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The Functional Theory of Counterfactual Thinking

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Abstract

Counterfactuals are thoughts about alternatives to past events, that is, thoughts of what might have been. This article provides an updated account of the functional theory of counterfactual thinking, suggesting that such thoughts are best explained in terms of their role in behavior regulation and performance improvement. The article reviews a wide range of cognitive experiments indicating that counterfactual thoughts may influence behavior by either of two routes: a content-specific pathway (which involves specific informational effects on behavioral intentions, which then influence behavior) and a content-neutral pathway (which involves indirect effects via affect, mind-sets, or motivation). The functional theory is particularly useful in organizing recent findings regarding counterfactual thinking and mental health. The article concludes by considering the connections to other theoretical conceptions, especially recent advances in goal cognition.

Keywords

counterfactual thinking; regret; goals; rumination; mental simulation; inference; decision making; conditional; volition; motivation

Who among us has never wondered about what might have been had some past choice been different? With perhaps a little more effort, you might have been an athlete, a doctor, maybe even a rock star. Who among us has never regretted choices made and actions taken? Maybe you should have studied harder in school, traveled more when you had the chance, or had the salmon for lunch instead of the pasta. And who has never pondered a lost love and imagined how passionate it might have been? Thinking about what might have been, about alternatives to our own pasts, is central to human thinking and emotion. Such thoughts are called counterfactual thoughts.

Counterfactual thoughts are mental representations of alternatives to past events, actions, or states (Byrne, 2005; Roese, 1997). They are epitomized by the phrase “what might have been,” which implicates a juxtaposition of an imagined versus factual state of affairs. The term *counterfactual* derives from philosophical writings in which the logical status of possibility and probabilistic reasoning were closely scrutinized (e.g., Chisholm, 1946; Evans & Over, 2004; Goodman, 1947; Kvart, 1986; Lewis, 1973; Vaihinger, 1965). For example, to say that a basketball team “almost” won a game is to specify a counterfactual outcome with a particular (although not necessarily exact) level of probability. In everyday life, an individual’s counterfactual musings often take the form of a conditional proposition, in which the antecedent corresponds to an action and the consequent corresponds to an outcome (e.g., “If only I had studied, I would have passed the exam”). Crucially, counterfactual thoughts are often evaluative, specifying alternatives that are in some tangible way better or worse than actuality. Better alternatives are termed *upward counterfactuals*; worse alternatives are termed *downward counterfactuals* (Markman, Gavanski, Sherman, & McMullen, 1993; Roese,

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1994). When upward counterfactuals focus on personal choice, the resulting emotion is termed *regret*, which itself has spawned a large literature emphasizing biased judgment and decision making (Zeelenberg & Pieters, 2007). In this article, we focus exclusively on counterfactual thinking and regret defined in terms of cognitions about past events. Although anticipatory counterfactuals (or "prefactuals") and anticipatory regret have each been explored in earlier research (e.g., Anderson, 2003; Byrne & Egan, 2004; Gleicher et al., 1995; Sanna, 1996, 2000; Simonson, 1992; Zeelenberg, Beattie, van der Pligt, & de Vries, 1996), they fall outside the scope of our overview.

Counterfactual thinking seems to be a common feature of people's conscious mental landscape (Sanna, Stocker, & Clarke, 2003; Summerville & Roese, in press). The capacity to entertain counterfactual possibilities emerges early in life (typically by age 2) and seems to be evident as soon as children have mastered the lexical skills to express subjunctive ideas of "if only" (Beck, Robinson, Carroll, & Apperly, 2006; >Dias & Harris, 1990; German & Nichols, 2003; Harris, 1991; Perner, Sprung, & Steinkogler, 2004). Moreover, counterfactual reasoning is common across nations and cultures (Au, 1983, 1992; Gilovich, Wang, Regan, & Nishina, 2003; Liu, 1985), even if the particular focus of those counterfactuals reflects the different priorities inherent in different cultures (Chen, Chiu, Roese, Tam, & Lau, 2006). Counterfactual thinking may well be an essential property of intelligence itself (Hofstadter, 1979).

Why do we have counterfactual thoughts? Where do they come from, and what purpose (if any) do they serve? The present article summarizes what is currently known about the behavior regulatory function of counterfactual thinking. According to this theoretical perspective, the primary function of counterfactual thinking centers on management and coordination of ongoing behavior. Thinking about what might have been influences performance and facilitates improvement, and it does so by way of several distinct mechanisms. Counterfactual thoughts are deeply connected to goals and are a component of regulatory mechanisms that keep behavior on track, particularly within social interactions (Epstude & Roese, in press; Johnson & Sherman, 1990; Markman & McMullen, 2003; Roese, 1997, 2001; Roese & Olson, 1997; Roese, Sanna, & Galinsky, 2005; Segura & Morris, 2005). Later in this article, we review recent discoveries in cognitive neuroscience, which are strikingly compatible with this functional framework.

THEORETICAL BACKGROUND

The earliest theoretical tradition to explain counterfactual thinking was *norm theory* (Kahneman & Miller, 1986), which specified exemplar-based processing of base-rates as the key determinant. Counterfactual generation was described in terms of the momentary activation in memory of exemplars of past similar experiences. Unusual experiences tend to result in "if only" thoughts that recapitulate the normal state of affairs. For example, a motorist involved in an accident during a drive on an atypical route at her typical time of commuting would wish that she had taken her typical route, but another accident victim, driving along his typical route at an atypical commuting time would instead wish that he had driven at the more typical time. Further, mental simulation was also highlighted as a key component: "Mental simulation yields a measure of the propensity of one's model of the situation to generate various outcomes, much as the propensities of a statistical model can be assessed by Monte Carlo techniques" (Kahneman & Tversky, 1982, p. 201; see also Kahneman, 1995; Kahneman & Varey, 1990). More generally, norm theory was situated within the heuristics and biases tradition, portraying counterfactual thinking (framed as a "simulation heuristic") as a form of biased judgment and decision making. Much subsequent research provided evidence compatible with this interpretation of counterfactual thinking as impediment to sound judgment (Gavanski & Wells, 1989; Gleicher et al., 1990; Landman, 1987; Macrae, 1992; Macrae, Milne, & Griffiths, 1993; Miller, Turnbull, & McFarland, 1990; Sherman & McConnell, 1995).

Subsequent theoretical approaches have built on norm theory's specification of lower-level (i.e., exemplar activation) or mental simulation processes. For example, the mental models perspective (Byrne, 1997,2002,2005;Byrne & McEleney, 2000;Feeney & Handley, 2006) has approached counterfactual thinking in terms of the basic building blocks of reasoning and how particular pieces of information are chained together to form inferences. Further, in the time, environment, motivation, personality, and outcome model, the concept of mental simulation was used to integrate counterfactual judgments (which typically focus on the past) with judgments focusing on the present and future (Sanna, Carter, & Small, 2006). In the reflection-evaluation model (REM), processes of assimilation versus contrast were integrated across different kinds of comparative judgment, including counterfactual comparison, temporal comparison, and social comparison (Markman & McMullen, 2003).

The functional perspective on counterfactual thinking, which is the focus of this article, emphasizes top-down than rather than bottom-up processes. In this view, counterfactual thinking may be seen primarily as a useful, beneficial, and utterly necessary component of behavior regulation. Accordingly, counterfactual thoughts are closely connected to goal cognitions, as we elaborate further throughout this article. Counterfactual thoughts are typically activated by a failed goal, and they specify what one might have been done to have achieved that goal (Markman et al., 1993; Roese, Hur, & Pennington, 1999). It is interesting to note that this theory casts norm theory in a somewhat different light: Rather than depicting counterfactual thoughts as a source of bias, counterfactuals are instead seen as mostly beneficial, yet with important dysfunctional exceptions that may emerge under particular conditions. In the next section, we lay out the main details of this functional theory of counterfactual thinking.

THE FUNCTIONAL THEORY: OVERVIEW

The two defining features of a functional interpretation of a psychological process are that (a) the process is activated by a particular deficit or need and (b) the process produces changes that end the deficit or fulfill the need. In the case of counterfactual thinking, if its primary function is problem solving, then counterfactual thinking should be activated by problems, and it should have the effect of evoking behaviors that correct those problems. This proposition is at root a regulatory loop-governing behavior. This regulatory loop is depicted in Figure 1, and it shows several cognitive steps linked within a sequence. The loop is an example of a negative feedback model (Carver & Scheier, 1998;Miller, Galanter, & Pribram, 1960), which operates to preserve homeostasis by increasing activity level (i.e., corrective behavior) when a discrepancy is detected between the current state and an ideal reference state (e.g., body temperature, hunger, or goal progress). In Russell's (2003) theory of core affect, affective experiences are themselves indicators of a discrepancy between current and ideal state, and hence affect often mediates behavior change. When there is a match between the current state and the reference state, corrective activity is terminated. In terms of counterfactual thinking, research has shown that problems activate counterfactual thinking, that counterfactual thinking produces behavior change, and that affect may be one pathway by which such behavior change occurs.

The process begins with a problem, mishap, or other negative experience that falls below a reference value for success or satisfactory performance. Recognition of a problem then activates counterfactual thinking (step 1 in Figure 1). This counterfactual conditional is an inference that links an antecedent to a consequent; in everyday cognition, most typically the antecedent is an action and the consequent is a goal (e.g., "If only I had studied harder, I would have passed"). Counterfactual thoughts themselves have as an inherent property such causal implications, and these directly fuel the activation of corresponding behavioral intentions ("I intend to study harder next time" step 2 in Figure 1), which in turn unleash corresponding

corrective behavior (the student indeed studies harder next time; step 3 in Figure 1). To the extent that such behavior alleviates the original problem, this mechanism is effective in regulating behavior in terms of goal pursuit.

Counterfactuals and Goals: An Illustration

The connection of counterfactual to goals was illuminated in a simple demonstration conducted in our lab. The study was a modified 20-statement task in which undergraduate participants recorded 20 open-ended statements of "whatever comes easily to mind" in response to two kinds of stems (10 statements for each stem): a counterfactual stem ("if," with instructions to focus on "how the past might have been different") versus a causal attribution stem ("because of," with instructions to focus on "how certain events in the past brought about other kinds of events"). Thus, causal statements represented the control condition. After recording the 20 statements, participants were asked to mark a "P" or a "G" or both beside each statement to indicate whether it referred either to a personal action or a goal (defined to participants as "something intended; something someone works toward and wants to achieve"). Personal actions accounted for a greater proportion of counterfactual statements than of causal statements (M = .73 vs. .61), $t(31) = 3.24$, $p = .003$. Further, goals accounted for a greater proportion of counterfactual statements than causal statements to focus on goals (M = .34 vs. . 22), $t(31) = 3.20$, $p = .003$. Of readily available counterfactual thoughts, then, about three quarters focused on personal action and about one third centered on effortful, deliberative goals.

Mechanisms, Old School: Contrast and Causal Inference

The regulatory loop described above was, in previous writings, connected to the second of the following two mechanisms underlying the consequences of counterfactual thinking: contrast effects and causal inference effects (Roese, 1997; Roese & Olson, 1995b, 1997). In Roese's (1997) review, a diverse range of judgmental consequences of counterfactual thinking were interpreted in terms of their reliance on either of these two mechanisms.

Contrast effects occur when a judgment becomes more extreme via the juxtaposition of some anchor or standard (Ostrom & Upshaw, 1968; Sherif & Hovland, 1961; Thibaut & Kelley, 1959). For example, a cup of coffee feels hotter, by contrast, if one has just been eating ice cream. In the same way, a factual outcome may appear worse if a more desirable alternative outcome is salient and better if a less desirable outcome is salient (e.g., Markman & McMullen, 2003; Medvec & Savitsky, 1997; Mellers, Schwartz, Ho, & Ritov, 1997; Roese, 1994). Consider further the instance in which an Olympic bronze medalist realizes that she barely made it onto the medal stand and thus might easily have won no medal at all (Medvec, Madey, & Gilovich, 1995). In this example, the affective contrast resulting from a downward comparison is relatively pleasant (i.e., there is a feeling of "relief" in recognizing that one might have, but did not, experience a negative outcome). Hence, counterfactual thoughts may fulfill a mood repair function, in that people may strategically generate downward counterfactuals so as to feel better (Sanna, Chang, & Meier, 2001; Sanna, Meier, & Turley-Ames, 1998; Sanna, Meier, & Wegner, 2001). Accordingly, the contrast effect mechanism has been connected to an affect regulatory function (Roese & Olson, 1997; Sanna, 2000).

The second mechanism identified by Roese (1997) was that of causal inferences. Causal inference effects occur because a counterfactual conditional may emphasize, dramatize, or illuminate the causal link between an antecedent behavior and a desired outcome. To say that "If I had studied harder, I would have passed" is to underscore the causal impact of studying on grades. By virtue of their conditional structure and implicit reference to a parallel factual statement, counterfactual comparisons to actual sequences of events serve to isolate one particular causal antecedent in terms of its sufficiency to produce a divergent outcome.

Although this partition of mechanisms of counterfactual thinking into either of contrast effects or causal inference effects served a previously useful explanatory role, recent evidence has rendered it somewhat less effective. First, affective assimilation effects, as well as contrast effects, have been demonstrated to follow from counterfactual thoughts (Markman & McMullen, 2003; Markman, McMullen, & Elizaga, 2008; McMullen, 1997; McMullen & Markman, 2000; Summerville & Roese, in press). To the extent that individuals adopt a reflective mental stance and find themselves focusing and vicariously experiencing the details of a counterfactual scenario, they may assimilate toward the emotions contained in it (e.g., the deep anxiety on realizing that the flight you had missed had later crashed, as opposed to elation at the contrast between the factual situation of living and the counterfactual possibility of dying). Second, the impact of counterfactual thinking on performance may sometimes occur via the activation of mind-sets rather than causal inferences (Galinsky & Moskowitz, 2000; Galinsky, Moskowitz, & Skurnik, 2000). For these reasons, we propose a different way of encapsulating the behavioral consequences of counterfactual thinking other than the distinction between contrast effects and causal inference effects, one that better captures the new insights gleaned from recent research.

Mechanisms, New School: Content-Specific Versus Content-Neutral Pathways

We suggest a distinction between content-neutral and content-specific pathways from counterfactual thinking to action. Gollwitzer and Moskowitz (1996) used a similar distinction to describe the more general influence of goals on action, and given that counterfactual inferences are often goal related, this distinction provides a useful way to organize an expanding set of interlocking findings.

The content-specific pathway involves the transfer of information (regarding action that might have been taken) from the counterfactual inference to behavioral intentions, which in turn influence performance of corresponding behavior. The content-specific pathway is what appears in Figure 1. This pathway is content specific in the sense that the particular information contained in the counterfactual (i.e., the lesson learned, or the belief in the causal effectiveness of a particular action) is funneled directly into a behavioral intention and, as a consequence, behavior. In the content-neutral pathway, on the other hand, it is the activation of a more general style of information processing, or motivation to expend greater effort, that results in behavior change (see Figure 2). Contrast effects may fuel behavior change via this pathway, but in addition, so too might assimilation effects, mind-sets, or motivations, all of which operate in a manner that is independent of the specific information contained in the original counterfactual. Below, we review evidence for both pathways. Further, we argue that these pathways may operate either in isolation or interactively. We turn first to the content-specific pathway.

THE CONTENT-SPECIFIC PATHWAY

Step 1: From Problems to Counterfactual Thinking

The regulatory sequence begins with the occurrence (and recognition) of a problem, mishap, or other negative experience that falls below a reference value for success or satisfactory performance. For example, a student might receive a failing grade on an exam, which represents a discrepancy between current performance and the reference standard of success (such as the goal of attaining a grade of B). Recognition of a problem then activates counterfactual thinking (step 1 in Figure 1). For example, the student might think, “If only I had studied harder, I would have passed.” This counterfactual conditional is essentially a causal statement linking the action of studying to the goal of achieving a pass grade.

Various lines of evidence demonstrate that negative (as opposed to positive) outcomes activate counterfactual thinking. For example, in a study of reactions to bets on National Football League games, comments by participants about their losses and wins were coded by judges for counterfactual content; far more counterfactual comments were directed toward losses than toward wins (Gilovich, 1983, Experiment 1). Other evidence has come from manipulations of bogus feedback on laboratory tasks (e.g., anagrams). Counterfactual thinking, assessed using an open-ended thought-listing task, is more frequent following failure than success (Hur, 2001; Roese & Hur, 1997; Roese & Olson, 1997; Sanna & Turley, 1996; Sanna & Turley-Ames, 2000). Moreover, this effect was evident even when the more general activation of cognitive activity by negative outcomes was taken into account (Roese & Hur, 1997).

Negative affect may also influence the activation of counterfactual thinking, for the reason that negative (as opposed to neutral) affect may act as a signal that goal progress is insufficient or problematic, whereas positive affect signals adequate goal progress (i.e., the affect as information perspective; see Schwarz, 1990; Schwarz & Clore, 1983). Moreover, negative affect may act as a general alarm or signaling system, which then heightens a range of cognitive activity (Lieberman, Gaunt, Gilbert, & Trope, 2002; Taylor, 1991). Inductions of negative (relative to neutral or positive) mood states have been found to heighten upward counterfactual thinking in several studies (Sanna, 1998; Sanna et al., 1998; Sanna, Meier, et al., 2001; Sanna, Turley-Ames, & Meier, 1999). Goal cognitions were clearly involved in these affective effects, for two reasons. First, the effects were moderated by individual difference factors that implicate variation in goals, such as optimism versus defensive pessimism (Sanna, 1998) and self-esteem (Sanna et al., 1999). Second, and more telling, direct manipulations of goal states themselves interacted with mood effects, such that negative mood was particularly likely to heighten upward counterfactual thinking when the individual is focused on performance or self-improvement motives (Sanna, Chang, et al., 2001). Thus, two key determinants of the activation of counterfactual thinking are the recognition of a problem (blocked goal) and the negative emotions that accompany that recognition.

In highlighting problems as a key determinant of counterfactual thinking, we emphasize that this determinant influences the mere activation of counterfactual thinking, that is, whether an individual bothers to think “if only” versus merrily moving forward without a backward glance. A different set of determinants, such as norm violation and perceived control, has been shown to dictate the content of counterfactual thinking. These determinants have been reviewed elsewhere (Miller et al., 1990; Roese, 1997; Roese et al., 2005; Roese & Olson, 1995a); for present purposes we focus on the activation stage. To summarize, the first step in the regulatory loop is the activation of counterfactual thinking by problems or negative affect.

Step 2: From Counterfactuals to Intentions

The content-specific pathway involves a particular insight contained in the counterfactual regarding the usefulness of some action, which is then transferred to a corresponding behavioral intention, which then fuels behavior. For example, if the counterfactual is “If only I studied more of the definitions for the anthropology exam, I would have performed better,” then the content-related intention would be “I intend to study more of the definitions for the next anthropology exam.” This direct semantic connection emerges because the specific causal insight contained in the counterfactual (an issue to which we turn below) provides the basis for the formation of a behavioral intention.

The first experimental demonstration of the effect of counterfactuals on intentions was somewhat ambiguous, however. Roese (1994, Experiment 2) manipulated counterfactual thinking by having participants first focus on a recent academic performance that was disappointing, then generate three ways that the performance might have been better (upward counterfactual) versus might have been worse (downward counterfactual); an additional, no-

counterfactual, control condition was also included. The dependent measure was a set of Likert intention ratings. Participants who generated upward counterfactuals reported elevated intentions to perform future success-facilitating behaviors compared with no-counterfactual control participants. Generation of downward counterfactuals had no effect relative to the control participants.[1] Similar between-participant demonstrations of the effect of a counterfactual manipulation on behavioral intentions were presented in the contexts of computer purchasing (Krishnamurthy & Sivaraman, 2002) and smoking cessation (Page & Colby, 2003).

Although the above studies may be taken as evidence of a content-specific pathway, ambiguity remains as to whether the effects involved formation of intentions inspired directly by the content of an upward counterfactual or resulted instead from a motivational push by the negative affect that sprung from that upward counterfactual (via a contrast effect). In the latter case, the motivational push would result in higher Likert ratings on a range of intention judgments, both specific and unrelated to the counterfactual in question. A study by Morris and Moore (2000, Study 1) is similarly ambiguous. These authors examined the near-accident reports filed with the Aviation Safety Reporting System by experienced pilots, then coded these narratives for both counterfactual content and "lessons learned," phrased as explicit statements by pilots regarding "an action that will be taken in the future" (p. 746) that would lessen the risk of another near accident. Upward, self-focused counterfactual statements were correlated with these intention statements, even after controlling for the severity of the original event. Intriguing as these studies were as demonstrations of the usefulness of counterfactual thinking for performance improvement, the ambiguity remains: Are intentions affected by counterfactuals by way of transfer of specific content?

To address this ambiguity, a recent series of experiments provided more direct evidence for the content-specific pathway by which counterfactuals influence behavior. Smallman and Roese (2007) used a sequential priming paradigm to demonstrate that counterfactual thinking facilitates intentions to perform specific contentrelated acts. In each trial, participants made two judgments, the first involving a counterfactual versus control (or baseline) judgment and the second involving a behavioral intention judgment. A methodological challenge was how best to prime the "counterfactualness" of information while leaving constant its informational content. The solution in these studies was to manipulate only the stem but not the main body of an action phrase.

In the prime segment of each trial, participants first saw an event, designed to establish the context (e.g., "spilled food on shirt"). Two seconds later, a stem plus action phrase appeared below, to which participants pressed a key to indicate their agreement or disagreement. In the counterfactual trials, a counterfactual stem was paired with the action phrase (e.g., "might have" + "eaten more carefully"). In the control trials, participants answered a question about the action phrase that was specified by the control stem. Control trials were intended to draw attention to the action phrase without encouraging inferences of a counterfactual nature. In one study, for example, participants answered questions about how many words appeared in the action phrase (e.g., "more than 1," "fewer than 4"). In another study, the stem prompted them to consider the frequency with which the action occurs in daily life, by way of a frequency stem paired with the action phrase (e.g., "common behavior?" + "eaten more carefully"). To achieve generality, several counterfactual stems were used (might have, could have, should have, etc.). Counterfactual versus control stems were interspersed randomly. The target task was a behavioral intention judgment semantically related to the negative event in the prime

[1]The absence of a difference between the downward and the control condition might suggest that those in the control condition spontaneously generated downward counterfactuals. Evidence from other studies (e.g., Hur, 2001; Roese & Hur, 1997) suggests that this was not the case but rather that upward counterfactuals are more likely to be generated spontaneously.

task. On each trial, the stem "In the future I will" appeared at center screen; directly beneath it appeared an action that varied according to the content of the prime task (e.g., "eat more carefully"). Again, participants indicated their agreement with a key press. In addition, a no-prime baseline condition was used, in which intention judgments were made without preceding prime judgments.

Relative both to the control judgment and to baseline, counterfactual judgments produced a significant facilitation in response latency to respond to behavioral intention prompts. This effect was evident across several variations in procedure, including different control judgment tasks. These experiments revealed, not simply that a counterfactual might energize intentions by producing a heightened or stronger belief in a future course of action, but more specifically that the completion of a counterfactual judgment brings to mind information that facilitates the construction of a behavioral intention.

Of course, one could argue that this effect might be motivational, in that for the brief moment in which counterfactual judgments were made, a temporary motivational impulsion energized intentions and would have had the same effect even on intentions not directly related to the counterfactual in question. A further experiment ruled out this possibility that a content-neutral mechanism could be sufficient to explain the facilitation effect. This experiment compared the facilitation effects on behavioral intentions that were matched versus mismatched in semantic content to the counterfactual prime. If a general motivational energization had produced the facilitation effect, that effect would be equivalent in both the match and mismatch cases. However, the facilitation effect was evident only when the counterfactual and intention matched in content, thus ruling out a motivational mechanism as the sole contributor to the facilitating effect of counterfactuals on behavioral intentions. Another experiment further clarified this effect by demonstrating that facilitation occurred on behavioral intention judgments but not on a different, control judgment (focusing on whether the action could be performed singly or required multiple actors), even though the two kinds of judgments were based on the same action content and involved response latencies of similar duration and variability. Overall, this research provided the strongest evidence to date that counterfactual thinking bears a close and special causal link to behavioral intentions.

Step 3: From Behavioral Intentions to Behavior

The next step in the content-specific pathway involves the link from behavioral intentions to behavior. Two kinds of evidence have appeared: indirect evidence demonstrating the effect of intentions on behavior, and direct evidence involving manipulations of counterfactual thinking on behavior as mediated by the content-specific pathway.

Intentions influence behavior—In research inspired by the theory of reasoned action and the theory of planned behavior (Ajzen, 1991; Ajzen & Fishbein, 1980), much research has linked behavioral intentions to behavior. Although much of this evidence is correlational (see Sheeran, 2002, for a review), Webb and Sheeran's (2006) meta-analysis of 47 experimental tests of the impact of behavioral intentions on action revealed a moderately powerful mean effect size (d = .36).

Perhaps most relevant to the functional theory of counterfactual thinking is recent research on implementation intentions (Gollwitzer, 1993,1999;Gollwitzer & Sheeran, 2006). As opposed to goal intentions ("I really would like to be successful in school") or behavioral intentions ("I will study for the chemistry exam"), an implementation intention is more specific, more concrete, and linked to a specific moment of opportunity ("I will study for the chemistry exam next Tuesday evening for 3 hours"). Meta-analyses reveal that implementation intentions exert a stronger impact on behavior than do behavioral intentions (d = .65 vs. .36; see Gollwitzer & Sheeran, 2006; see also Gollwitzer & Brandstätter, 1997;Orbell, Hodgkins, & Sheeran,

1997;Orbell & Sheeran, 2000;Pham & Taylor, 1999;Sheeran, 2002), in part because they involve a stronger link in memory between representations of specific acts and specific opportunities (Sheeran, Webb, & Gollwitzer, 2005). As such, implementation intentions elicit action when the relevant opportunity is encountered, even when cognitive resources are depleted (Brandstätter, Lengfelder, & Gollwitzer, 2001). In line with this research, we predict that the more specific the intention resulting from a counterfactual thought, the more likely the corresponding behavioral consequence. For example, failure on an exam could lead to different intentions. Some individuals might simply conclude that they should spend more time studying (i.e., forming a goal intention), whereas others might make a detailed schedule of their preparations for a specific upcoming exam (i.e., forming an implementation intention). The likelihood of performing the behavior (i.e., studying more) is relatively higher for individuals who formed an implementation intention. To summarize, evidence that intentions (whether defined as behavioral or implementation) influence behavior is substantial.

Counterfactuals influence behavior—Roese (1994, Experiment 3) used an experimental induction of counterfactual thinking (having participants generate and write down task-specific counterfactual thoughts on a piece of paper) positioned between the completion of two block of anagrams. This computer-presented anagram task was multifaceted, involving the acquisition of points through quick solution of each anagram, or rapid termination of the trial (when it appeared too hopeless to solve) so as to avoid penalty. In addition, participants could "buy" clues at a cost to the total score accumulated. The rules of this task were relatively straightforward and involved several decision points and possible strategies toward which counterfactual thoughts could be directed. Inducing participants to generate counterfactuals focusing on the first block of anagrams resulted in significant improvement on the second block of anagrams. Moreover, it was those counterfactuals that were upward (as opposed to downward) and additive (as opposed to subtractive) that facilitated performance. These performance benefits were linked to participants' identification, within their counterfactual statements, of performance-enhancing strategies (such as being quicker to skip past unsolvable anagram trials and buying fewer clues because their cost did not justify their value). Subsequent application of these strategies (recorded by the computer) was indeed associated with performance increases. Thus, when participants generated counterfactuals that focused on the addition of new actions that would have made their past performance better, the participants were more likely to act on them and to reap the ensuing rewards.

Reichert and Slate (2000) replicated that research with high school students, showing that counterfactual direction (upward vs. downward thoughts) influenced performance on an anagram task. The researchers also showed that compared with downward counterfactuals, upward counterfactuals enhanced high school students' performance in a subsequent anagram task. Markman et al. (2008) also used an anagram paradigm and assessed behavior in terms of performance and persistence. These authors found that upward versus downward counterfactuals influenced performance but showed further that counterfactual thinking does so both via shifts in mood (and hence motivation, i.e., an example of a content-neutral pathway) and by way of shifts in "strategic thoughts" (i.e., the extent to which the counterfactuals themselves focused on useful strategies, as coded by independent raters). This latter mechanism involving strategic thought content is, of course, consistent with the idea of a content-specific pathway, although behavioral intentions were not assessed directly.

Further evidence came from Morris and Moore (2000, Study 2a), who created an experiment in which participants attempted to land a virtual aircraft using Microsoft Flight Simulator software running on a desktop computer. A manipulation of counterfactual direction of comparison regarding previous landing attempts resulted in improved landings on subsequent trials. In addition to these experimental demonstrations, several correlational findings are consistent with the interpretation that counterfactuals influence performance. Landman,

Vandewater, Stewart, and Malley (1995) reported that upward counterfactual thinking among a sample of midlife women was associated with envisioning future changes in career, lifestyle, and interpersonal relationships. Nasco and Marsh (1999) tracked college students for a month, measuring their thoughts and reactions to exam scores, and then comparing these to their actual grades a month later. Immediately after receiving grades on a test early in the semester, students were asked to write down any counterfactual thoughts that came to mind. Specifically, they were asked, "Please list any things that might have occurred differently that would have resulted in a different grade on the test." The more that students thought about how their just-completed test might have gone better (counterfactual thinking), the more they took action to improve their situation (changed study habits). These actions corresponded, in turn, to greater feelings of personal control. Finally, personal control corresponded to higher scores on the next test. Thus, several lines of evidence converge to support the proposition that counterfactual thinking influences behavior via a content-specific pathway. Notably, the current literature does not contain any demonstrations involving all three elements (counterfactual manipulation, behavioral intention, behavior) of the content-specific pathway within the same experiment, and so this remains an important objective for future research.

THE CONTENT-NEUTRAL PATHWAY

The content-neutral pathway involves the way information is handled, as opposed to the particulars of the information itself. That is, independent of the meaning contained in a counterfactual thought, the counterfactual may also ignite attentional, cognitive, or motivational processes that themselves alter behavior. To clarify, in the content-specific pathway, apple-thoughts lead to apple-behaviors ("I should have eaten an apple" results in subsequent apple consumption), whereas in the contentneutral pathway, apple-thoughts might lead to orange-behavior (or turnip or squash or guava behavior). Three distinct of content-neutral effects—mind-sets, motivation, and self-inference—have been demonstrated.

The Counterfactual Mind-Set

The term *mind-set*, originally developed within the domain of problem solving (Külpe, 1904), has gained popularity in recent years in counterfactual thinking research (Galinsky et al., 2000; Hirt, Kardes, & Markman, 2004; Kray & Galinsky, 2003). A *counterfactual mind-set* may involve a range of cognitive operations, including attention shifts to specific classes of information and the use of specific inferential strategies. For example, Kray, Galinsky, and Wong (2006) showed that a counterfactual mind-set enhanced performance on tasks involving the assessment of patterns of association but impaired performance on tasks involving generation of novel ideas unrelated to salient association.

Originally, a counterfactual mind-set was thought to have a unitary effect in terms of eliciting a tendency to consider a wider range of alternatives to a given problem (e.g., Galinsky & Moskowitz, 2000; Kray et al., 2006). Markman, Lindberg, Kray, and Galinsky (2007) demonstrated, however, that there are at least two counterfactual mind-sets that evoke different consequences. These authors argued that in the earlier studies, a particular subtype of counterfactual thinking (subtractive, focusing on the mental deletion of elements that were indeed present in actuality; see Table 1) was mainly responsible for the observed effects. By manipulating the counterfactual mind-set prime to emphasize either subtractive or additive counterfactuals (which focus on the mental addition of elements not present in actuality), they found that the subtractive mind-set enhances analytical and problem-solving tasks, whereas the additive mind-set enhances performance in creative idea generation tasks.

Motivation

Motivational effects are another example of the content-neutral pathway. At the most basic level, the negative affect born of upward counterfactual comparisons may motivate behavior change (Markman & McMullen, 2003; Markman, McMullen, Elizaga, & Mizoguchi, 2006; McMullen & Markman, 2000). In Markman, McMullen, et al.'s (2008) experiment involving performance on an anagram task, participants' improvement as a result of an induction of counterfactual thinking was partly accounted for by shifts in affect. Thus, the negative affect stemming either from a contrast effect in upward counterfactual thinking ("I feel bad because I could have done better) or from an assimilation effect in downward counterfactual thinking ("I feel bad when I focus on how I might have done worse") motivated participants to try harder on a subsequent anagram task.

Counterfactual thinking may also influence the strategic mode of information processing, with much of this evidence framed in terms of regulatory focus theory (Higgins, 1997). According to this theory, a strategic focus on promotion versus prevention concerns (i.e., focus on ideals and aspirations vs. security and responsibilities) influences attention, interpretation, and memory for subsequently encountered information. Additive counterfactuals tend to activate a promotion focus, whereas subtractive counterfactuals tend to activate a prevention focus (Pennington & Roese, 2003; Roese et al., 1999; Roese, Pennington, et al., 2006). Because regulatory focus influences task performance (e.g., Förster, Higgins, & Idson, 1998), effects of counterfactual thinking on performance may be mediated by shifts in regulatory focus. Markman et al. (2006) demonstrated the operation of "value from fit" effects (Higgins, 2005, 2006), in that upward versus down-ward counterfactual thinking produces greater or lesser task persistence depending on their fit with situationally activated promotion versus prevention focus. Also, if the promotion focus prompted by additive counterfactuals elicits a more global processing style, whereas the prevention focus associated with subtractive counterfactuals elicits a more local processing style, then further differentiation in performance effects might occur (Förster, Friedman, Özelsel, & Denzler, 2006; Förster & Higgins, 2005; Sassenberg & Moskowitz, 2005).

Self-Inference

Higher-order self-inference effects represent the third example of the content-neutral pathway. Counterfactual thoughts, by pointing out specific actions that might have averted a problem, might result in broader self-inferences of efficacy, mastery, and overconfidence (Roese, 1999). For example, a manager might decide that she should have fired a problematic employee. If she had fired that person, a better outcome might have been realized. This counterfactual illuminates the causal potency of the act of firing, but it also reifies the power that the manager feels she has at her disposal. As a result, she may come to feel that she is in control, knows what is happening, and is effectively able to confront future problems. Several studies have shown that counterfactual thinking influences perceived control (McMullen, Markman, & Gavanski, 1995; Nasco & Marsh, 1999; Tetlock, 1998). Nasco and Marsh (1999) showed that participants who generated upward counterfactuals after a test situation had a higher degree of subjective control, and there was also a positive correlation between the degree of counterfactual thinking and future test performance. Similarly, counterfactual thinking can increase hindsight bias, a form of retrospective overconfidence (Roese, 2004; Roese & Maniar, 1997; Roese & Olson, 1996; Sanna, Schwarz, & Stocker, 2002), although this effect has yet to be connected to behavioral effects.

To summarize, the content-neutral pathway counterfactuals may influence behavior independently of any semantic content of the respective counterfactual. Key evidence takes the form of effects on judgments within domains entirely removed from the domain for which

the counterfactual was originally generated. Three distinct examples of content-neutral effects —mind-sets, motivation, and self-inference—have each been demonstrated in recent research.

THEORETICAL CLARIFICATIONS

Causal Inference

Regarding the content-specific pathway, the conceptual glue that binds together the counterfactual and the behavioral intention is a causal inference. That is, a causal insight about the power of a particular action to bring about a particular desired end transfers from the counterfactual to the intention, giving meaning in terms of "why" the action in question might be a good thing to do. To say that one might have gotten a better grade by studying harder (a counterfactual) is to say that studying causes better grades. Whether phrased as a counterfactual (e.g., "should have studied harder") or an intention (e.g., "I will study harder next time"), the causal meaning remains the same, and indeed is the same as in a generic explanation of a known outcome (e.g., "Sheila got a good grade because she studied hard").

Numerous experiments have manipulated counterfactual thinking and measured shifts in causal reasoning, either in terms of indirect manipulation of counterfactual salience (e.g., Branscombe & Weir, 1992; Burrus & Roese, 2006; Creyer & Gurhan, 1997; Macrae, 1992; Macrae et al., 1993; Nario-Redmond & Branscombe, 1996; Roese & Maniar, 1997; Wells & Gavanski, 1989) or in terms of more direct presence versus absence of explicit counterfactual information (e.g., Branscombe, Owen, Garstka, & Coleman, 1996; German, 1999; Goldinger, Kleider, Azuma, & Beike, 2003; Harris, German, & Mills, 1996; Mandel & Dahmi, 2005; Roese & Olson, 1996; Wells & Gavanski, 1989). Although there has been debate about the precise connection of counterfactuals to causal inference (Mandel, 2003; N'gbala & Branscombe, 1995; Spellman, 1997; Spellman, Kincannon, & Stose, 2005; Spellman & Mandel, 1999), we suggest the simple conclusion that causal insight is a property or characteristic of counterfactual thinking. That is, to the extent that a counterfactual takes the form of a conditional proposition (i.e., an "if-then" statement), its very essence embodies a causal proposition.

Accuracy

For the content-specific pathway to operate, the insights obtained from a counterfactual must be functional. If a plane crash was in fact due to pilot error, for example, yet accident investigators later conclude that the crash was due to an aircraft design flaw, then this inaccuracy in causal ascription will result in some very dysfunctional consequences. Time and money would be wasted in addressing the wrong cause of the accident while neglecting a remedy for the true cause. In grappling with the issue of accuracy in social judgment more generally (e.g., Kruglanski, 1989; Swann, 1984), a pragmatic conception of accuracy has proven useful. The criterion to measure accuracy in this line of thinking would be whether a judgment matches real-life demands. Similarly, we would define functionality of a counterfactual as accurate in terms of real-world implications. However, abundant research has shown that spontaneous human reasoning can be flawed in many ways (e.g., Gilovich, Griffin, & Kahneman, 2002). Yet it has also been shown that on careful consideration of the available information, individuals oftentimes arrive at surprisingly accurate conclusions (Försterling, 1994; Kruglanski & Freund, 1983). Moreover, being motivated to form an accurate judgment (as would be the case in an aircraft accident investigation) tends to increase accuracy (Kunda, 1990). Consistent with a dual process framework, we assume that the degree to which counterfactual inferences are accurate depends to a large extent on an individual's accuracy motivation, as well as on the individual's information processing capacity (see Kahneman, 1995; Sherman & McConnell, 1995). However, when it comes to spontaneous counterfactuals, a number of mechanisms connected to goal-directed cognition may also enhance their accuracy.

Causal inferences may be rapid and spontaneous (Hassin, Bargh, & Uleman, 2002) and are especially pervasive following unexpected outcomes (Clary & Tesser, 1983; Kanazawa, 1992; Kunda, Miller, & Claire, 1990). For counterfactuals to benefit behavior automatically, correction processes must therefore be similarly automatic. Initially, however, several counterfactual thoughts might be spontaneously generated, with varying degrees of plausibility. We suggest that an implicit filtering mechanism results in the inhibition of all but the most plausible. Such a mechanism has already been discussed with regard to visual recognition (Peterson, 1994), verbal comprehension (Gernsbacher & Faust, 1991; Swinney, 1979; Twilley & Dixon, 2000), and stereotyping (Bodenhausen & Macrae, 1998). That is, the presentation of a stimulus (an object, a word, or a person), particularly if ambiguous, may result in the parallel activation of multiple possible meanings (e.g., several different identifications of the object, such as bird versus bat; multiple meanings generated on hearing the word *bat*, such as flying mammal versus wooden stick; or multiple group-level categorizations of a person, for example as a woman vs. as a librarian). In each of these examples, the less plausible interpretations are inhibited within hundreds of milliseconds, leaving behind a few, or just one, interpretation to go on to influence subsequent judgment. Moreover, philosophical essays on the logical basis of conditional reasoning have offered the same insight (e.g., Evans & Over, 2004; Johnson-Laird & Byrne, 2002). On the basis of a thought experiment by Ramsey (1990), it has been argued that people test the subjective probability of a conditional based on a relatively simple procedure. The antecedent is temporarily assumed to be valid. Then, if the resulting cause-consequence relation can be easily imagined to hold, a high probability is assigned. If not, then the conditional is evaluated as relatively improbable. In other words, if the assumed relation between cause and effect constitutes an obvious mismatch with the individual's understanding of reality, the relation is tagged as invalid. Over, Hadjichristidis, Evans, Handley, and Sloman (2007) provided evidence for similar underlying mechanisms between the processing of causal conditionals, probability judgments, and counterfactual thinking. Their results suggest that the Ramsey test might indeed be an important aspect of the basic cognitive mechanisms behind counterfactual thinking. Therefore, we suggest that if multiple counterfactuals are generated after failure experiences, only the most plausible and realistic (with regard to their match to pragmatic knowledge of the world) remain to guide further behavior (cf. Evans & Over, 2004; Kahneman & Miller, 1986; Over & Evans, 2003; Seelau, Seelau, Wells, & Windschitl, 1995). Direct evidence for these rapid probability estimations and logic-testing procedures remains, however, for future research to uncover.

In addition, three mechanisms identified in other lines of research may help further to increase the causal accuracy of counterfactual thoughts. First, counterfactuals that focus on actions that are not feasible or aim toward situations that are no longer open to modification tend to be suppressed via dissonance reduction (cf. Gilbert & Ebert, 2002; Gilovich, Medvec, & Chen, 1995; Roese & Summerville, 2005). Second, goal-related constructs that are higher in accessibility tend to facilitate goal pursuit while at the same time blocking pursuit of competing goals (i.e., goal shielding; see Brendl, Markman, & Messner, 2003; Shah, Friedman, & Kruglanski, 2002). Third, after completion of the goal, goal concepts in memory tend to be deactivated or reduced in accessibility (Förster, Liberman, & Higgins, 2005; Zeigarnik, 1927). These three mechanisms (dissonance reduction, goal shielding, and the Zeigarnik effect) operate automatically to clear away some of the less insightful goal-related counterfactual thoughts.

Even so, these various accuracy-enhancing mechanisms are far from perfect. Many inaccurate or uninsightful counterfactuals may still survive to the point of feeding into ongoing behavior. Some may be distorted in a self-serving direction (Roese & Olson, 1993a); others may be plain wrong (Sherman & McConnell, 1995). Indeed, some dysfunctional counterfactuals become the fodder for rumination, as when a car accident victim focuses relentlessly on how she might have avoided the accident, even though to an outside observer the accident was attributable

entirely to the other driver, who was drunk at the time (cf. Davis, Lehman, Wortman, Silver, & Thompson, 1995). Such self-blame-engendering counterfactuals may exacerbate negative affect, become a risk factor for depression, and yet bring no benefit in terms of behavior regulation (Lecci, Okun, & Karoly, 1994; Markman & Miller, 2006; Oettingen, Pak, & Schnetter, 2001; Sanna et al., 2003, 2006).

The state of the literature does not permit a clear statement as to the mean accuracy of the average counterfactual thought. Some are accurate and useful; some are not. Effort and ability increase accuracy. And even at the implicit, automatic level, several mechanisms operate to increase accuracy. More generally, this perspective emphasizes that two distinct pathways (content specific vs. content neutral) underlie the connection between counterfactual thinking and behavior. The issue of counterfactual accuracy is important only for the content-specific mechanism. For the content-neutral mechanism, accuracy is irrelevant because those effects emerge independently of the particular information contained in the counterfactual, be it accurate or absurd. Thus, taking this broader view, it becomes clear that one of the main reasons for the general usefulness of counterfactual thinking is that it can produce performance benefits in two ways, only one of which hinges on causal accuracy.

Kinds of Counterfactuals: Structure Fits Function

Not all counterfactual thinking is useful for behavior regulation, and several typologies help further to specify which kinds of counterfactuals are best suited for this role. Three main distinctions are summarized below (see Table 1).

Direction of comparison—This distinction (between upward vs. downward comparisons) was borrowed from earlier writings on social comparison theory (e.g., Brickman & Bulman, 1977; Wills, 1981). It boils down to an emphasis on improvement versus preservation of the status quo. Whereas an upward counterfactual can tell you how to get ahead, a downward counterfactual can tell you only how to keep things from getting worse. Within the content-specific pathway, upward comparisons are generally more useful for behavior regulation than are downward comparisons, in that the specific insights in an upward comparison center more closely on new action and new strategies than do those of downward comparisons. Within the content-neutral pathway, both upward and downward counterfactuals may be useful. For example, upward and downward counterfactuals may arouse a counterfactual mind-set to the same extent (Galinsky & Moskowitz, 2000). Further, upward and downward counterfactuals may each exert affective motivational effects (Markman et al., 2008; McMullen & Markman, 2000).

Structure—This distinction boils down to whether the counterfactual is constructed by adding versus removing elements that were in fact present in actuality. An additive counterfactual (akin to a regret of inaction) focuses on doing something that was not, in fact, done (e.g., “If only I had gone to dental school”). A subtractive counterfactual (akin to regret of action) focuses on the deletion of something that was done (e.g., “If only I hadn’t gone to graduate school”). Sometimes, this distinction is not informative, as when a choice is between only two options (e.g., picking heads or tails at the start of a sports match). In such cases, picking heads implies not picking tails, and vice versa. More often, however, choices embrace a multitude of options (e.g., selecting a meal from among a dozen menu options), and then the additive counterfactual becomes more specific than the subtractive. The subtractive counterfactual removes one choice from consideration (“I shouldn’t have ordered the fish”), leaving unstated the specific option that should be chosen. For this reason, additive counterfactual thinking often involves more creativity, more consideration of novel options (Gilovich & Medvec, 1995; Markman et al., 2007; Roese & Olson, 1995b). With regard to behavior regulation, greater clarity, specificity, and creativity may bring relatively greater performance improvements.

Subtractive counterfactuals usually involve negated information ("If only I had not started smoking") whereas additive counterfactuals do not (they specify affirmation, which is accomplished grammatically by the absence a marker of negation, as in "If only I had started exercising"). Recent findings indicate that although negations are easily understood when information is processed explicitly, the meaning of negations may be lost when the same information is processed implicitly (DeCoster, Banner, Smith, & Semin, 2006; Deutsch, Gawronski, & Strack, 2006; Kaup & Zwaan, 2003). For example, the statement "Ben was not happy," when processed implicitly by way of lower-level associative pattern activation, might involve the loss of the "not" marker, resulting in a different inference ("Ben was happy"). The processing of negated information seems to require more controlled mental operations, and so it may be the case that subtractive (relative to additive) counterfactuals offer a lower potential to elicit automatic behavioral intentions. We hope that future research tests this idea.

The ideas described above center on the content-specific pathway. As we have already noted, the additive versus subtractive distinction has also proven useful as a way to differentiate counterfactual mind-sets (Markman et al., 2007). The finding that additive counterfactuals bring greater improvements than downward counterfactuals on an anagram task (Roese, 1994) could be interpreted as evidence for either pathway. Thus, the additive-subtractive distinction has proven informative in understanding the functional benefits of counterfactual thinking.

Self versus other—This distinction is simply between a focus on one's own actions as opposed to the actions of others. When it comes to regret, self-focus is a basic, defining feature (i.e., many articles define regret in terms of an emotion stemming from one's own decision or action). Counterfactual thoughts may focus on self or other, and it is straightforward that self-focused thoughts are more useful for self-improvement than are other-focused counterfactuals. Although one may learn from the mistakes of others, insights that are self-directed are by definition more specific in their focus on personal improvement.

In looking across the three distinctions described above, it is interesting to note that those counterfactuals most useful for behavior regulation are indeed the ones that are most frequent in everyday life (Roese et al., 2005). Upward counterfactuals are more common than downward counterfactuals (Nasco & Marsh, 1999; Roese & Hur, 1997; Roese & Olson, 1997), additive are more frequent than subtractive counterfactuals (Gilovich & Medvec, 1995; Roese et al., 1999; Roese & Olson, 1993a, 1993b), and self-focused are more common than other-focused (Davis et al., 1995; White & Roese, 2007). True, many situational moderators of these main effects have been established (e.g., Gilovich & Medvec, 1995; Roese et al., 1999; White & Lehman, 2005; Zeelenberg, van den Bos, van Dijk, & Pieters, 2002), but the mere existence of these three main effects represents a very basic indication of the value of the functional theory of counterfactual thinking, in the sense that these main effects are not readily explained by norm theory or by mental models theory.

A recent investigation using the experience sampling approach has provided the clearest picture to date of the relative frequency of these different kinds of counterfactuals across a variety of life circumstances (Summerville & Roese, in press). Participants carried a small palmtop computer for a period of 2 weeks, during which it beeped at random intervals to solicit participants' descriptions of their current thoughts. Counterfactuals were more likely to be upward than downward (measured on a continuous scale), and self-focused counterfactuals outnumbered other-focused counterfactuals by more than 2:1 (the addition vs. subtraction distinction was not assessed in this study). White and Roese (2007) used laboratory tasks to discover no self-other differences in downward counterfactual thinking but greater upward counterfactual thinking aimed at the self than at others. Although self-reported improvement motives were found to account for much of upward counterfacsstual thinking, counterfactual

thinking was tempered by impression management concerns related to the desire to avoid making callous ascriptions of blame to another person. For example, in one study participants played a lab version of Texas hold'em poker, with counterfactual comments recorded during gameplay. Although impression management concerns moderated the results, upward outnumbered downward counterfactuals overall, and self-focused outnumbered other-focused counterfactuals. These studies provide further evidence that the types of counterfactual thoughts in daily life tend to be ideally suited to meeting the needs of behavior regulation.

Interactions Between the Two Pathways

The consideration of two main pathways by which counterfactuals might influence behavior suggests a novel consideration, thus far unaddressed in the literature: What interactive effects appear when the two pathways merge? By highlighting the similarities to related models, we may derive some new suggestions and hypotheses.

The most basic assumption is that the compatibility between the two pathways should strengthen the link between a counterfactual thought and a specific behavior. Recently, Strack and Deutsch (2004) have shown that psychological compatibility is a fundamental principle that can account for a variety of phenomena, especially the links between affect, motivational state, and behavior. Similarly, research on regulatory focus theory has shown the benefits of compatibility between motivational orientation and the type of goal individuals pursue (i.e., "value from fit"; see Higgins, 2005; Higgins & Spiegel, 2004; Shah, Higgins, & Friedman, 1998). Extrapolating these findings to this discussion, we propose that when the components of the two pathways can benefit from each other, and when more components are activated, the stronger the resulting connection between counterfactual thoughts and behavior.

To illustrate, we break this general hypothesis down into more specific assumptions. First, a counterfactual mind-set should strengthen each of the links between the components of the content-specific pathway: Counterfactual thoughts should occur more frequently and they should also be more likely to result in respective behavior. For example, having recently had a number of counterfactual thoughts (i.e., being in a counterfactual mind-set) about one's own achievement in college may increase the likelihood that, on the occasion of a new mishap concerning interactions with friends, an individual will try to solve this friendship-related trouble. Thus, a mind-set produced by counterfactual thought in a different domain may facilitate the link from the identification of a problem to the action that solves it. On the other hand, an activation of the content-specific pathway can also result in the activation of content-neutral mechanisms, such as a counterfactual mind-set or an increase in subjective control. To illustrate, regrets about a specific underachievement in college and the resulting intention to fix this situation may also activate a counterfactual mind-set, which has certain consequences for other domains of life (e.g., creativity; Markman et al., 2007). However, these speculations await empirical confirmation.

The Opportunity Principle: Master Moderator

Counterfactual thinking may influence behavior for the better, which is to say that counterfactual thinking may contribute to behavior regulation. Nevertheless, counterfactual thinking may also serve another function, namely, affect regulation. Sometimes, people focus strategically on downward possibilities so as to generate positive emotional experiences ("Look on the bright side, at least you weren't killed!"; see Feeney, Gardiner, Johnston, Jones, & McEvoy, 2005; Roese, 1994; Sanna, 2000; Sanna, Chang, et al., 2001; Sanna et al., 2006; Sanna, Meier, et al., 2001). Although research initially presumed that it was mainly downward counterfactuals (which bring positive affect via a contrast effect) that could be used for affect regulation, more recent research suggests that upward counterfactuals may also bring positive affect, by way of an assimilation effect (Markman et al., 2008). A key question is, under what

conditions might people be more likely to gear their counterfactual thinking toward behavior regulation than affect regulation?

The mere perception of opportunity is a good candidate for master moderator. A strikingly diverse set of findings converges on the conclusion that when opportunities exist for further action, behavior regulation becomes the dominant response. Direct confrontation of the problem at hand results. Upward counterfactual thinking, along with the experience of regret, is heightened, and these are directly tied to behavior control. By contrast, when opportunity is denied, or where problematic circumstances are inevitable, affect regulation becomes the dominant response. Ways are sought to feel better rather than fix the problem at hand. Downward counterfactual thinking may be more likely in this case, but so too will a range of cognitive reconstruals, from cognitive dissonance reduction to self-serving biases. The opportunity principle thus reflects the surprising notion that regrets are more intense when opportunities remain open for future action (Roese & Olson, 2007; Roese & Summerville, 2005). Opportunities that are closed result in greater satisfaction, at least once the mechanisms of affect regulation have done their job (Gilbert & Ebert, 2002).

The moderating role of opportunity has been demonstrated in a variety of settings. Using a manipulation of event repeatability, Markman et al. (1993) found that upward counterfactual thinking was greater when participants, playing computerized blackjack in the lab, had the opportunity to play another round. Roese and Olson (1995c) found that upward counterfactual thinking was greater when participants perceived greater personal control over the task at hand. Tykocinski and Steinberg (2005) found that participants suppressed counterfactuals about how a better outcome might have been achieved when the situation was uncontrollable rather than controllable. Further, when a decision can not be changed (as when a shirt may not be returned for a refund), satisfaction is greater (reflecting active processes of affect regulation) than when the decision *can* be changed (Gilbert & Ebert, 2002). A less obvious example centers on the number of options in a choice situation. Iyengar and Lepper (2000) found that a wider range of choices (e.g., 24 different flavors of jam) resulted in lower satisfaction than when choices were fewer (e.g., 6 flavors). Study 3 of that article included a measure of regret, which showed that greater perceived opportunity (born of wider choice options) evoked more regret (see also Schwartz, 2000).

To summarize, perceived opportunity appears to be the master moderator that shifts between mechanisms of behavior regulation and affect regulation. High opportunity triggers behavior regulation, whereas low opportunity triggers affect regulation. Thus, upward counterfactual thinking (and regret) that is associated with behavior control is more likely when perceived opportunity, or control, or efficacy—in short, the mere assumption possibility—remains high.

COUNTERFACTUALS AND THE ORBITOFRONTAL CORTEX

Neuroanatomical evidence has accumulated to reveal the correspondence between counterfactual thinking and activity in the prefrontal cortex generally, and more specifically the orbitofrontal cortex. This evidence is intriguing, as earlier research has established the general functional significance of the orbitofrontal region with regard to executive control (Miller & Cohen, 2001) and the integration of emotion with cognitions relating to deciding and planning (Bechara, Damasio, & Damasio, 2000; Beer, Knight, & D'Esposito, 2006; Lengfelder & Gollwitzer, 2001). Two types of evidence may establish functional dependence on specific anatomical structures: imaging studies that reveal which structures are activated by particular activities and lesion studies that reveal which activities deteriorate if a particular structure is damaged.

In terms of imaging, Ursu and Carter (2005) examined differential brain activation using functional MRI during a decision task that involved rewards and penalties. They found that

the orbitofrontal region was activated by trials involving missed opportunities, as when a reward was expected but not obtained. Mere valence of the outcome was not sufficient to explain the pattern of activation. Rather, it was participants' comparison between their actual versus imagined outcome that dictated orbitofrontal activation. Coricelli et al. (2005) linked the emotion of regret to the orbitofrontal region. In this study, participants made choices between two gambles, and regret was elicited via feedback regarding positive outcomes of the nonchosen gamble. Regret co-occurred with medial orbitofrontal activation and with activation of the anterior cingulate cortex and the hippocampus. This pattern of activation accumulated over the course of the experiment, along with participants' increasing tendency to become regret averse. It is important to note that similar activation patterns were evident for regret experienced following bad choices and for anticipated regret.

In terms of lesion, Gomez-Beldarrain, Garcia-Monco, Astigarraga, Gonzalez, and Grafman (2005) found that individuals with prefrontal cortex damage were less likely than control participants to produce spontaneous counterfactual reflections. Another study was more specific in its localization to the orbitofrontal region. Camille et al. (2004) compared patients with orbitofrontal lesions with healthy participants performing a gambling task. Healthy participants reported regret consistent with the activation of counterfactual thinking following gambling losses. Participants with orbitofrontal lesions, however, reported no regret and also failed to anticipate the possible negative consequences of their choices.

Taken together, these imaging and lesion studies indicate that the orbitofrontal cortex plays an important role in the generation of counterfactual thoughts. More specifically, its role seems to involve the integration of affect in the course of successful decision making (cf. Beer et al., 2006). Cognitive neuroscience evidence is thus rapidly accumulating that is consistent with the functional basis of counterfactual thinking. We hope that this summary may guide future studies in cognitive neuroscience as well as in basic social cognition.

IMPLICATIONS FOR MENTAL HEALTH

Counterfactual thinking has been implicated in mental health in two ways: an excess of and a deficit in counterfactual thinking have distinctly different consequences for mental health. The functional theory provides an overarching perspective that illuminates the various demonstrations that have appeared in the literature in recent years. The content-specific pathway in Figure 1 is particularly useful in this regard, in that it constitutes the default process that operates within most healthy people most of the time. If the principal consequences of (upward) counterfactual thinking are problem-solving insights and negative affect (stemming from the contrast between factuality and a better alternative), then excessive counterfactual thinking may be associated with excessive problem-focused cognitions (e.g., worry, anxiety) and excessive negative affect (e.g., dysphoria, depression). By contrast, a deficit of counterfactual thinking would be associated with a deficit of problem-focused cognition (e.g., underachievement, work difficulty, social dysfunction), along with an absence of negative affect. Along these latter lines, schizophrenia has been shown to be associated with impaired counterfactual thinking.

Generally speaking, more intense upward counterfactual thinking, and also regret, correspond to greater distress (Davis et al., 1995; Gilbar & Hevroni, 2007; Lecci et al., 1994; Wrosch, Bauer, Miller, & Lupien, 2007). Indeed, several laboratory studies have revealed a correspondence between depression and an excess of counterfactual thinking. In a mock job interview task, Monroe, Skowronski, MacDonald, and Wood (2005) found that people with mild depression reported more regret after receiving new information about a candidate that "should have been hired" than did nondepressed people, and this effect was independent of the personal relevance of the decision and also the objective differences between the job

candidates. Although Markman and Miller (2006) did not find a difference in overall frequency of counterfactual thinking as a function of severity of depressive symptoms, they did discover that with more severe depression, people generated counterfactuals that were less reasonable and hence less useful for managing ongoing behavior. The severely depressed were thus "firing blanks," in the sense that they focused on counterfactuals that were robbed of their functional character yet were still affectively unpleasant (see also Markman & Weary, 1996, 1998).

Anxiety disorders can involve a considerable amount of rumination (e.g., Nolen-Hoeksema, 2000). In a study of social anxiety, Kocovski, Endler, Rector, and Flett (2005) showed that compared with a control group, people with social phobia showed an increased amount of ruminative coping after exposure to fictitious social situations. Participants high in social anxiety were more likely to report upward counterfactual thoughts than were low-social-anxiety participants. Participants with social anxiety seem to be highly concerned about potential past failures and inadequate behavior in social situations (Rachman, Gruter-Andrew, & Shafran, 2000), resulting in both greater rumination and greater upward counterfactual thinking.

These findings raise the general question of the relation between rumination and counterfactual thinking. Much past research has established an association between rumination on one hand and depression and anxiety on the other (e.g., Cox, Enns, & Taylor, 2001; Nolen-Hoeksema, 2000; Nolen-Hoeksema & Davis, 1999; Segerstrom, Tsao, Alden, & Craske, 2000). Thus, it is possible that the link between counterfactual thinking and depression or anxiety might be explained entirely in terms of rumination. However, measures of rumination can contain aspects of regret (e.g., "I think about a recent situation, wishing it had gone better"), leaving unanswered the question of whether an excess of counterfactual thinking is related to depression independent of rumination.

In a recent survey of adult Americans (Roese et al., 2008), we measured both regret and rumination, defining the latter as mere repetitive thought, irrespective of thought content (which may be either positive or negative in valence; Segerstrom et al., 2000; Segerstrom, Stanton, Alden, & Shortridge, 2003). An excess of counterfactual thinking better predicted depression and anxiety than did an excess of rumination. Further, the interaction between tendency to think counterfactually and rumination (as when people obsess repetitively over things they might have done differently) was strongly predictive of depression (but not anxiety), over and above the unique contributions made by these two factors in isolation. Thus, counterfactual thinking is conceptually separable from rumination in terms of its connection to mental health outcomes, but ruminative counterfactual thinking is a particularly strong risk factor for depressive symptoms. Overall, the above studies are consistent with the conception that an excess of counterfactual thinking connects to mental disorders by way of an excess of its two main properties: problem-focused cognition (anxiety) and negative affect (depression).

Turning to the question of a deficit of counterfactual thinking, damage to the prefrontal cortex has long been associated with impairment in decision making, planning, and behavior control. In the previous section, we discussed new evidence suggesting that the connection of counterfactual thinking to behavior relies in an important way on neural circuitry within the orbitofrontal cortex (Gomez-Beldarrain et al., 2005; Camille et al., 2004; Coricelli et al., 2005; Ursu & Carter, 2005). Of mental disorders linked to frontal lobe damage, schizophrenia represents a particularly profound disorder of mind and behavior, involving incoherent reasoning, arbitrarily connected thoughts, and diminished self-insight (Amador et al., 1994; Fusar-Poli et al., 2007; Goldman-Rakic & Selemon, 1997; Shad, Tammingaa, Culluma, Haasa, & Keshavana, 2006). Moreover, affective experience is also disrupted and may involve either inappropriate or even completely absent emotional reactions to everyday life events. As a

result, behavior regulation is deeply disturbed: People with schizophrenia have difficulty maintaining close relationships and holding onto jobs (Yager & Ehmann, 2006).

Hooker, Roese, and Park (2000) found that counterfactual thinking was impaired in people with schizophrenia and that this impairment corresponded to social dysfunction. Thus, it may be that a deficit of counterfactual thinking in particular, and in goal-regulatory cognitions more generally, corresponds to the impairment in social functioning observed in people with schizophrenia. Using the functional framework presented in this article, the link between impaired counterfactual thinking and social dysfunction among schizophrenia sufferers might be due to breakdowns in any of the three causal links depicted in Figure 1. Hooker et al. demonstrated that step 1 (problems activate counterfactuals) is broken, but Brandstätter et al. (2001, Study 2) demonstrated that step 3 (intentions activate behaviors) remains intact among people with schizophrenia. Roese, Park, Smallman, and Gibson (in press) used the same sequential priming paradigm as used by Smallman and Roese (2007) to assess step 2 (counterfactuals activate intentions) among people with schizophrenia, compared with case-matched control participants (which were equated for variation in cognitive ability). This research revealed that the link between counterfactuals and intentions is indeed broken for people with schizophrenia. If this link had been intact, the finding might have suggested the straightforward efficacy of a counterfactual therapy designed to increase counterfactual thoughts oriented toward everyday social interactions. Unfortunately, these results indicated instead that such an intervention would be futile. If counterfactual thoughts do not influence intentions, performance improvement is unlikely to result.

In this section, we summarized the applicability of the functional theory to understanding the connections between counterfactual thinking and mental health. By contrasting disorders rooted in either excess or deficit, we have shown how counterfactual thinking may be related to depression (excess), anxiety (excess), and schizophrenia (deficit). We now turn to some more general implications of the functional theory of counterfactual thinking.

IMPLICATIONS FOR COGNITION

Comparative Thinking

The functional theory of counterfactual thinking is rooted in processes of comparative judgment. A counterfactual is at root a comparison between an actual outcome and a fictive alternative. Comparison processes have been a core element of social psychological thinking for many years (e.g., Festinger, 1954; Mussweiler, 2003; Thibaut & Kelley, 1959). In their REM, for example, Markman and McMullen (2003) discussed the comparative process of counterfactual thinking in an integrative manner, pointing out the similarities to social comparison and temporal comparison. Speaking to different kinds of comparison (counterfactual, social, temporal), these authors differentiated between two processing modes, reflection and evaluation. The reflection process is experiential in the sense that a quasi-realistic simulation of a possible alternative may be considered momentarily as if it were true (e.g., nervously visualizing a car accident that nearly happened but was averted with inches to spare). The evaluation process, on the other hand, involves the use of an alternative outcome as a standard of comparison against which current performance may be gauged. In more basic terms, reflection involves assimilation effects, whereas evaluation involves contrast effects. When combined with direction of comparison, the REM posits unique interactive effects (for both affect and behavior) within the 2 × 2 combination of reflection versus evaluation and upward versus downward. Positive affect (and the motives associated with it) results from upward reflection and downward evaluation, whereas negative affect (along with its associated motives) results from upward evaluation and down-ward reflection. Assimilation versus contrast is an important distinction also within the inclusion-exclusion conception (Schwarz

& Bless, 1992), the interpretation-comparison model (Stapel & Koomen, 2000), and the selective accessibility model (Mussweiler, 2003).

Our summary of the functional theory of counterfactual thinking is fully compatible with the REM for the simple reason that the REM is itself a functional theory.

The REM offers a detailed specification of comparison processes, whereas our goal in this article is to summarize a broad umbrella that makes reference not only to recent research on the behavioral benefits of counterfactual thinking but also to recent insights from the goal cognition literature, to which we turn next.

Goal Theories

We have positioned counterfactual thinking as an instance of goal-focused cognition; hence, we turn next to a consideration of how the functional theory connects to other theories of goals. Moskowitz, Li, and Kirk (2004) summarized a broad range of findings under their implicit volition model. They proposed that goals are knowledge structures that can be situationally activated, most often when a discrepancy is noted between the current state and the goal state. Their explication of the reglatory loop embodied by goal cognition (cf. Carver & Scheier, 1998; Higgins, 1998; Lewin, 1935; Miller et al., 1960) is precisely the same conception we have used with regard to the content-specific pathway. In this light, counterfactuals are goal cognitions, with the antecedent portion of the counterfactual conditional specifying an action (I should have studied harder) and the consequent specifying the desired goal state (then I would have passed). Moskowitz et al. argued that much of the cognitive processing related to goal pursuit is unconscious. In this regard, our functional theory is compatible with the implicit volition model, at least in terms of the content-specific pathway, in that recent evidence shows that problems activate counterfactual thinking automatically (Goldinger et al., 2003), counterfactuals activate intentions automatically (Smallman & Roese, 2007), and intentions activate behavior automatically (Brandstätter et al., 2001). An additional observation, however, is that counterfactual thinking is often conscious, or leaves a conscious residue, even if it may proceed efficiently and without awareness. Counterfactual thinking may be said to operate on several scales: at the lowest, implicit end, which focuses on short-term behavioral correction, all the way up to broad life regrets, consciously held, which may fuel major life changes. Although the scale may differ, and the degree of awareness may vary, the same basic pattern of behavior regulation characterizes all these cases.

As another example of the close linkage between counterfactual thinking and goals, there is a striking similarity between counterfactual thinking and the memory advantage for unfulfilled versus completed tasks, that is, the Zeigarnik effect (Zeigarnik, 1927). Not attaining a desired goal increases the accessibility of goal-related information (Förster et al., 2005). For example, the goal to find a pair of glasses stays active in memory until the glasses have been found. When the goal is reached, its accessibility drops sharply, and may even be actively inhibited (Förster et al., 2005; Liberman, Förster, & Higgins, 2007). We point out that counterfactuals may embody the very meaning of not reaching a desired goal. Thus, both continued accessibility for counterfactuals specifying how a goal might have been achieved and the finding that regrets of inaction linger longer than regrets of action (Savitsky, Medvec, & Gilovich, 1997) are perhaps special cases of the more general Zeigarnik effect.

In a similar vein, it has been shown that the need for the interpretation of an event evokes an “open” mind-set that allows for active inferences about the event and its causes. After the interpretation has been achieved, the mind-set “closes” and inferences are no longer made (Fiedler, Schenck, Watling, & Menges, 2005). In addition, the mental simulation of an event may involve a mind-set that fosters the consideration of alternatives (Galinsky & Moskowitz, 2000; Hirt et al., 2004). Combining these three lines of research (Zeigarnik effect, “open” mind-

set, and counterfactual mind-set), one may assume that counterfactuals are closely related to a memory advantage of failures in goal pursuit. This in turn results in a mental state that causes individuals to search for explanations and interpretations of this state, with heightened attention toward alternative courses of action.

The functional theory of counterfactual thinking embodies the proposition that such thoughts serve to regulate human behavior. Thus, counterfactuals help correct and improve behavior that has been unsuccessful in the past. To have counterfactual thoughts about an outcome, one must have a reference point to which the present may be compared. Sometimes expectancies may serve as such reference points (Roese & Sherman, 2007). In the context of goal research, expectancies have been discussed as an important determinant of intention formation and goal commitment (Oettingen, 1996). Most important, expectancies can induce a strong desire to obtain a goal and a strong goal commitment (Oettingen, 2000; Oettingen et al., 2001; Oettingen & Mayer, 2002). For example, contrasting a somewhat negative reality to a positive future serves as a strong motivator to initiate action (Oettingen et al., 2001, Study 3). On a more basic level, recent evidence confirms the assumptions that goals, in and of themselves, have a positive value connected to them (Custers & Aarts, 2005). Obtaining a desired end state can therefore be motivated simply by the goal to achieve this positive value (see Förster, Liberman, & Friedman, 2007, for a review). This framework provides a straightforward way to connect these findings to counterfactual thinking, namely, the content-neutral pathway. The positive value of a desired end state might therefore operate as a motivator of behavior that is completely independent of the actual content of the goal.

Much of the recent progress in research on goal pursuit has delivered impressive evidence for the automatic nature of many of the processes involved (see Fishbach & Ferguson, 2007; Förster et al., 2007; Moskowitz et al., 2004, for recent reviews). However, in the present context, the explicit, deliberative pursuit of a goal is also of crucial importance. Hence, we would like to point out some commonalities between our model and the Rubicon model of action phases (Gollwitzer, 1990; Heckhausen, 1987, 1991), which has fueled much of the current research on goal pursuit.

In its most basic version, the Rubicon model predicts a temporal pattern involving particular phases of goal pursuit. After deliberation about a goal in the *predecisional phase*, a goal intention is formed. Next, in the *preactional* phase, the right time and possible opportunities for action initiation are evaluated (i.e., planning). The *actional* phase begins with the initiation of actions designed to move toward the goal. This phase continues until an outcome is reached, which may be success (goal completion) or failure. Finally, in the *postactional* phase, the outcome and preceding actions are evaluated (see Heckhausen, 1991, for a detailed discussion of the theory). It should be kept in mind that each action phase is accompanied by a specific mind-set that facilitates information processing during the respective phase (Gollwitzer, 1990).

Our content-specific pathway (Figure 1) can be taken as a simplified version of the temporal sequence in the Rubicon model. With respect to the functional theory of counterfactual thinking, it is probably the predecisional phase and the postactional decisional phase that are most likely to involve counterfactual thinking. In the predecisional phase, the deliberation about which of several goals to adopt might be influenced by memories of counterfactuals relevant to previous goal experiences. In the postactional phase, the evaluation of the goal outcome may proceed in part by consideration of alternative means that could have been taken in order to realize the goal more effectively. Take the example of a student preparing for an exam. Most likely the student will have the goal to pass the exam with a good result. Thus, the first three phases of the goal pursuit involve studying, developing a level of aspiration, and taking the actual exam. However, in the fourth (postactional) phase, the student will compare

the actual result with the desired one. If the outcome was failure, counterfactual thinking will likely be salient (i.e., what might have been done to be successful). These counterfactuals can involve any and all of the student's thoughts and actions within the previous three phases. The insights gained during the postactional phase should directly merge into a new predecisional phase, where a new intention is formed regarding new goal pursuit (e.g., the next exam scheduled in that course). A new behavioral intention might be, for example, to study harder, resulting in a restart of the entire goal sequence. However, the post-decisional phase may also involve the insight that previous expectations were simply too high, resulting in an adjustment of standards without a change in future behavior. Most important, the Rubicon model assumes that the fourth, postactional, phase is largely dominated by conscious deliberation. As we have noted throughout this article, counterfactual thinking may be either automatic or deliberative, and there are many instances of counterfactual thinking operating at a rapid, implicit level ("I should have had tea instead of coffee") and at the grandest scale of ruminating on pivotal choices over a lifespan ("I should have been a dentist"). The Rubicon model is useful, then, for framing the operation of those more consciously reflective counterfactuals that center on relatively more important goals. In the language of the Rubicon model, counterfactuals may be volitional. As an immediate consequence, relatively automatic processes may again be initiated, yet it is the volitional nature of counterfactual thinking that is the key to understanding their functionality.

Lifespan

Research in developmental psychology has dealt with a functional account of regret (Heckhausen, 2000; Wrosch, Dunne, Scheier, & Schulz, 2006), which bears a close resemblance to the present theoretical conception. For example, Wrosch and Heckhausen (2002) found that the experience of regret varies with age and the differences in perceived control associated with different points along the lifespan. Younger adults with a high level of control tend to experience more personal regret than do older adults (who possess less control over their life). Older adults tend to have regrets that might be described as "neutered," in the sense that the affective sting is mitigated by a focus on the actions of other people rather than on the self. This shift in the experience of regret over the life course may well be related to the general decline in control over one's life as a whole that comes with age (see Heckhausen & Schulz, 1995). Thus, these findings connect directly to the functional theory by showing that regret, which is perhaps the most saliently vivid face of counterfactual thinking in conscious life, corresponds to the opportunity principle as a function of aging, such that reduced opportunity results in reduced activation of self-focused, upward counterfactual thinking.

Additional support for the functional role of counterfactuals has emerged from recent research on *Sehnsucht*, a German word that seems to have no obvious analog in the English language, although *regret* and *yearning* perhaps come closest. Sehnsucht is an aching feeling of longing for something deeply meaningful that probably can never come to fruition. Sehnsucht might focus on an imagined love that "might have been" but never came to be, but it may also center on an actual loved one who died long ago. In both cases there is a deep cherishing of the overall worth of that loved one; hence, positive affect is as much a component of Sehnsucht as is negative affect. The bittersweet essence of Sehnsucht was perhaps a significant reason the word was nominated as the third-most-beautiful word in the German language (Deutscher Sprachrat, 2004)![2]

Recent research has addressed the extent to which Sehnsucht is functional for an individual (Scheibe, Freund, & Baltes, 2007), focusing in particular on major life longings (e.g., physical

[2]Although *Sehnsucht* was the third-most-nominated word, *Habseligkeiten* (only inadequately translated as "(blessed) belongings") was chosen as the winner of the competition.

well-being, romantic partnerships). Self-report data from individuals of various ages revealed that Sehnsucht provides individuals with a sense of directionality in life and helps them cope with their perceived imperfections (Scheibe et al., 2007). However, similar to our own findings on the influence of regret on well-being (Roese et al., 2008), an excess of Sehnsucht is associated with reduced well-being. A related affective experience is homesickness, and some recent work has shown that high levels of rumination about home and about loneliness while being away from home have a profound effect on well-being (Stroebe, van Vliet, Hewstone, & Willis, 2002). It might be fruitful for future research to investigate the combined roles of regret, Sehnsucht, and homesickness in well-being. All such experiences, we suggest, have their roots in the functional basis of counterfactual thinking.

Lastly, the functionality of counterfactual thoughts has also received attention in the area of personality development. King and Hicks (2007) described the value of regrettable life experiences in the development of maturity (i.e., gaining wisdom as one grows older). They argued that actively dealing with life regrets is both a cause and a consequence of maturity. Being able to let go of failed goals promotes happiness. However, evaluating these goals can also bring positive effects in terms of ego development. For example, in a study with gay and lesbian participants, King and Smith (2004) found that having an elaborate “straight self” positively predicted ego development, specifically as individuals grappled with, accepted, and learned from this “lost self” (a sense of self that might have been less stigmatized). Clearly, thinking about what might have been intersects with a wide range of heartfelt emotions, which is yet another reason such thoughts are so intrinsic to the human experience.

CONCLUSION

Counterfactual thinking centers on insights into what might have been different if some details of the past had been altered. These insights are a common feature of the mental landscape, and past research has long linked them to emotional experience. The first generation of counterfactual research in psychology assumed that such thoughts are dysfunctional; that is, instances of error, bias, or difficulty in coping (Gleicher et al., 1990; Kahneman & Tversky, 1982; Landman, 1987; Macrae, 1992; Miller et al., 1990; Miller & McFarland, 1986; Sherman & McConnell, 1995). The second generation of research, dating from the 1990s (and forming the bulk of this article), pointed to a functional perspective, in which counterfactual thinking serves a largely beneficial function of behavior regulation (Johnson & Sherman, 1990). Working on a job, dining with friends, conversing with acquaintances, studying for exams, mapping out finances for retirement: All such daily acts require planning, management, organization, and frequent course correction. Problems are inevitable. Accidents happen, glitches arise, and people struggle to fix what has blocked the road to their desires. Counterfactual thoughts do sometimes bring bias or difficulty in coping, but balanced against this cost is a larger benefit in terms of the coordination of daily behavior. Counterfactual thinking connects directly to course correction, to goal cognition, and to behavior regulation. As data from imaging studies in cognitive neuroscience continue to accumulate, we hope that this summary of the functional theory of counterfactual thinking can serve as a useful framework with which to understand them.

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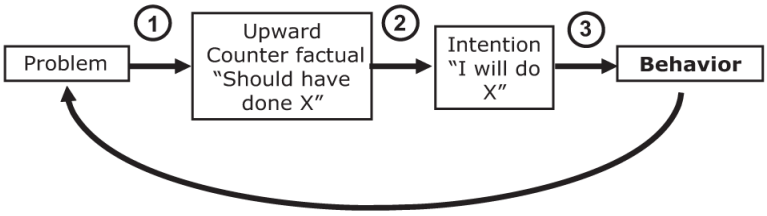

Figure 1.
The content-specific pathway by which counterfactuals influence behavior
SOURCE: Adapted from Roese & Olson, 1997, and Segura & Morris, 2005.

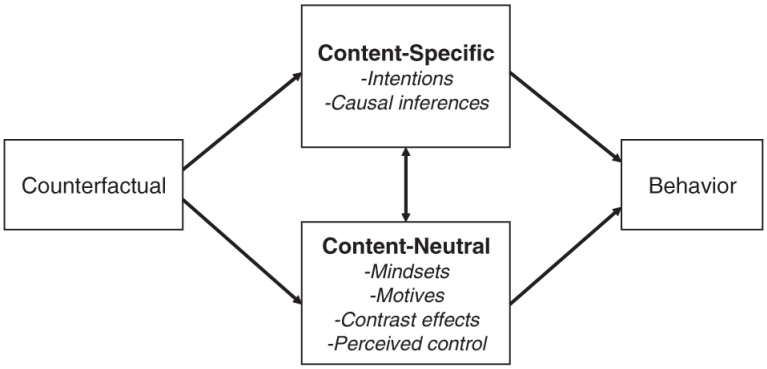

Figure 2.
Content-specific versus content-neutral pathways of counterfactual thinking

Table 1

Types of Counterfactual Thinking

Type	*Description*	*Example*
Upward vs. downward	Comparison of a present outcome to a better (upward) or worse (downward) alternative	"I should have taken the job with the higher salary" (upward) "Other people with my qualifications earn much less than I do" (downward)
Action vs. inaction (additive vs. subtractive)	Addition or subtraction of an aspect from the present state	"I should never have started smoking" (action) "I should have taken vitamin C" (inaction)
Self vs. other	Focus is on the actions or features of oneself or other people	"I should have driven more slowly" (self) "The other driver should have paid more attention" (others)