived late) rated the outcome as event more negative. Thus, arriving late for a job interview was evaluated as more negative when presented as a counterfactual possibility than when presented as a factual event. The positive variant of the scenarios mirrored these results. Extending these findings to probability judgments, Study 4 demonstrated that estimated probabilities for success were higher if a facilitating antecedent (e.g., arriving in time for a job interview) was presented as counterfactual compared to when presented as factual. Study 5 focused on accident scenarios,

and demonstrated that the probability of negative consequences were higher when aggravating antecedents (e., not wearing a seat belt) were presented as counterfactual compared to factual, and were lower when ameliorating antecedents (e.g. wearing seat belt) were presented as counterfactual compared to factual.

3.2   Paper 2 – Judgments vs affective evaluations of counterfactual outcomes

If counterfactual consequences are exaggerated, does the same overestimation effect apply to affective reactions? The present research presented participants with scenarios presented as either factual or counterfactual and asked them to rate either the perceived affective valence of the scenarios or perceived severity of consequences. In Experiment 1, participants tended to exaggerate the potential consequences of negative events that were presented as counterfactual as opposed to factual, which was a replication of the results of Teigen et al. (2011). However, evaluations of affect followed the opposite pattern, and were rated as less negative when presented as counterfactual than when presented as factual. Experiment 2 replicated this interaction for positive outcomes: Imagining a positive scenario outcome leads to more positive outcome (consequence) expectations when the positive turn of events is presented as counterfactual compared to factual. However, when participants are asked to estimate the valence of the same positive outcomes, factual scenarios are consistently rated as more positive than counterfactual scenarios. Overall, the results from the two experiments reported here indicate that counterfactual thinking differentially affects judgment of consequences and evaluations of affect: Consequence estimates are exaggerated, whereas affect evaluations are attenuated.

3.3   Paper 3 - Lessons learned (or not learned) from accidents and near-accidents

This study analyzed thoughts and feelings following accidents and near-accidents with the aim to understand if people utilize potentially important information following near-accidents to regulate their future behavior. Specifically, we investigated the degree to which participants reported having become a more careful driver after accidents and near-accidents, and explored possible mechanisms involved in learning from such events.

The main results showed that people reported increased carefulness after both accidents and near-accidents, but significantly more so following accidents. Interestingly, people who had repeated experience with accidents reported increased carefulness whereas the same effect was not observed for near-accidents. Little to no change in reported carefulness was observed following near-accidents. Examining the possible mechanisms involved, these results could not be explained by differences in the intensity of emotional reactions nor by differences in the kinds of emotions following the different types of incidents. Changes in reported carefulness were in both cases primarily associated with unpleasantness and experienced regret. However, an analysis of participants counterfactual reflections about their experiences clearly showed that self-focused upward counterfactuals were associated with learned carefulness.

4   General discussion

The present thesis contributes to research on counterfactual thinking by exploring the role of such thoughts in two different contexts. The first two papers address the process by which counterfactual thoughts are constructed, suggesting that counterfactual representations are more abstract and schematic than representations of factual events, and explore possible consequences for judgments and affective evaluations. Paper 3 addresses possible functions of counterfactual thinking, investigating the role of such thoughts in learning from accidents and

near-accidents. These two lines of investigation are connected, as the properties of counterfactual representations presumably have consequences for what people learn from them. In the following, I will first outline how the three papers are connected, then discuss specific findings and potential theoretical and empirical implications.

By comparing counterfactual thinking to prospective thinking, Paper 1 systematically investigated how participants estimate possible consequences and effects of scenarios describing various critical situations, finding that such outcome expectations are exaggerated for counterfactual as opposed to factual evaluations. We argue that these results bear theoretical significance in that they are consistent with an abstract high-level account of counterfactual thinking, but are at odds with the notion that counterfactual thoughts tend to be situationally constrained and address minor rather than major alterations of reality (Byrne; 2002, Epstude & Roese, 2008; Kahneman & Miller, 1986; Roese & Epstude, 2017). Furthermore, this tendency of exaggerating counterfactual consequences is consistent with previous studies demonstrating that people who have actually been in near-accidents tend to engage in rather dramatic downward counterfactual thinking (Teigen 1995, 1998b), and consequently report experiencing positive emotional states such as luck and gratitude (Teigen, 1997). Clearly, such experiences are not intrinsically positive, but are evaluated positively in contrast to a worse possible outcome. One implication could be that this relative evaluation hinders learning, as upward focused counterfactuals and the negative emotional states that accompany them have been found most beneficial for learning (e.g., Roese, 1997). Alternatively, it could be reasoned that such dramatic downward counterfactuals are instrumental in avoiding similar situations in the future (McMullen & Markman, 2000), especially if this exaggeration of counterfactual consequences is also associated with an affective impact bias (e.g., Wilson & Gilbert, 2003).

In Paper 2 we built on the findings in Paper 1, and extended the line of investigation to include affective evaluations of similar scenarios. If people tend to overestimate not only the potential consequences, but also the affective impact of outcomes when thinking counterfactually, this may have important motivational implications because of the increased aversiveness or attractiveness involved. The results replicate the finding from Paper 1 in demonstrating that counterfactual compared to factual consequences are exaggerated, but show that affective evaluations follow the opposite pattern. Affective evaluations are attenuated when presented as counterfactual as opposed to factual. We argued that these findings are consistent with an abstract high-level account of counterfactual thinking, as general, abstract representations tend to be less affectively evocative than concrete and specific instances (e.g., Frijda, 1988; Loewenstein, 1996; Nisbett & Ross, 1980). However, these finding raise some questions about the role of counterfactual thinking in learning from accidents and near-accidents. Clearly, counterfactual intensity is not the only relevant determinant with motivational implications for learning, but the negative affect associated with vividly reflecting on a downward counterfactual might be important (especially) for avoidance learning, as it draws attention to the possibility that a negative outcome could have occurred (McMullen & Markman, 2000; Sanna & Turley-Ames, 2000).

In Paper 3 we asked people about their thoughts and feeling following autobiographical experiences with accidents and near-accidents, and examined the degree to which these experiences have inspired caution. We found that accidents inspire more caution than near-accidents, and that repeated experience with near accidents seem to inspire caution, but that there is no change in caution following repeated experience with near-accidents. Interestingly, learned carefulness does not seem to be associated with reported emotional intensity of counterfactual scenarios. However, learned carefulness was strongly associated

with self-focused upward counterfactuals, and the specific emotions of unpleasantness and regret. These results are not consistent with an account where "exaggerated counterfactuals" scare people straight, but are more consistent with a "near-miss" bias (e.g. Dylan & Tinsley, 2008) or at least an outcome bias (Baron & Hershey, 1988) where near-misses fail to act as a deterrent inspiring caution in future decision making. Especially the finding that repeated experience with near-accidents did not inspire caution is consistent with such an interpretation. Repeatedly experiencing situations where something is feared but avoided might lead people to update their general knowledge category, or evoked norm, about a hazard and the affect associated with it, such that the near-accident come to fall within what is considered normal and acceptable. Interestingly, people who responded with self-focused upward counterfactuals reported significantly higher degrees of learned carefulness compared to those who responded with other types of counterfactuals. This finding is consistent with a functional perspective of counterfactual thinking, suggesting that such thoughts are especially conducive for learning (e.g., Epstude & Roese, 2017), as negative affect triggers counterfactual thoughts specifying how similar situations can be avoided in the future.

4.1   Abstract counterfactuals

The notion that the counterfactuals people construct are abstract and schematic cannot be directly derived from prevailing theoretical accounts of counterfactual thinking. According to both Norm theory (Kahneman & Miller, 1986) and the functional perspective (e.g., Epstude & Roese, 2008), such thoughts tend to be heavily constrained by reality, and typically centre on mutating specific elements in a situation that are either goal relevant (e.g. Roese & Epstude, 2017) or norm violating (Kahneman & Miller, 1986). In the following, I will discuss evidence and arguments in support for the contrasting view that counterfactual thinking may be abstract and schematic.

Proponents of Construal Level Theory have proposed that the ability to form abstract and decontextualized representations of the external world is the core property that allows people to mentally travel across time and place, take the perspective of others, and consider hypothetical alternatives to actual events (e.g., Liberman & Trope, 2010). This view is supported by neuroimaging studies showing that prospection (e.g. Addis, Wong & Schacter, 2007), perspective taking (e.g., Mitchell, Banaji & Macrae, 2005) and imagining hypothetical scenarios (Hassabis, Kumaran & Maguire, 2007) activate the same common core network in the brain, the default-mode network, indicating that these abilities may be variations of a common process. Furthermore, there is behavioural evidence, both within the CLT framework and elsewhere, indicating that manipulating various distance dimensions have parallel effects on both mental representations and subsequent judgments and evaluations, indicating a common mental process.

Although the majority of studies within the CLT perspective have focused on temporal, spatial, and social distance (e.g. Trope & Liberman, 2010), several researcher have specifically proposed that there is an association between degrees of hypothetically, often conceptualized as varying in degrees of probability, and abstract and schematic mental representations (Trope, Liberman & Wakslak, 2007; Wakslak et. al., 2006). For instance, Wakslak et al. (2006) demonstrated that low probability events (i.e., hypothetical possibilities) were represented by more abstract and general features compared to high probability events (i.e., less hypothetical events). Building on these findings, Wakslak and Trope (2009) demonstrated that people who were led to adopt a high-level-construal mind-set assigned lower probability assessments to events than people led to adopt a low-level mind-set. These results are directly comparable to the association previously found between other psychological distance dimensions and how abstractly and concretely events and objects are

represented (e.g., Liberman & Trope, 2010), and supports the notion that hypothticality can meaningfully be thought of as a psychological distance dimension.

Gilead, Lieberman and Maril (2012) presented more direct evidence linking counterfactual thinking to abstract mental representations, indicating that representations of hypothetical and false events preserves the gist, but disregard the details. In the encoding face of the experiment, participants were presented with pictures of various objects (i.e., a cat) in combination with either a factual proposition (i.e., Danny traveled to Germany and saw a cat), a conditional proposition (i.e., If Danny will travel to Germany he will see a cat), or a negated proposition (i.e., Danny traveled to Germany and did not see a cat). In the retrieval face, participants were shown a series of pictures, and were asked to indicate which ones they had seen before, which ones were similar to the ones previously presented and which ones were new. The results demonstrated increasing error rates in classifying similar objects as identical when stimuli was previously paired with a negation, a conditional or a factual propositions respectively, indicating that objects paired with false or hypothetical propositions tended to be encoded with less perceptual detail and in a more abstract, gist-based manner than what was the case for factual propositions.

Behavioural evidence from research on episodic memory and episodic future thinking are also relevant to the current discussion. There is for instance evidence indicating that mentally traversing various distance dimensions, such as remembering the past or imagining the future (e.g. D'Argembeau & Van der Linden, 2004), or thinking counterfactually (e.g., De Brigard and Giovanello, 2012), have comparable effects on how vividly and concretely episodic and contextual details are represented. First, D'Argembeau and Van der Linden (2004) reported that remembered past events were subjectively experienced as more vivid and rich in detail compared to imagined future events, as might be expected as the first is actually

experienced and the latter is not. However, more relevant to the present discussion is the finding that both memories of the past and imagined future events were similarly impacted by temporal distance, such that both were more detailed and vivid in the near compared to the distant future or past (D'Argembeau & Van der Linden, 2004).

Furthermore, De Brigard and Giavanello (2012) compared representations of past, future and counterfactual events on a number of dimensions, such as for instance clarity, visual detail, vividness, specificity in temporal and spatial location together with emotional valence and intensity, and found that the phenomenological characteristics of the three types of representations were similar in most respects. The authors did report, in accord with (D'Argembeau & Van der Linden, 2004), that remembered events were richer in sensory detail and more clearly situated in time and space compared to imagined future or counterfactual events. However, a particularly interesting finding in relation to the present discussion was that the emotional intensity of counterfactual events were attenuated compared to both remembered and imagined future events, which is in accord with the results reported in the present thesis (Terum & Svartdal, 2013).

4.2 Constrained or extreme counterfactuals

Various forms of mental simulations might rely on the same basic mechanism, but still operate on material that is differently constrained by reality. Clearly, both prospective and counterfactual thinking is to some degree constrained by the past. As counterfactual speculations about what could have happened starts from the realization that it did in fact not, and thus operate on mental representations of factual events, some researcher have suggested that counterfactuals are more firmly anchored in past events compared to predictions about the future (e.g., Van Boven, Kane & McGraw, 2010). Other researchers have proposed an alternative hypothesis that is more in line with the ideas expressed in the present thesis: as

counterfactual alternatives will never actually come into existence, but possible futures might, future oriented thoughts are more constrained and more subjected to reality checks than counterfactual thinking (Ferrante, Girotto, Straga & Walsh, 2013).

Again, this hypothesis challenges the common view that counterfactuals involve minimal mutations of reality, and tend to focus on aspects that are norm violating, controllable, and close to actual outcomes. However, several researchers have recently pointed out that many of these results come from scenario-type studies, where participants assume the role of readers and generate counterfactual thoughts in response to fictional stories, and have questioned the generality of these finding. Actual event and outcomes are experienced in complex environments that might make other types of information available for counterfactual speculation (Girotto, Ferrante, Pighin, & Gonzales, 2007; Pighin, Byrne, Ferrante, Gonzales & Girotto, 2011; Ferrante, Girotto, Stragà & Walsh, 2013).

For instance, in a series of experiments, Girotto et al. (2007) assigned participants to conditions where they either assumed the role of actor (i.e, actually performed a task) or perceiver (i.e., read about protagonist who performed a task). The task was presented as a blind choice between an envelope containing an easy (i.e., one digit multiplication problem; anagram a four letter word) or a difficult task (two digit multiplication problem; anagram a seven letter word) that was to be solved under time pressure, but was manipulated so that the difficult task was always selected. Note how this manipulation makes the choice of envelope a highly accessible counterfactual. The dependent measure was the counterfactuals produced by participants. Interestingly, readers focused on the subjectively most salient counterfactual and undid the protagonists' choice (If only s/he had chosen the other envelope). Actors, on the other hand, tended to undo factors that constrained their ability to solve the problem, and thus produced counterfactuals that were uncontrollable (e.g., If only I had more time), exceptional (e.g. If only I have had a calculator) and norm violating (e.g., If only I were better at

arithmetic). Girottoe et al. (2007) argued that the difference in counterfactual generation relates to the information available to participants. For scenario readers the initial choice of envelope is highly salient, but participants who are immersed in solving a particular problem tend to have their attention directed towards the challenges at hand.

These findings suggests that prefactural thoughts, that focus on the future, may be more constrained than counterfactual thoughts that focus on the past (Ferrante et al., 2013). Counterfactual thoughts tend to focus on factors that explain failures, such as features of the problem (e.g., If only I had more time) or the problem-solving attempt (If only I had concentrated more). Whether they focus on controllable and close counterfactuals may depend more on the information that happens to be momentarily available, than on whether or not this information will facilitate any future attempt (Girotto et al., 2007). It will also depend on motivational concerns, as counterfactuals are sometimes evoked for purposes other than preparatory concerns, such as to provide meaning (e.g., Kray et al. 2010) or excuse poor performance (McCrea, 2008). In contrast, thoughts about the future might be more constrained by situational demands precisely because future event might still happen and one would be wise to come prepared.

Girotto et al. (2013) reasoned that when people reflect on how things could be better in the future, the constraints that limited success in the past will also be present in the future. Some of these constraints are under personal control (e.g., problem solving strategy, effort, focus and concentration) and others are not (e.g., task demands, stable traits and abilities). Only controllable features can be influenced and changed and thus serve a preparatory role in the future. Consequently, Girotto et al. (2013) predicted and found that when participants fail a task, counterfactual thoughts tended to undo uncontrollable features, such as task demands or participants own permanent traits, but that prefactual thoughts tended to focus on features participants could control. Mental simulation of the future may be more constrained and goal

directed, precisely because future events might still happen, whereas counterfactual events will not.

These findings parallels the findings presented in Article 1 and 2 in the present thesis. A key function of mental simulation is preparation for the future. This preparatory function is likely more relevant to future than to counterfactual events, or events that are psychologically close rather than distant. Consequently, people might imagine immediate future events with more contextualized and situation specific detail than counterfactual events, as this allows for more informed expectations about what the future will bring. Counterfactual thought may be less constrained, more geared towards considering the possibility of outcomes that are dramatically different from actual outcomes, thus testing out the significance of meaningful hypothetical possibilities. Furthermore, to the extent that people mentally simulate future events more concretely than they simulate counterfactual events, they might associate more intense emotion with future than counterfactual outcomes (e.g., Van Bowen & Ashworth, 2007).

4.3   Abstract counterfactuals and affect

The relation between abstract representations and experienced or predicted affect appears complex. Generally, the strength of people's emotional reaction to events and outcomes that are outside of one's direct experience depends on how concretely and vividly those outcomes are represented mentally (e.g., Frijda, 1988; Nisbett & Ross, 1980). An important function of emotion is to prepare people for action, in terms of either approaching or avoiding significant events (e.g., Frijda, 1988). As this action readiness is more important in the immediate than the distant future, people typically experience more intense emotions when events and objects are close as opposed to far away (e.g., Loewenstein, 1996). Consequently, if counterfactuals are imagined as rather abstract and schematic, it follows that

mental simulation of counterfactual events may be less affectively engaging than simulating future events, as is argued in Paper 2. This interpretation is consistent with the idea that people respond to imagined situations in much the same way as they respond to real situations (e.g., Lang, 1977), but that the intensity of the emotional reaction depends on the degree to which the situations feels close and real (Frijda, 1988). Furthermore, it is consistent with resent evidence showing that simulated counterfactual versions of the past are both less vivid and less affectively engaging than both imagined futures or remembered past events (De Brigard & Giavanello, 2012).

More direct evidence for the link between reduced distance and stronger affective reactions was provided by William and Bargh (2008). They primed participants with either spatial closeness or spatial distance by plotting points on a Cartesian coordinate plane, and found that people primed with spatial distance tended to report less emotional distress from violent media and weaker emotional connection to family members than participants primed with spatial closeness. Similarly, Ayduk and Kross (2008) demonstrated that directing people to adopt a self-distanced perspective, by asking them to picture a memory from a birds-eye view, reduced the emotional intensity of contemplating past emotional events compared to when memories were relived from a more self-immersed perspective, indicating that psychologically distancing oneself from memories attenuates emotional reactions. Reasoning along similar lines, Chandran and Menon (2004) suggested that psychological distance could influence risk perception, and demonstrated that presenting risks and hazards as occurring every day compared to every year made the hazards seem more proximal and concrete, evoking a stronger feeling of risk and threat. The attenuation effect described in the present thesis can be interpreted as consistent with research indicating an association between abstract representations of events and dampened affective reactions.

However, it is worth noting that this interpretation seem inconsistent with research on affective forecasting, that generally have demonstrated that people tend to overestimate the intensity (e.g., Buehler & McFarland, 2001) and duration (Gilbert, et. al., 1998) of their emotional reaction to future experiences (e.g. Wilson & Gilbert, 2003). That is, studies on this "impact bias" have typically shown an association between increased psychological distance and stronger emotional reactions. Some of this research even seem to address counterfactuals states of affairs, such as when people overestimate how much happier they think they would have been living in California instead of the Midwest (Schkade & Kahneman, 1998). Furthermore, abstract mental representations have even been implicated as something that contributes to (rather than reduces) the impact bias, as several researchers have suggested that increasing temporal distance should increase the impact bias (Wilson &; Gilbert, 2003; Ayton, Pott & Elwakili, 2007; Liberman, Sagristano & Trope, 2002).

The "impact bias" is a multi-determined phenomenon, impacted both by factors that contribute to inflated predictions about the affective impact of future events and by factors that reduce the actual impact of experienced events. One factor that contributes to inflated predictions is focalism. When forecasters try to predict the duration and intensity of future emotional experiences, they tend to single in on one focal event (e.g., failing an exam), and thus overlook the myriad of other factors that will also influence (and moderate) the emotional impact of the event (e.g., Schkade & Kahneman, 1997; Wilson et al. 2003). This focusing illusion (or focalism) is at least in part a consequence of an overly simplistic, schema driven representation of future events. Consequently, as temporal distance tends to reduce the complexity of mental representation of an event (Ayton, Pott & Elwakili, 2007; Liberman, Sagristino & Trope, 2002; Wilson &; Gilbert, 2003), temporal distance may contribute to focalism, which in turn increases predicted affect. In line with this, Ayton, Pott, and Elwakili

(2007) demonstrated that defocusing exercises that induced low-level construals of a future event reduced the extremeness of affective forecasts. Note that this interpretation does not challenge that there is a direct link between the concreteness and contextual detail of the emotional eliciting stimuli and stronger affective reactions, but rather suggest that abstraction may also contribute to an opposing effect in that it contributes to focalism and therefore the extremeness of affective forecasts. However, the relation between abstraction and affective reactions seem complex, and research efforts should be made to resolve the apparent inconsistencies in existing research.

Furthermore, even if we interpret our findings in Paper 1 and 2 within the framework of construal level theory, it should be noted that Trope and Liberman (2010) suggest that it might be useful to distinguish between emotions that ensue from a low-level construal of an emotion-eliciting event, and emotions that ensue from a high-level construal of an event. They suggest that emotional reactions will be attenuated over psychological distance only as long as they are low level. High level emotions – emotions that require taking a distant perspective and thus require a more abstract construal of the emotion eliciting stimuli – might in fact be augmented over psychological distance. In line with this, Leach and Plaks (2009) demonstrated that errors of omissions were represented more abstractly than errors of commission, and used this finding to explain why short term regret tend to centre on actions whereas long term regrets focus on failures to act (e.g., Gilovich & Medvec, 1995). The notion that high and low-level emotions might be differentially affected by psychological distance is intriguing and should be explored in future research.

4.4   Counterfactuals, affect and learning

There is abundant research within the counterfactual thinking literature demonstrating that how we feel about actual experiences and outcomes is affected by how we think and reflect around alternative possibilities. Much of this research has typically focused on contrast effects, demonstrating that counterfactual alternatives, better or worse, tend to amplify the affective reaction to a given outcome (e.g., Gilovich & Medvec, 1995; Kahneman & Miller, 1986). The studies presented in the present thesis have had a different approach. Instead of focusing on contrast effects, the focus has been on the counterfactuals people generate, how they might have been felt and how they may affect behavioral intentions. The rationale for this approach that the evaluative and behavioral consequences of counterfactual thinking do not only depend on the contrast between a factual outcome and some counterfactual alternative, but also on how we construe counterfactual alternatives. For instance, a near-accidents has the potential to motivate a change in driving style, perhaps particularly if the one thinks that a serious rather than trivial accidents was avoided.

McMullen & Markman (2003) have suggested that people engage in two distinct modes of simulation when contemplating counterfactuals, with different implications for motivation and learning. In an evaluation mode factual outcomes are evaluated in contrast to a counterfactual benchmark and typically lead to contrast effects. For example, a student failing an exam may experience negative affect, as the outcome is likely contrasted to a better possible outcome, which in turn triggers counterfactual thoughts about what could have been done in order to achieve a better grade (Epstude & Roese, 2008; Roese, 1997). In a hazardous situations, the contrast effect could be exemplified by the positive affect associated with avoiding a more negative outcome (i.e., luckily my ankle was just sprained not broken), which may help in feeling better about bad outcome. In a reflection mode, on the other hand,

people will mentally simulate and phenomenologically reflect on the counterfactual as if it were true, thereby assimilating the affect associated with the counterfactual outcome. One example would be positive fantasies, such as vividly imagining some desired goal state (e.g., imagine if I had passed my exam). Another could be the dramatic downward counterfactuals often reported after accidents and near-accidents. Furthermore, such mental simulations can be evaluated from two perspectives: We can focus on the more or less detailed mental representation of an episode or outcome, and on the experiential quality of that simulated episode. Both aspects presumably have motivational implications for future behavior. However, as Paper 1 and Paper 2 in this thesis suggest the first aspect tends to be exaggerated and the second appears to be attenuated, raising the question of how such mental simulations affect future intentions.

Research on the near-miss bias suggests that near-misses might not be effective at motivating behavior change as it may increase confidence rather than caution (Dillon & Tinsley, 2008), particularly if there is no salient information indicating that a close and worse counterfactual outcome could have happened (Tinsley, Dillon & Cronin, 2012). Such resilient rather than vulnerable near-misses increases confidence by normalizing the near-miss, leading people to update their knowledge and expectations connected to that particular class of hazards and the negative affect associated with it. The results from Paper 3 can be interpreted as consistent with findings on biased near-misses, and further indicate that accidents do not inspire caution even when people recognize and self-label them as such. Particularly interesting was the observation that carefulness was unaffected by the number of near-accidents people had experienced. However, consistent with the functional perspective (e.g., Epstude & Roese, 2008; Roese & Epstude, 2017), people who do responded to near-accidents with self-focused upward counterfactuals appeared to learn more from such experiences than

people that respond with other types of counterfactuals. This might indicate that the negative affect associated with near-accidents does not motivate behavior change directly, but rather stimulates further counterfactual analysis, which in turn affect intentions and behaviors.

There are clearly similarities between various types of mental simulation processes, and they have similar effects on judgments and evaluations. However, as various types of mental simulations operate on different material, there are also differences. One difference with potentially interesting implication for learning from counterfactual thinking were pointed out by Szpunar and Schacter, (2013) and De Brigard, Szpunar, and Schacter (2013), namely that repeated simulation of counterfactual and future events have opposite effects. Repeatedly imagining a specific self-relevant future event led people to think of that event as more plausible and likely to happen. Furthermore, the imagined scenarios became more detailed and easier to simulate with repetition (Szpunar & Schacter, 2013). However, repeatedly simulating a specific counterfactual event made that event seem less subjectively plausible (De Brigard et al., 2013). An interesting implication of these findings is that repeatedly revisiting past mistakes, thinking about what we could have done differently in order to correct the wrong, will only make our newfound insight seem more and more implausible the more we think about it. The results in Paper 3 suggest that repeated experience with near-accidents does little to motivate behavioral change. In addition, the results of De Brigard et al. (2013) suggest that repeatedly revisiting close calls that could have taken a dramatic turn for the worse will not scare us straight either. Combined, these findings suggest there may be a limited potential in learning from assimilation based counterfactual thinking, at least in the context of learning from near-misses.

4.5 Potential new directions

If counterfactuals are more abstract and schematic than thoughts about actual outcomes, implications for both how people think about risk and hazards and about assignments of responsibility and blame might follow.

Most theories of decision making under risk and uncertainty assume that decision makers order and choose between options based on an assessment of the desirability and likelihood of each option (e.g., Kahneman & Tversky, 1979). However, probabilities are sometimes unknown and often hard to compute (e.g., Kahneman & Tversky, 1982; Slovic et al. 2002) and the desirability of future prospects difficult to assess in advance (e.g., Wilson &; Gilbert, 2003). Consequently, the relative weight assigned to each dimension tend to vary over time and situations (e.g., Sagristano, Trope & Liberman, 2002; Teigen, 2005; Trope & Liberman, 1998). When strong affect is involved, probabilities might even be ignored altogether, and the goodness or badness of potential consequences becomes the focus of attention (e.g., Sunstein, 2002).

Construal level is one such factor affecting how people balance probabilities and consequences (Sagristano, Trope & Liberman, 2002). As probability considerations (how likely am I to win?) are primarily of interest if the potential consequences are desired (do I want the price?), probability is in a sense subordinate to the desirability of consequences. Consequently, as subordinate features are taken more into consideration when mentally construed at lower levels, gambling preferences are influenced by temporal perspective (Sagristano, Trope & Liberman, 2002). Sagristano et al. (2002) demonstrated that temporal distance decreased the influence of probabilities and increased the influence of payoffs, so that gambles with a high probability and a low payoff were preferred for the near future,

whereas gambles with a low probability but a high payoff were preferred for the distant future.

If thinking counterfactually involves adopting an abstract high-level mindset, one possible implication is that people will be more concerned with potential consequences than probabilities when considering counterfactual alternatives. Clearly, there are probabilistic elements in considerations of past events, as people frequently think of various outcomes and their counterfactual counterparts as more or less likely. This is especially evident in regards to near - misses, where the subjective probability estimates for past events seem to be assessed based on counterfactual closeness (Teigen, 1998; 2005). For instance, if a large vehicle hits the pavement just inches from where a couple was just walking, closeness will be used as a cue for probability, and people will consider it likely that someone could have been hit. Furthermore, counterfactual probability estimates depend on physical distance, so that the one closest to the point of impact is perceived as having been exposed to the greatest risk.

Thus, counterfactual closeness both tend to trigger counterfactual thinking and it will be used as a proxy for probability if closeness cues are available. However, such ques are not always easily available, for instance because it may be unclear what one should use as a standard for assessing closeness (Kühberger, Großbichler, & Wimmer, 2011). For example, the difference between missing a plane by 5 minutes and 30 minutes might be large when compared in a scenario description, but might both be considered "close" for a trip that has been planned for weeks, or if it meant missing a travel of some particular importance (Kanten & Teigen, 2015). If counterfactuals thinking involves higher level construals than thinking about factual events, and high level construals involves focusing more on possible consequences than on how probable they are, one possible implication is that people are less sensitive to situation specific details that affect the probability of antecedent events when

considering counterfactual than factual scenarios. This could imply a systematic difference between how we evaluate risk before engaging in an action, and how the same risk is evaluated in retrospect.

4.6 Final Remarks

In order to make sense of the past and prepare for the future people engage in various types of mental simulation, such as to imagining the possible consequences of future choices or contemplating how events might have played out differently in the past. Such mental simulations can be evaluated from two rather different perspectives: We can focus on the more or less detailed mental representation of an episode or outcome, and on the experiential quality of that simulated episode. Both aspects may have important motivational implications for the regulation of future behavior.

Close calls and near escapes constitute powerful triggers for counterfactual thinking, as we often can't help but think about what could have happened were it not for the narrow margins separating our fortune from failure. Such hypothetical thoughts are in principle only limited by our imagination, and as they can never actually be exposed to a reality check, we might enjoy many degrees of freedom in simulating alternatives to the past. Such elaborations of what might have been could be instrumental in driving home lessons for the future. However, to the extent that such thought are abstract and schematic they appear to be affectively unimpressive. Perhaps the primary function of dramatic downward counterfactuals is not to motivate behavior directly, but rather motivate deliberate analysis and reflection that then in turn promotes insight and learning

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