

Can the performance effects of upward counterfactual thoughts be attributed to effort mobilization?

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Zusammenfassung

Aufwärts gerichtete kontrafaktische Gedanken lassen erkennen, wie ein vorausgegangenes Ergebnis hätte besser sein können. Experimente konnten zeigen, dass solche Gedanken mit der Absicht verbunden sind, nachfolgende Leistungsergebnisse zu verbessern. Die vorliegende Dissertation präsentiert ein neues Modell zur Selbsteinschätzung von aufwärts gerichtetem kontrafaktischem Denken, das zu dem Schluss kommt, dass aufwärts gerichtetes kontrafaktisches Denken sehr eng mit Selbsteinschätzung und Selbstregulation zusammenhängt. Das neue Modell zeigt die Bedingungen auf, unter welchen aufwärts gerichtetes Denken Affekt und Leistung beeinflusst. Ziel dieser Dissertation war es, erste Belege für das Modell zu finden, indem Leistungseffekte von aufwärts gerichtetem kontrafaktischem Denken untersucht wurden. Vier Studien überprüften, ob die positiven Auswirkungen von aufwärts gerichteten kontrafaktischen Gedanken auf Leistung entweder durch verstärkte Kräftemobilisierung oder durch die Identifikation nützlicher Verhaltensweisen hervorgerufen werden. Zusätzlich wurde die Rolle von Affekt und Steuerbarkeit der Verhaltensweisen, die in den kontrafaktischen Gedanken erwähnt wurden, untersucht. Die Ergebnisse zeigten, dass aufwärts gerichtete kontrafaktische Gedanken und spezifische Pläne in Form von Durchführungsintentionen unabhängige und additive Effekte auf Leistung haben. Darüberhinaus hatten die kontrafaktischen Gedanken einen deutlichen Effekt auf Leistung und Durchhaltefähigkeit, was vermuten lässt, dass wahrscheinlich die Kräftemobilisierung für die förderlichen Effekte von aufwärts gerichteten kontrafaktischen Gedanken verantwortlich war. Schließlich zeigte sich, dass die Leistungseffekte auch mit der Beurteilung mangelnder Fortschritte in der Zielerreichung und der Überzeugung, dass das Leistungsergebnis steuerbar ist, verbunden waren.

Abstract

Upward counterfactual thoughts identify how a previous outcome could have turned out better. Research has found that such thoughts are associated with intentions to improve on subsequent performance outcomes. The present dissertation proposes a new self-evaluation model of upward counterfactual thinking which reasons that upward counterfactual thinking is closely tied to self-evaluation and self-regulation. The new model precisely outlines the conditions under which upward counterfactuals impact affect and performance. This dissertation aimed to find preliminary support for the model by examining the performance effects of upward counterfactuals. Four studies investigated whether the beneficial consequences of upward counterfactuals for performance are caused by amplified effort mobilization or the identification of useful behaviors. In addition, the role of affect and controllability of behaviors mentioned by the counterfactual were examined. Results showed that upward counterfactuals and specific plans in the form of implementation intentions have independent and additive effects for performance. Moreover, upward counterfactuals had broad effects on performance and persistence, suggesting that effort mobilization was likely responsible for the beneficial effects of upward counterfactuals. Finally, the performance effects appeared to also be connected to evaluations of insufficient goal progress and belief that the performance outcome was controllable.

KEYWORDS: Counterfactual thinking, motivation, self-regulation, implementation intentions

Introduction

After smashing the world record in 2002 in Chicago, Paula Radcliffe had become a hopeful for the 2004 Olympics in Athens. However, stomach cramps and a leg injury led her to disappointingly pull out of the Olympic marathon with a mere six kilometres left. Radcliffe was quoted after the Olympics saying "I don't have regrets. I would rather have been in there and known the answer rather than watching it on TV and wondering 'What if?'" She was forced to ask herself what went wrong on the day of the race and consider what was within her control and what was not. Radcliffe used the experience and learned from her performance on that day to go on to break the women's world record in the marathon again in 2003.

Defining Counterfactual Thinking

Individuals often contemplate how an outcome could have turned out differently, imagining either a better or worse outcome, when thinking about a previous outcome, as Paula Radcliffe did after the 2004 Olympics. Such thoughts are referred to as counterfactual thoughts and generally take the form "what if..." or "if only..." (Hofstadter, 1979; Kahneman & Miller, 1986). For example, a student might think "What if I would have studied harder for the exam, then I could have gotten an A on it." or "If only I had left the house 10 minutes earlier, then I would not have missed the train." By generating counterfactuals, an individual can compare alternative outcomes to reality (Sevdalis & Kokkinaki, 2006). Counterfactual thinking has been shown to be an important determinant of perceived causes of events (Mandel & Lehman, 1996; Wells & Gavanski, 1989), emotional reactions to the aftermath of events (Markman, Gavanski, Sherman, & McMullen, 1993, 1995), and preparations for the future (Markman et al., 1993; Roese, 1994).

Various conditions that are likely to activate counterfactual thinking have been identified. The most frequent trigger of counterfactual thoughts is negative affect, as it is a classic signal that something is amiss and corrective action is necessary (Roese, 1997). Research investigating outcome valence (positive and negative outcomes) has indicated that counterfactual thinking was more often a result of negative events compared to positive events (Sanna & Turley, 1996). Sanna

and Turley (1996) further examined outcome expectancy and observed that unexpected outcomes were also likely to trigger counterfactual thinking. It has furthermore been established that the closeness of an outcome is another important antecedent of counterfactuals, such that the closer the event was, the more likely it is that the individual will engage in counterfactual thinking (Kahneman & Tversky, 1982; Kahneman & Varey, 1990). First of all, closeness can be thought of in terms of temporal closeness, such that missing the train by one minute is more likely to result in the generation of counterfactuals than missing the train by a half hour. Closeness can also entail near misses, such that counterfactuals are more frequent after a near miss (being one point away from an A on an exam) than missing something by a long shot (being eight points away from an A on an exam).

The literature on counterfactual thinking has additionally made an essential differentiation based on how counterfactuals alter an outcome. Thoughts identifying how an outcome could have turned out for the better are termed upward counterfactual thoughts and those depicting how an outcome could have turned out worse are termed downward counterfactual thoughts (Markman et al., 1993, 1995; Roese & Olson, 1995). An upward counterfactual could be “if I would have trained more for the marathon, then I would have run the marathon faster.” A downward counterfactual might be “what if I would not have trained so hard for the marathon, then I might not have been able to finish the marathon.” Past research has corroborated that upward and downward counterfactual thoughts each have unique consequences for individuals (Roese, 1994; Roese & Olson, 1995).

3 Consequences of Counterfactual Thinking

Upward counterfactual thoughts have been found to result in more negative affect, whereas downward counterfactual thoughts have a tendency to result in more positive mood and contentment with the outcome (Markman et al., 1993, 1995; Roese, 1994). Hence, downward counterfactuals are said to have an “affective function”, since they shield the individual’s mood and increase contentment with the actual outcome (Roese, 1994). However, given that they do not identify ways an outcome could have been better, they do not necessarily increase the individual’s intent to improve on subsequent performances. Referring again to the marathon example (“if I

would have trained more for the marathon, then I would have run the marathon faster.”), it is expected that the runner would not regret the insufficient training and thus it is doubtful that the runner would train more in the future. Therefore, depending on the type of counterfactual thinking an individual engages in, there will likely be different implications for affect and future performance (Markman et al., 1993; Roese & Olson, 1995).

Research on counterfactual thoughts has focused on their functionality and their implications for affect and behavior, especially for performance. The focus of this dissertation will solely be on the effects of upward counterfactuals, thus downward counterfactuals will not be taken into consideration. To better understand the effects of upward counterfactual thoughts, three areas will be discussed in detail, namely the affective consequences, causal reasoning, and the performance effects (preparative effects) of counterfactual thinking. To begin, the affective consequences of upward counterfactual will be considered.

1. Affective Consequences

As previously mentioned, negative affect is a consequence of upward counterfactuals, given that the individual compares the current outcome to better alternatives (Markman et al., 1995; Roese, 1994; Roese & Olson, 1993). However, by considering how an outcome could have been better, the individual often becomes aware of ways to improve in the future; thus, upward counterfactuals also result in a “preparative effect” (Roese, 1994). In the marathon example (“if I would have trained more for the marathon, then I would have run the marathon faster.”), it would be predicted that the runner would experience negative affect (likely regret) for not training enough, but the chances of training more in the future for the next marathon or race would increase.

The Reflection Evaluation Model (REM, Markman & McMullen, 2003) can be employed to better understand the role of affect in counterfactual thinking. The REM distinguishes between two separate forms of mental simulation that occur when engaging in counterfactual thinking. The first form is called “reflection” and entails envisioning that the alternative outcome is true and incorporating information about

it into an individual's self-view. The other form is called "evaluation" and involves the comparison of the actual outcome to the alternative outcome standard and excluding information about the alternative outcome from an individual's self view. Whereas reflection is often triggered by having apparent future opportunities to repeat the event, evaluation is often triggered when there is an absence of future opportunities. The reflection process has been shown to lead to affective assimilation. That is, upward counterfactuals increase positive affective, whereas downward counterfactuals lead to increased negative affect. On the other hand, the evaluation process initiates affective contrast. When evaluating, upward counterfactuals generally increase negative affective by identifying a better outcome as a standard of comparison, whereas downward counterfactuals normally lead to increased positive affect by identifying worse outcomes as a standard of comparison (Markman, McMullen, & Elizaga, 2008; Roese, 1994). Markman and McMullen (2003) have identified several situations in which the evaluation process is the default mode of processing: When one is accountable for the outcome, when the incident is final (not enduring), and when self-concepts are malleable and changeable (instead of being set).

Comparable to propositions of the REM, research derived from various fields has established that affect serves as a means of input (see also Gendolla, 2000; Hirt, Melton, McDonald, & Harackiewicz, 1996; Martin, Ward, Achee, & Wyer, 1993) for decisions regarding goal progress. How an individual feels at a precise moment is applied to judge an individual's proximity or progress towards a particular goal. This postulation is supported by previous research demonstrating that an individual's current mood is utilized as an indication for evaluative decisions; however, this only occurs when there is no objective information readily available and when they consider their current mood a result of that precise process (Martin et al., 1993; Schwarz, 1990).

The REM supposes that affect resulting from counterfactual thinking is also used to determine whether a goal has been achieved or not (Markman & McMullen, 2003). Following counterfactual thinking (assuming an individual holds an achievement goal), if an individual experiences negative affect, it should signal that goal progress is inadequate and more effort needs to be engaged. Conversely, if an

individual experiences positive affect afterward, it should signal that goal progress is adequate and effort should be either sustained at current levels or terminated. The REM therefore predicts that when an individual holds an achievement goal, upward counterfactuals should lead to increases in motivation and persistence when negative affect is experienced. This assumption has found support by recent research demonstrating that participants who engaged in the evaluative mode of upward counterfactual thinking had both improved persistence and performance on an anagram task (Markman et al., 2008). It was additionally found that this effect was mediated by experiencing negative affect.

Whereas general affective reactions to counterfactual thinking have received a great amount of attention, an additional area of research has investigated the effects of counterfactual thinking on specific emotional reactions, for instance feelings of regret and guilt. Following previous lines of research, it has been demonstrated that various types of counterfactual thoughts generate unique and specific affective responses, more than merely influencing valence and intensity (Niedenthal, Tangney, & Gavanski, 1994). For example, Niedenthal and collaborators (1994) determined that participants' feelings of both guilt and shame were dependent on the specific type of counterfactual that they produced, after all participants were subjected to the same stimulus. It was found that counterfactuals focusing on the individual's own behavior produced amplified feelings of guilt concerning the outcome, whereas counterfactuals focusing on the self produced amplified feelings of shame concerning the outcome. After a negative outcome, the degree to which the counterfactuals varies attributes of the self then determines amplified feelings of shame, and in some instances diminished psychological well-being (Branscombe, Wohl, Owen, Allison, & N'Gbala, 2003; Niedenthal et al., 1994). Moreover, McCrea (2008) demonstrated that upward counterfactuals that excused a performance outcome by designating a self-handicap as the cause lead to reduced negative state self-esteem.

2. Causal Reasoning

Research has established that counterfactual thoughts can convey causal inferences; nevertheless, the relationship between the two is still disputed (Epstude

& Roese, 2008; Mandel & Lehman, 1996; Roese, 1997; Wells & Gavanski, 1989). Counterfactuals embody one means of causal information upon which the individual can draw (Mandel & Lehman, 1996; Roese, 1997; Wells & Gavanski, 1989). For instance, Wells and Gavanski (1989) established that assessments of causality can be affected by counterfactual thoughts, in that the antecedent of the counterfactual is seen as responsible for the outcome. It was found that after reading a tragic story about a woman who had an allergic reaction to her dinner and then died, participants took the antecedent they had counterfactualized to subsequently be more causal of the outcome (Wells & Gavanski, 1989). Thus, the causal reasoning of the participants was impacted by the counterfactuals. Moreover, Roese (1997) proposed that causal inferences arise during counterfactual thinking because the counterfactual can highlight the causal relation between the behavior and the sought outcome. An additional important point intertwined with the notion of content is controllability. Counterfactuals often center on behaviors within an individual's control, which makes them more personally relevant to the individual (Mandel & Lehman, 1996; Markman et al., 1995; Roese, 1997). It is also practical if the content relates to a controllable factor, as the individual is able to change that behavior for subsequent actions (Mandel & Lehman, 1996; Roese, 1997).

3. Performance (Preparative) Effects

Upward counterfactuals have frequently been found to result in negative mood by comparing the actual outcome to ways it could have been better, yet they also seem to be quite functional by identifying ways to improve on subsequent outcomes (Markman et al., 1995; Roese, 1994; Roese & Olson, 1993). Roese (1994) has indicated that upward counterfactual carry a "preparative function" and can consequently be implemented to enhance future performances. Other research has suggested that dissatisfaction with a previous performance can lead to amplified effort expenditure on a future performance (Markman et al., 1993; McMullen & Markman, 2000). More recently, Markman and colleagues (2008) demonstrated that persistence and motivation can also be improved by engaging in upward counterfactual thinking. Thus research has consistently found that upward counterfactuals lead to improvements in subsequent performance within various

performance contexts, nevertheless little is known about the mechanism(s) underlying this effect. There are several possible explanations for these performance effects stemming from different lines of research. The goal of this dissertation is to examine the validity of these explanations and thereby uncover the cause of the performance benefits of upward counterfactual thoughts. This investigation will be conducted by considering theoretical models integrating self-regulation and self-evaluation.

First, it is possible that upward counterfactuals identify a specific strategy which could be applied to improve subsequent performance. Epstude and Roese's Functional Theory of Counterfactual Thinking (2008) asserts that there are two pathways to performance, a content-specific and a content-neutral pathway. The content-neutral pathway is believed to be independent of content referenced in the counterfactual, and activates another type of information processing or possibly motivation, which then transforms the behavior and has broader implications for performance. On the other hand, a content-specific pathway to performance is driven by the specific and beneficial information that is included in the counterfactual. That is, the counterfactual may specifically identify causes for the performance outcome. This information can easily be converted into a behavioral intention that subsequently propels behavior. Thus, this path to improved performance is indicative of an information effect, as suggested by Roese (1994). It was found that individuals who engaged in upward counterfactual thinking had amplified intentions to execute the behavior in the thought (Roese, 1994). Moreover, Roese (1994) showed that those who had generated upward counterfactuals regarding the usage of clues on an anagram task were more likely to implement the strategy from the thought (using fewer clues), which led to the greatest performance benefits. Nevertheless, this finding was not revealed for the other behaviors that were counterfactualized and the results were only correlational, and thus failed to manipulate the content of the thoughts. By identifying a cause for performance, the strategy becomes more accessible via the causal inference for performance. It would then be predicted that a content-specific pathway would identify corrective actions for performance (Smallman & Roese, 2007). As found by Smallman and Roese (2007), upward counterfactuals led to increases in the accessibility of behavioral intentions.

An individual can consequently change the strategy to make success more likely (Markman & McMullen, 2003). Markman and colleagues (2008) found that participants who generated thoughts regarding a potentially useful strategy improved their subsequent performance. However, it is not clear whether these effects were the result of a content-specific pathway or not, as these two pathways were not systematically tested.

A second plausible explanation is that upward counterfactuals lead to increased feelings of control over the performance or self-efficacy. Self-efficacy is best described as individuals' beliefs in possessing the required abilities to successfully complete a particular undertaking (Bandura, 1986; 1989). Past findings have established that self-efficacy is predictive of an individual's behavior and can have benefits for performance via cognitive, affective and motivational processes (for a review, see Bandura, 1989). For example, individuals with high self-efficacy beliefs in their problem-solving abilities are very effective in solving analytical problems (Bandura & Wood, 1989). Another example is individuals with high self-efficacy beliefs frequently set higher goals for themselves and have a stronger commitment to them (Bandura & Wood, 1989). One line of research has shown that upward counterfactuals were related to increases in self-efficacy (Tal-Or, Boninger, & Gleicher, 2004). Past studies have also shown that participants report feeling more prepared for an upcoming performance after generating upward counterfactuals (Markman et al., 1995). It has additionally been shown that feelings of control were predicted by upward counterfactuals and that this was related to improved future performance (Nasco & Marsh, 1999). Furthermore, such amplified feelings of control seem to derive from perceived improvements in the environment. The perception that performance is within an individual's own control could therefore be a decisive factor behind the performance effects.

Lastly, upward counterfactuals could potentially improve performance by means of their consequences for negative affect. Markman and McMullen's (2003) Reflection Evaluation Model (REM) suggests that after engaging in counterfactual thinking, affect becomes a determinant of motivation. The REM reasons that the affective and motivational consequences of counterfactual thinking are determined by one of two processes, as previously discussed. After generating upward

counterfactuals, the critical factor is whether the individual vividly envisions the alternative outcome or evaluates and compares the current outcome to the alternative outcome's standard. When engaging in the evaluation process, the individual compares the actual outcome to a better outcome, which enhances negative affect. Conversely, when engaging in the reflection process, the individual reflects upon a better outcome, which enhances positive affect. Affect then serves as input into judgments of goal progress (Gendolla, 2000), such that when an individual experiences positive affect, it signifies that the performance is satisfactory and goal pursuit is no longer necessary. On the other hand, when an individual experiences negative affect, it signifies that the performance is unsatisfactory and thus goal pursuit should continue. As the REM predicts, Markman and colleagues (2008) found that motivation and persistence increased when participants experienced negative affect as a consequence of evaluating upward counterfactuals. It is thus plausible that the performance effects of upward counterfactual thinking are due to effort mobilization, which may stem from reasoning that the goal progress was insufficient.

Relevant Models of Self-Regulation

To better understand the effects of counterfactual thinking, they should be related to the extensive theoretical frameworks of self-regulation and self-evaluation. The placement of counterfactual thinking in the context of self-regulation will first be discussed. One particularly relevant model is the model of action phases (Gollwitzer, 1996; Heckhausen, 2003), which asserts that goal pursuit transpires in four distinct phases: a pre-decisional phase, a post-decisional phase, an action phase, and a post-actional phase. In the pre-decisional phase, individuals contemplate whether or not to engage in goal pursuit; in the post-decisional phase, individuals plan how to execute the task. Individuals actively pursue the goal in the action phase and then appraise their goal progress in the post-actional phase. In the post-actional phase, individuals must determine if they have successfully achieved their goal, and if not, whether to persist or disengage. The middle two stages entail the implementation of behavioral strategies; therefore, they have generally been designated as volitional by nature. The first and final phases are, on the other hand, inherently motivational, given that they encompass goal setting (see also Lewin, Dembo, Festinger, & Sears,

1944; Locke & Latham, 1990). Individuals generally only choose to continue engaging in the task when they judge their progress as inadequate, when they view the goal as valuable with a potential positive outcome, and when they deem their personal behavior as accountable for the inadequate result (i.e., the result was controllable).

Counterfactual thinking takes place in the post-actional phase (see also Epstude & Roese, 2008); upward counterfactuals are therefore proposed to have an effect on judgments of goal progress (i.e., if goal discrepancy is encountered), in addition to perceptions of the controllability of the performance outcome. The post-actional phase is responsible for judging whether the goal has been achieved or not, and if not, whether it is meaningful to continue goal efforts or to disengage (Gollwitzer, 1996; Heckhausen & Gollwitzer, 1987). Upward counterfactuals, similarly, scrutinize whether or not the performance outcome has been attained and if a successful outcome is feasible. This process should then assist an individual in deciding whether or not to maintain goal efforts. Thereby, the potential beneficial effects of counterfactual thinking for future performance could be an outcome of an individual's enhanced yearning to improve. Upward counterfactuals distinctly express that the performance could have been improved, which consequently encourages the individual to try harder on the next performance (see also Locke & Latham, 1990). Consider again the marathon runner generating the counterfactual "if I would have trained more for the marathon, then I would have run the marathon faster." This thought would clearly be post-actional (after completing the marathon) and would easily allow the runner to decide what needs to be done to improve on future performances. This notion that affect can serve as input is also proposed to be most influential in the motivational stages of goal pursuit, for instance in the post-actional phase (Schwarz & Bohner, 1996). This is also in line with the REM that the preparative effect of counterfactuals requires an individual to experience negative affect (Markman & McMullen, 2003; Markman et al., 2008; McCrea, 2008; McMullen & Markman, 2000).

Other models of motivation have also arrived at similar conclusions as the model of action phases. For example, Control Theory (Carver & Scheier, 1999) and Social Cognitive Theory (Bandura & Cervone, 1983; Bandura & Locke, 2003) postulate that individuals only put forth more goal-directed effort when an

inconsistency between the current goal state and the end result is realized and when self-efficacy regarding the task is experienced. Thus, the end state can only be achieved when an individual's capabilities are not exceeded. It is expected that an individual would engage successive effort when a disappointing performance outcome could be accredited to insufficient previous effort (Weiner, 1985), and when the individual believes that increased effort will most likely produce a successful outcome (Vroom, 1964).

Taking the idea of goal discrepancy one step further, past research suggests that dissatisfaction with a recent performance outcome is responsible for the effort mobilization benefits of counterfactual thinking. For example, the cybernetic models of motivation suppose that an individual enhances goal striving when progress towards the goal is deemed insufficient, although only when the goal is deemed achievable (Bandura, 1991; Carver, 2003; Carver & Scheier, 1999; Lawrence, Carver, & Scheier, 2002). These motivation models specifically state that the experience of negative affect can be linked directly to dissatisfaction with the current goal progress. This deviates from the notion that negative affect serves as input for assessing goal progress, as here the negative affect is indicative of an underlying goal discrepancy. Upward counterfactuals ostensibly bring attention to pertinent goal discrepancies by clearly signalling that a better outcome was not realized. It can accordingly be deduced that upward counterfactuals initiate enhanced mobilization of effort and preparative behavior as a result of increased attention being directed to the goal discrepancy. Negative affect is simply an indication of this discrepancy.

Self-Protection vs. Self-Improvement

Another means to better understand the effects of counterfactual thinking is to examine how counterfactuals relate to self-evaluation. Self-evaluation can broadly be defined in terms of a process that is used by individuals to both assess and alter the self-concept (Sedikides & Strube, 1997). Because counterfactuals transpire in the post-actional phase, they can furthermore be regarded as a type of self-evaluation. Counterfactual thinking involves the evaluation of various performance outcomes, and thereby falls under the classification of self-evaluation. Self-evaluation has additionally been recognized as playing a key role in the domain of self-regulation

(Taylor, Neter, & Wayment, 1995). Self-evaluation is influenced by various motives; self-improvement and self-enhancement are two of the principal and most relevant motives for the research presented here. Self-improvement embodies an individual's aspiration to meticulously assess a performance outcome and subsequently apply that information to better future outcomes. Self-enhancement denotes an individual's aspiration to assess a performance outcome in a positive light and consequently use that positive evaluation to protect or nurture self-esteem (Crocker & Park, 2004; Greenwald, 1980; Sedikides & Strube, 1997; Taylor et al., 1995; Trope, 1986).

Past research has already established these motives in a variety of diverse situations, for example, within the realms of social comparison (Taylor et al., 1995), information search (Butler, 1993; Trope, Ferguson, & Raghunathan, 2001), and causal attributions (Zuckerman, 1979), to name a few. Many distinct situational factors determine which motive an individual elects to pursue. A few situations where an individual may weigh the long-term self-improvement motive as more decisive than the short-term self-protection motives are when ability is regarded as adaptable (Dunning, 1995; Dweck & Leggett, 1988) or within the individual's control (Trope, Gervy, & Bolger, 2003; Ybema & Buunk, 1993), in addition to when self-concerns have previously been attended to (Sherman & Cohen, 2006; Trope et al., 2001). The difficulty is when self-protection and self-improvement concerns both surface and are incompatible in a situation, which frequently occurs (Taylor et al., 1995). For instance, imagine that a marathon runner receives negative feedback from the coach. The runner's self-protection motive may be activated and cause the runner to disregard any possible advantageous information contained in the feedback. On the other hand, the runner's self-improvement motive may be activated and lead the runner to focus on information that could negatively influence mood and self-esteem. Past research has stressed that trying to protect self-esteem can end up damaging performance and self-regulation (Baumeister, Campbell, Krueger, & Vohs, 2003; Crocker & Park, 2004). Similarly, Lazarus and Folkman (1984) demonstrated that problem-focused methods of coping are more successful than emotion regulation when dealing with situations in which the individual has control over the outcome.

Research has determined that counterfactual thoughts can be used to protect or sustain affect or rather be implemented to improve subsequent performance outcomes (Epstude & Roese, 2008; Markman & McMullen, 2003). However, these effects have yet to be researched within the context of self-evaluative motives. The model presented here posits that the consequences of upward counterfactuals, both affective and performance-related, are influenced and most likely moderated by self-evaluative motives. More specifically, it is implausible that upward counterfactuals used to shield self-worth will result in enhanced performance outcomes. Upward counterfactuals that are used for the identification of potential improvement methods would be expected to produce negative affect. The final consequences of upward counterfactuals are expected to be shaped by the type of motive that has been activated (Jones & Berglas, 1978; Weiner, 1985), which should be influenced by factors like the importance of the task (Orbell, Hodgkins, & Sheeran, 1997), whether other occasions to improve present themselves, or if past self-protection motives were adequate.

An additional factor that has notable implications for the self-evaluative motive is attributions of causality. Researchers were able to establish that affect and self-esteem could be shielded from failure when individuals could attribute the failure to an external or to an unstable cause (Covington & Omelich, 1979; Jones & Berglas, 1978; Weiner, 1985). A marathon runner could attribute a poor performance to the hot and humid weather that day or to insufficient practice leading up to the race, respectively and thereby protect self-esteem. On the other hand, with respect to the self-improvement motive, attributing a failure to some unstable, yet controllable cause (e.g., insufficient practice) should trigger a boost in subsequent persistence because one presumes that a successful performance outcome will ensue (Bandura, 1977; Weiner, 1985).

Thus, the ensuing mood and performance outcome of upward counterfactuals can be linked to their attributional implications, as they have been found to be tied to such causal assessments (Mandel & Lehman, 1996; Wells & Gavanski, 1989). Consequently, when an individual deems a self-protection motive to be relevant, then self-esteem should be shielded when the upward counterfactual attributes responsibility to a lack of effort. Conversely, when an individual holds a self-

improvement motive, then an upward counterfactual concerning lack of effort should increase motivation and lead to the modification of those behaviors.

A Self-Evaluation Model of Upward Counterfactual Thinking

Based on these considerations, an innovative theoretical model regarding the affective and performance consequences of upward counterfactual thinking that incorporates pertinent theories of self-regulation and self-evaluation is presented here. The model uses the REM (Markman & McMullen, 2003) as a starting point; however, this new model argues that the effects of upward counterfactuals on affect and self-esteem will be moderated by self-evaluation motives. Moreover, the REM posits that specific factors are taken into consideration before engaging in either reflection or evaluation. Accordingly, it is posited that feelings and moods will be taken into consideration as a form of input when assessing goal progress. For instance, negative mood may signal that goal progress is not proceeding as planned, indicating that more effort may need to be engaged. Conversely, positive affect may signal that goal progress is advancing as planned and no additional effort needs to be employed. These assessments, based on the individual's affect, would then be used to estimate the degree of effort mobilization that is required for the performance.

Not only does the model consider self-evaluation motives, it furthermore proposes that the consequences of counterfactuals for both affect and performance are contingent on whether or not they allocate responsibility for the outcome. It is specifically posited that effort mobilization will only be enhanced when the upward counterfactual explicitly holds the individual's controllable behavior accountable for an inferior outcome. It is hence assumed that the attributional consequences of upward counterfactuals are more complex than merely asserting a useful strategy (as alleged by Epstude & Roese, 2008), but also having implications for the mobilization of effort.

Figure 1 is a visualization of this new theoretical model of the consequences of upward counterfactual thinking. As can be seen in the model, it is proposed that upward counterfactuals have three direct yet diverse pathways through which they impact performance. Several pathways will be included in the propositions below and relevant studies will also be taken into consideration. The four studies presented

in this dissertation aim to begin systematically testing these pathways and examine their implications for performance. Specifically, the role of self-improvement motives in upward counterfactual thinking will be probed.

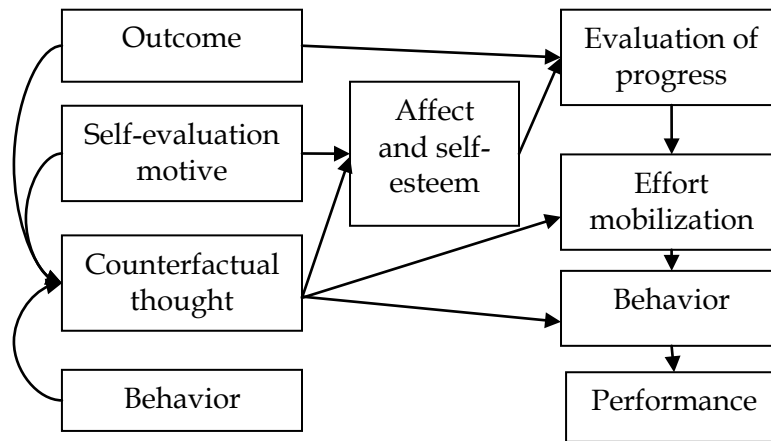


Figure 1. *Self-evaluative model of upward counterfactual thinking*

Proposition 1: Upward counterfactuals enhance performance, and more specifically persistence, via their effects on effort mobilization.

The first pathway demonstrates how upward counterfactuals impact judgments of goal progress by means of their consequences on affect and self-esteem. According to the model, when holding a self-improvement goal, upward counterfactuals should result in dissatisfaction and enhanced subsequent performance. The second pathway concentrates on the mobilization of effort as responsible for the performance and persistence effects of upward counterfactuals. When individuals are able to judge progress against a clear, objective goal, then upward counterfactuals should result in benefits for both performance and persistence. Conversely, when no objective goal standard is provided, then affect should be taken into consideration as a form of input when assessing whether or not the goal was attained and whether or not more effort should be mobilized (see also, Martin et al., 1993). Therefore, upward counterfactuals that lead to enhanced negative affect should be beneficial for performance via effort mobilization. Research thus far has not explored the function of objective and subjective goals and their impact on mobilizing effort. The studies presented here will examine whether the performance effects are attributable to dissatisfaction with a previous performance or

to the identification of a useful strategy. Furthermore, the role of subjective and objective goals for performance and persistence will be probed, in addition to their effects on upward counterfactuals via effort mobilization.

Proposition 2: Upward counterfactuals only increase performance and persistence when the thoughts identify controllable causes for the performance outcomes.

The final pathway focuses on upward counterfactuals identifying remedial actions or behaviors that when enacted would lead to an improved performance outcome. These effects are nevertheless dependent on the individual's willingness and motivation to put forth the necessary effort. In order to translate motivation into action, the individual must believe that the increased effort will be beneficial for performance (Bandura, 1977; Bandura & Cervone, 1983; Weiner, 1985). Therefore, an essential factor of the counterfactual is whether or not it suggests that a controllable action is to blame for the outcome. Effort mobilization is most likely augmented by upward counterfactuals that attribute the poor performance outcome to a factor within the individual's control. This dissertation will furthermore test whether only upward counterfactuals advocating that a controllable behavior is to blame for a poor performance will initiate effort mobilization and thereby increase performance and persistence.

Proposition 3: The upward counterfactual effects are broad, and driven by effort mobilization.

Based on the notion that the effects of upward counterfactual thoughts are driven by augmented effort mobilization, it is furthermore assumed that these effects will be far-reaching for performance. It is not supposed that the effects of upward counterfactuals can be explained by the content-specific pathway to performance, meaning the effects are not directly connected the content of the thought (Epstude & Roese, 2008). Rather it is proposed that their effects are in accordance with the content-neutral pathway to performance. Thus, the effects for performance are independent of the strategy provided in the counterfactual (Epstude & Roese, 2008).

Self-Protection in Counterfactual Thinking

The goal of this dissertation is to look at the self-improvement side of self-evaluation; however, research has recently started to look at how counterfactual thoughts can be used to fulfill self-protection motives. It has been demonstrated that counterfactuals made after a negative outcome are often designed to protect the self and group (McCrea, 2007), and counterfactuals are frequently partial as to preserve the individual's current attitudes (Crawford & McCrea, 2004). Moreover, McCrea (2008) has looked at the role of upward counterfactuals in shielding self-esteem by excusing poor performances, namely within the realm of self-handicapping. Self-handicapping is a way of shielding self-esteem if an individual fails by alleging or forming some sort of obstacle before a performance (Berglas & Jones, 1978). This obstacle can be blamed for the poor performance, rather than the individual's abilities. Self-handicapping commonly has negative implications for long-term achievement. While successfully protecting self-esteem, the costs are substantial concerning self-improvement (McCrea, 2008). It was specifically found that when a self-handicap was offered, then more upward counterfactuals regarding that handicap were produced. It was additionally demonstrated that upward counterfactuals regarding a handicap, in comparison to control thoughts, were able to successfully shield self-esteem, however, at the expense of diminished subsequent preparation and persistence, or more generally performance. These findings support the idea that upward counterfactuals can effectively shield self-worth, although it is often then detrimental to self-improvement.

Summary & Implications for the Presented Studies

Although research has begun to investigate the potential mechanism(s) underlying the performance consequences of upward counterfactual thinking, there is no conclusive explanation for these effects at this point. A series of studies reported here investigated the consequences of these thoughts for performance and persistence. The first study was designed to directly examine the possibility that these performance effects are driven by effort mobilization and not the identification of a useful strategy. The second study was intended to discount the notion that after generating a counterfactual thought individuals are more likely to create an

implementation intention using the same strategy. This would thereby eliminate the possibility that the effects of counterfactuals are attributable to their being translated into a plan. The third study was devised to further investigate the requirements for increased effort mobilization, namely whether negative affect is needed to observe improved performance, or if it is initiated by assessing goal progress. The study additionally aimed to determine whether dissatisfaction with a performance is sufficient to mobilize efforts or if the thought needs to mention that the performance was within the individual's control. Finally, the fourth study more directly examined the notion that upward counterfactuals increase persistence, independent of the strategy contained in the thought.

Study 1: The Importance of Planning in Counterfactual Thinking

Overview

The purpose of Study 1 was to test the possibility that the effects of upward counterfactual thinking on an upcoming performance are attributable to effort mobilization or the identification of a particular strategy, as discussed in the self-evaluative model of upward counterfactual thinking. In order to compare the effects of the counterfactual thought to a plan, implementation intentions pinpointing a parallel strategy were employed. Implementation intentions are specific if-then plans identifying when, where, and how one anticipates pursuing a goal. They take the form "If I encounter situation X, then I will perform behavior Y" and delegate action control to the specified situation (Gollwitzer, 1993, 1999). For example, a marathon runner might want to improve his or her performance on an upcoming race and therefore create the plan "Whenever my alarm goes off at 5:30 am on Tuesdays and Thursdays, then I will get up and immediately go on my planned training run." Implementation intentions differ from goal intentions, which denote an end result or behavior an individual wants to reach and generally take the form "I want to achieve X." Previous research has shown that forming an implementation intention benefits goal attainment above and beyond merely forming a goal intention (Gollwitzer & Sheeran, 2006). It has furthermore been found that the effects of implementation intentions are specifically realized, in that the benefits are precisely tied to what is contained in the plan. Implementation intentions only require a conscious intent to perform the specified goal-directed behavior, which then links the goal commitment to the action (Gollwitzer, 1993, 1999). Consequently implementation intentions can serve as an exciting control to examine whether or not the advantageous effects of counterfactuals are contingent upon the creation of a plan. If counterfactuals are adapted to the form of a plan and result in improved subsequent performance based on the identification of that plan, then their effects should closely mirror those of implementation intentions.

A previous study explored the effects of counterfactual thoughts to parallel implementation intentions (Päßler & McCrea, 2006). In this study, two sets of

anagrams were completed; scores were based on correct solutions, amount of time taken to complete the word, and points were deducted for wrong answers and buying clues. Since the counterfactual identified a strategy (skipping over difficult items after 60 seconds) for the second set, it was proposed that those effects would resemble those of a complementary implementation intention. The consideration of the counterfactual did not lead to more skipping behavior on the second set, but those in the implementation intention condition were more likely to skip on the second set. Instead, participants in the counterfactual condition were more likely to solve more anagrams correct in the second set when they had experienced negative affect after completing the first set. Therefore, the strategy was not effectively implemented in the counterfactual condition.

However, there was a major shortcoming of this study; the skipping strategy mentioned in the counterfactual thought did not improve performance. It can accordingly be supposed that a more useful strategy would have been adopted by those in the counterfactual condition; therefore, Study 1 was designed to investigate whether a useful strategy contained in a counterfactual thought would lead to increased application of that strategy, and thus have similar effects as would a parallel implementation intention. It was hypothesized that implementation intentions would have specific effects linked to the increased use of the identified strategy. This should consequently enhance overall performance, assuming that the strategy is effective (Diefendorff & Lord, 2003). Their effects would furthermore be independent of affect. However, in accordance with the self-evaluative model of upward counterfactual thinking, it was predicted that the effects of upward counterfactuals would have more general effects, beyond the increased use of the identified strategy owing to the mobilization of effort. Moreover, the effects of upward counterfactual thinking should be contingent on dissatisfaction with the preceding performance, and thus should be moderated by affect. Therefore, upward counterfactual thinking should lead to increased performance when individuals report more negative or less positive mood. No specific predictions were made as to whether the upward counterfactual effects would be more robust among those experiencing less positive affect or those experiencing more negative affect, as positive and negative affect are two separate dimensions and appear to be related to

the occurrence of negative outcomes or the lack of positive outcomes, respectively (Carver & Scheier, 1999; Higgins, 1996; Watson, Clark, & Tellegen, 1988). To ensure that the effects of counterfactuals were not attributable to increases in confidence or feeling prepared, concern and uncertainty about the subsequent exam, in addition to feelings of preparedness were measured.

Methods

Participants

Subjects were 65 (40 women and 25 men) University of Konstanz students recruited through posters hung around the university or were personally asked to participate in the study. All participants were recruited on a voluntary basis. Four participants were removed because of incomplete data due to computer malfunctions. Two participants were removed on the basis of being an outlier (more than 2 standard deviations from the mean on the manipulation checks and understanding questions). Thus, 59 (37 women and 22 men) participants remained in the study. The majority of participants fell within the age range of 21 to 25 years (70%) and the age breakdown was as follows: 6 were between 16-20 years of age, 41 were between the ages of 21-25, 11 were between 26-35 years of age, and 1 was between the ages of 31-35. The participants' average semester at the university was either the 5th or 6th semester; the breakdown was 13 in either the 1st or 2nd semester, 5 in either the 3rd or 4th semester, 13 in their 5th or 6th semester, 13 in their 7th or 8th semester, and finally 15 in either their 9th or more semester. Participants were also categorized based on their major with 17 majoring in psychology, 6 majoring in lehramt deutsch, and 36 majoring in something else.

The participants were either met or escorted to the lab and then asked to read and sign an informed consent form. Participants were made aware of the fact that they could stop the experiment at any time. Participants were required to read through the directions, fill out several questionnaires, and then perform the reaction time task. Afterwards participants were debriefed, thanked, and paid for their participation (they were given the option of receiving 3€ or a half-hour of research participation credit).

Design

Participants were randomly assigned to one of four conditions, producing a 2 (counterfactual, no counterfactual) x 2 (implementation intention, no implementation intention) between-subjects design. Regarding the analyses, 15 participants were in the counterfactual condition, 14 were in the counterfactual and implementation intention condition, 16 were in the implementation condition, and 14 were in the control condition.

Paradigm

A new paradigm was used in this study that was adapted from a task developed by Jaudas and Gollwiter (2004). It was pretested beforehand to ensure its effectiveness. The reaction time paradigm was composed of 12 pictures, each with a corresponding point value ranging from 0 to 110 points. The pictures were pretested to make certain that they were not too easy or difficult to differentiate. The 12 pictures and corresponding point values were the following: a rose (0 points), a butterfly (10 points), a daisy (20 points), a pepper (30 points), a dandelion (40 points), a leaf (50 points), a tulip (60 points), a mushroom (70 points), a sunflower (80 points), a star fruit (90 points), a daffodil (100 points), and a water lily (110 points). All of the objects were of some shade of yellow, so as to make it more challenging to differentiate between the various pictures.

Two pictures appeared on the screen simultaneously, one on the right-hand side and one on the left-hand side of the screen. Participants had to choose the picture with the highest point value, pressing either the "F" key for pictures on the left-hand side or the "J" key for pictures on the right-hand side of the screen. Participants were given 5000 milliseconds to respond for each set of pictures. If participants did not press one of the corresponding keys within those 5000 ms, then a message appeared on the computer informing them that they were not quick enough ("Please try to answer quicker"), and the trial was recorded as incorrect.

Each block consisted of 132 trials and participants were required to complete two blocks throughout the experiment. Participants' scores were based on both speed and accuracy. Points were only received on the "correct" trials, meaning when the "wrong" picture (picture with the lower point value) was chosen, no points were

awarded for that trial. Points were deducted for longer response times, specifically, for every 500 milliseconds, $1/10^{\text{th}}$ of the picture's point value was deducted. Participants were not able to see their speed after each trial; average speed, percent correct, and overall score were provided after each block.

Procedure

It should be noted that the experiment was conducted in the social psychology laboratory at the university. The lab is sectioned into five cubicles, allowing five individuals to participate in the study simultaneously. A personal computer is positioned in each cubicle. This study required software from both MediaLab and DirectRT, and an Excel spreadsheet was used to calculate and provide the feedback to participants.

Participants were tested in groups of one to four persons; however, generally only one or two participants were tested at a time. After being greeted by the experimenter, participants were required to sign an informed consent statement, were given the opportunity to ask questions, and it was made clear that they could discontinue the experiment at any time.

It was explained that the experiment dealt with decision making under time pressure, and that the experimenters wanted to see what impact experience has on problem solving. This is why it was necessary for the participants to do the reaction time task twice. It was additionally mentioned that participants would be receiving feedback after the first half of the experiment. Participants were also told that the experimenters were not only interested in how individuals fare, but also groups; therefore, they would be asked to answer a few questions regarding their self-perception and expectations.

After the explanation of the experiment, participants were instructed to answer a few demographic questions and complete the Rosenberg (1965) Self-Esteem Scale, a global self-esteem measurement asking participants how they generally feel about themselves. The measure is based on a 7-point Likert scale ranging from 1 (not at all) to 7 (very much). Participants were then asked to carefully read the instructions concerning the purpose of the study and how the task would proceed.

To ensure that participants understood the reaction time task instructions and scoring, participants were required to answer four questions regarding the task. Participants were also provided with an example trial and how the scoring would be calculated. In addition, all participants were provided with the same goal (“I want to achieve as many points as possible”), thus making certain that all participants adhered to the same goal intention. Furthermore, participants were required to write the goal three times to verify that the goal was internalized.

Participants were then asked to complete six questions regarding their expectations for performance, beliefs about their ability to do well, motivation and importance of performing well on the task. Questions were based on the standards and concern scale (Hirt, McCrea & Kimble, 2000) designed to measure feelings related to importance of the task, confidence and standards for performance. The questions are based on a 7-point Likert scale, asking participants how much they agree with the various statements from 1 (not at all) to 7 (very much). An assortment of questions was used in the pretest, and those found to be of utmost importance were included.

Next, participants were given one minute to look over the 12 pictures and their corresponding point values. Afterwards, the first part of the reaction time task commenced. Participants completed block 1 of the task, consisting of 132 trials, in which all combinations of the pictures were presented twice. Each combination was presented with one picture on the right-hand side and the other picture on the left-hand side of the screen, and then were presented the second time with the same two pictures presented on opposite sides of the screen. The order of presentation was randomly assigned by the computer. The pictures chosen had been previously pretested to make certain that they were neither too easy nor too difficult to distinguish. The pictures needed to be difficult enough to allow for improvement and that the scores (feedback) was negative enough to consider counterfactual thoughts.

Participants had a maximum of 5000 milliseconds to choose one of the two pictures by pressing either the “F” or “J” key. After pressing one of the two keys, the next set of pictures appeared on the screen until the entire block was completed. After completing block 1, all participants were provided with accurate feedback by

the experimenter regarding their performance on the first half of the task. Participants were informed what percent they got correct, their average speed (in milliseconds), and the total amount of points earned on block 1 in the format of an Excel spreadsheet.

Participants in the counterfactual condition were next provided with a statement explaining that people often come up with various thoughts when they think about a past performance, and frequently think “If I had only done X, then I would have performed better.” Participants were additionally told that past participants often had the following thought “If I had pressed the corresponding key every time I saw the water lily, then I would have done better.” The water lily was the picture with the highest point value. Participants were then required to write the aforementioned counterfactual thought three times to ensure that it was internalized.

In order to keep the conditions as parallel as possible, participants in the control condition were provided with a statement explaining that people often come up with various thoughts when they think about a future performance, and frequently think “I would like to know how . . .” Participants were additionally told that past participants often had the following thought “I would like to know how my friends would do on the test.” Participants were then required to write that control thought three times.

All participants were again provided with the previous goal (“I want to achieve as many points as possible”). Furthermore, participants were required to write the goal three times, thus making certain that all participants adhered to the same goal intention.

Participants in the implementation intention condition read a similar statement explaining that people often come up with various thoughts when they think about a future performance, and frequently think “When I see X, I will perform behavior Y.” Participants were additionally told that past participants often had the following thought “Every time I see the water lily, I will immediately press the corresponding key.” Participants were also required to write that implementation intention three times.

Participants in the counterfactual plus implementation intention condition were provided with a combination of the previous two descriptions. These

participants were asked to write both the counterfactual thought, and then received the goal, before finally writing the implementation intention.

Participants were then given an additional 30 seconds to look over the pictures and their corresponding point values one last time. They were then asked to complete the Mood Adjective Scale (McFarland & Ross, 1982). Participants were informed that the experimenters wanted to be certain that their mood had not impacted their future performance. Therefore, they would be presented with various words describing feeling states and they needed to indicate how strongly they felt in that moment concerning each mood adjective. Participants were subsequently presented with 32 mood items and had to indicate on a 5-point Likert scale how they felt at that moment, ranging from 1 (very little or not at all) to 5 (very strongly). Lastly, participants were once again requested to complete the previous six questions related to the standards and concerns scale (Hirt et al., 2000).

At this point participants completed the second block of the reaction time task, which mirrors that of block 1. After completing block 2, participants were then asked to answer three final questions concerning whether they had used any particular strategy during the task and what they generally thought about the test. Participants were then provided with accurate feedback by the experimenter regarding their performance on the second half of the task. Participants were informed what percent they got correct, their average speed (in milliseconds), and the total amount of points earned on block 2. Finally, participants were thanked, fully debriefed, and paid for their participation.

Results

Overview

The effects of mood, counterfactual thoughts, and implementation intentions on change from the first block to the second block in overall score, as well as average reaction time and error rate for critical (in which the target picture appeared) and non-critical trials, was investigated. Regression analyses were conducted due to the inclusion of continuous mood scores. Separate analyses were additionally performed including positive and negative mood scores, respectively. Following the recommendations of Aiken and West (1991), continuous variables were mean-

centered, and effects coding was utilized for the counterfactual (no counterfactual condition = -1; counterfactual condition = 1) and implementation intention (no implementation intention = -1; implementation intention condition = 1) independent variables. In addition, non-significant and theoretically irrelevant interaction terms were trimmed in a step-down procedure in order to increase the power of the analyses (Judd & Kenny, 1981)¹. Significant interactions were probed using simple-slope tests conducted at +/-1 SD from the mean while controlling for the covariate. Interactions were also plotted at +/-1 SD from the mean (Aiken & West, 1991).

We controlled for ratings of importance for each block to ensure any effects were not due to differences in commitment to put forth the necessary effort on the task.² Correlations between the key measures are presented in Table 3 below. Initial analyses revealed no significant effects of negative mood, change in feelings of preparedness from block 1 to block 2, or trait self-esteem. Therefore, we do not discuss these variables further.

Table 1. Means and standard deviations of dependent variables from first block.

	Mean	Standard Deviation
Critical reaction times (ms)	947.07	304.36
Critical error rates	.10	.10
Non-critical reaction times (ms)	1136.78	287.64
Non-critical error rates	.18	.08
Score	6761.83	651.89

¹ The model was first tested with the three-way and two-way interactions; however, they were not significant.

² Adding the standards and concern scale did not change the nature of the findings.

Table 2. Means and standard deviations of dependent variables from second block.

	Mean	Standard Deviation
Critical reaction times (ms)	735.33	132.14
Critical error rates	.04	.05
Non-critical reaction times (ms)	972.93	210.18
Non-critical error rates	.12	.08
Score	7589.57	487.94

Table 3. Correlations between dependent variables.

	Δ Critical trial reaction times	Δ Critical trial error rates	Δ Non-critical trial reaction times	Δ Non-critical trial error rates	Δ Overall score
Δ Critical trial reaction times	--	-.250	.664**	-.052	.592**
Δ Critical trial error rates		--	.238	.158	-.360**
Δ Non-critical trial reaction times			--	.085	.447**
Δ Non-critical trial error rates				--	-.725**
Δ Overall score					--
<i>M</i>	211.73	-.06	163.85	-.07	827.74
<i>SD</i>	247.98	.09	193.66	.07	509.93

** $p < .01$

Importance items and mood scales

Positive and negative mood scales were created on the basis of correlation and reliability analyses. Positive mood items (i.e., active, alert, attentive, determined, enthusiastic, inspired, interested) were summed to create a single index with a

Cronbach's alpha of 0.75. Negative mood items (i.e., angry, ashamed, distressed, guilty, hostile, inadequate, jittery, scared, worried) were also summed into a single index with a Cronbach's alpha of 0.84. Separate 2 x 2 ANOVAs were conducted on positive mood, importance of the task for block 1, and importance of the task for block 2. There were no significant effects on these measures, $F_s < 2.47$, $p_s > .12$, $\eta^2 < .05$.

Difference in critical trial reaction times

The average reaction time (in milliseconds) on the critical trials in block 1 was subtracted from the average reaction time (in milliseconds) on the critical trials in block 2, such that negative numbers are indicative of faster responses on block 2 than block 1. The regression model using positive mood and predicting decreased reaction times on critical trials revealed a significant effect of the second importance item, $\beta = .413$, $t(51) = 2.68$, $p = .01$. Those believing that it was important to do well on block 2 also had slower reaction times on block 2. There was also an Implementation intention x Positive mood interaction, $\beta = .251$, $t(51) = 2.02$, $p < .05$, $f^2 = .07$, see Figure 2. Simple-slope tests indicated that individuals low in positive mood tended to have faster reaction times in the implementation intention than no implementation intention condition, simple-slope = -53.972, $t(53) = 1.21$, $p = .23$, 95% CI: -35.72 to 143.67. No effects for the high positive group were found, simple-slope = 39.752, $t(53) = .86$, $p = .40$, 95% CI: -132.74 to 53.24. Moreover, the Counterfactual thought x Positive mood interaction was significant, $\beta = .334$, $t(51) = 2.78$, $p < .01$, $f^2 = .13$, see Figure 3. Simple-slope tests indicated that individuals low in positive mood had faster reaction times in the counterfactual than in the no counterfactual condition, simple-slope = -120.363, $t(53) = 2.88$, $p < .01$, 95% CI: 36.48 to 204.25. The counterfactual effect was not significant among those high in positive mood, simple-slope = 21.173, $t(53) = .50$, $p = .62$, 95% CI: -105.72 to 63.38. There were no other effects, $t_s < 1.67$, $p_s > .10$.

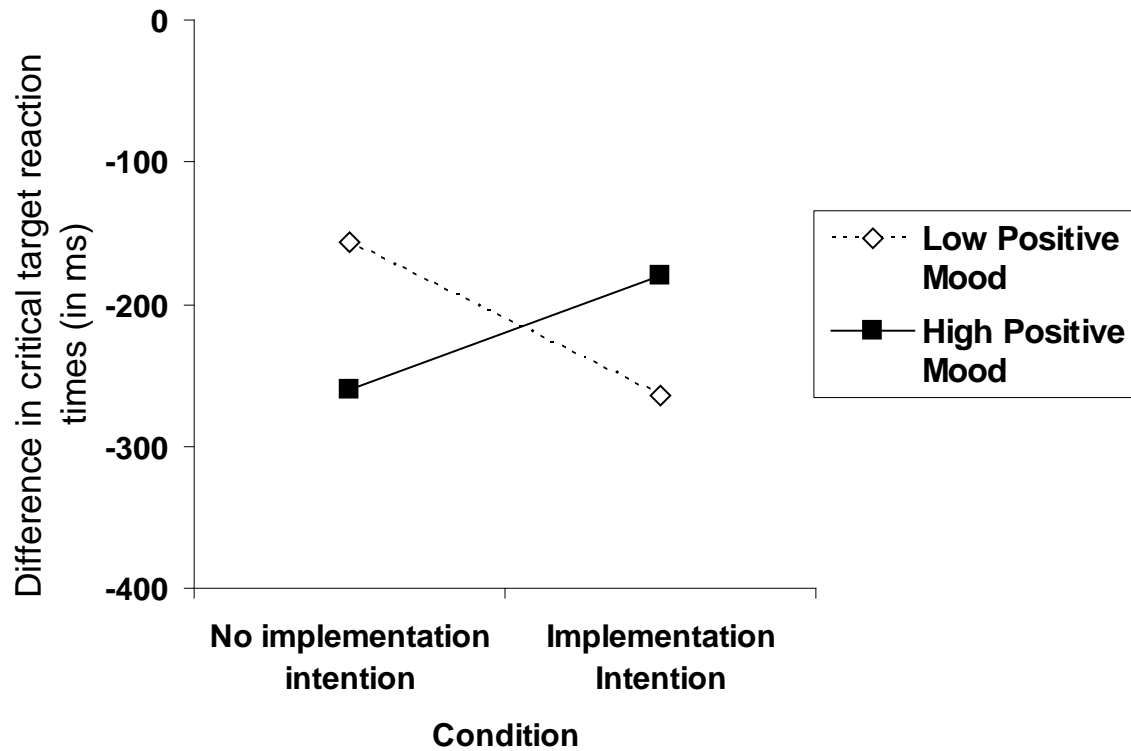


Figure 2. Implementation intention \times Positive mood interaction on difference in reaction time to critical target.

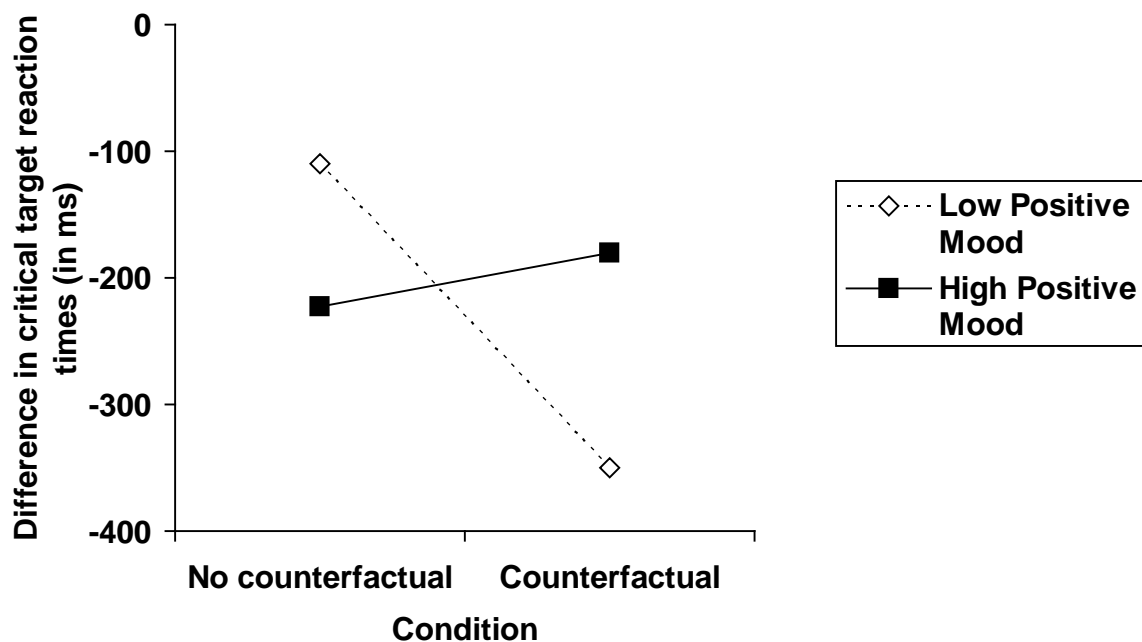


Figure 3. Counterfactual \times Positive mood interaction on difference in reaction time to critical target.

Difference in critical trial error rates

The percentage of errors on critical trials in block 2 was subtracted from the percentage of errors on critical trials in block 1. No significant effects were found, $t_s < 1.79$, $p_s > .08$, although this may be due to the high accuracy rate on these trials.

Difference in non-critical trial reaction times

The reaction time (in milliseconds) on the non-critical trials in block 1 was subtracted from the reaction time (in milliseconds) on the non-critical trials in block 2. The regression model revealed a significant effect of the second importance item, $\beta = .421$, $t(51) = 2.45$, $p < .05$. Those who thought that it was important to do well on block 2 also had slower reaction times on block 2. No other significant effects were found, $t_s < 1.65$, $p_s > .11$.

Difference in non-critical trial error rates

The percentage of errors on non-critical trials in block 2 was subtracted from the percentage of errors on non-critical trials in block 1. The regression model using positive mood and predicting a difference in percentage of errors on non-critical trials revealed a significant effect of the first importance item, $\beta = .367$, $t(51) = 2.29$, $p < .05$. Those believing that it was important to do well on block 1 also made fewer errors on the non-critical trials in block 1. Moreover, a significant Counterfactual thought \times Positive mood interaction was revealed, $\beta = .265$, $t(51) = 2.05$, $p < .05$, $f^2 = .08$, see Figure 4. Individuals low in positive mood tended to make fewer errors on non-critical trials in the counterfactual condition than in the no counterfactual condition, simple-slope = $-.023$, $t(53) = 1.91$, $p = .06$, 95% CI: $-.046$ to $.001$. The counterfactual effect was not significant among those high in positive mood, simple-slope = $.008$, $t(53) = .71$, $p = .48$, 95% CI: $-.015$ to $.032$. No other effects were observed, $t_s < 1.27$, $p_s > .08$.

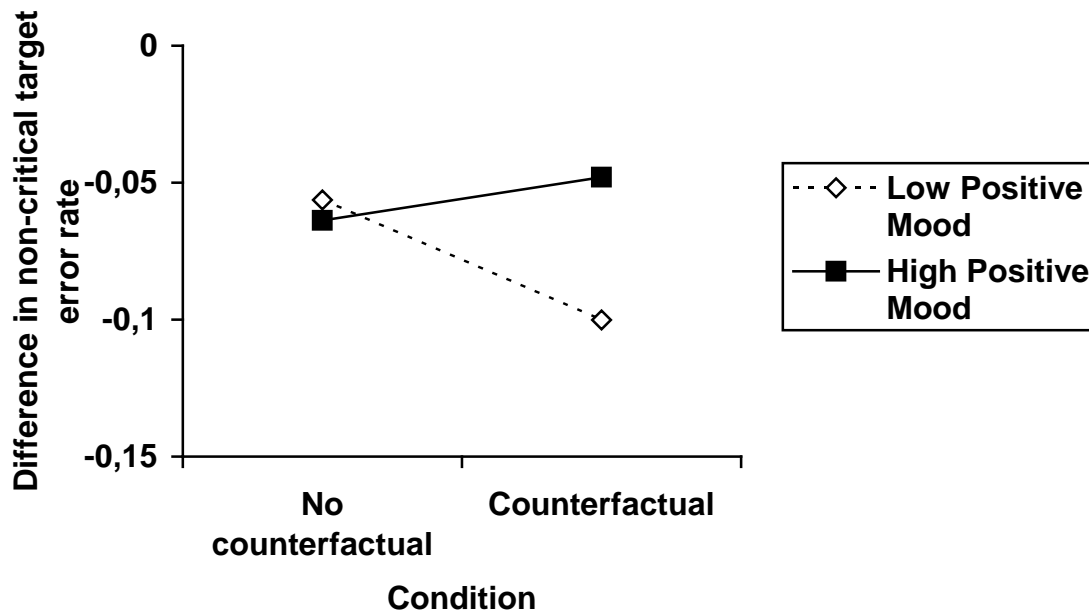


Figure 4. Counterfactual \times Positive mood interaction on difference in error rates for non-critical targets.

Overall score

The total score in block 1 was subtracted from the total score in block 2. The regression model revealed a significant Implementation intention \times Positive mood interaction, $\beta = -.306$, $t(51) = 2.42$, $p < .05$, $f^2 = .10$, see Figure 5. Participants low in positive mood tended to score more points in the implementation intention than no implementation intention condition, simple-slope = 172.321, $t(53) = 1.83$, $p = .07$, 95% CI: -16.48 to 361.13, and no effects were found in the high positive group, simple-slope = -63.641, $t(53) = .65$, $p = .52$, 95% CI: -259.38 to 132.10. The regression model additionally revealed a significant Counterfactual \times Positive mood interaction, $\beta = -.386$, $t(51) = 3.15$, $p < .01$, $f^2 = .16$, see Figure 6. Participants low in positive mood tended to score more points in the counterfactual than no counterfactual condition, simple-slope = 234.124, $t(53) = 2.61$, $p < .05$, 95% CI: 54.21 to 414.04, and no effects were found in the high positive group, simple-slope = -98.433, $t(53) = -1.09$, $p = .28$, 95% CI: -279.78 to 82.92. There were no other significant effects, $ts < 1.10$, $ps > .16$.

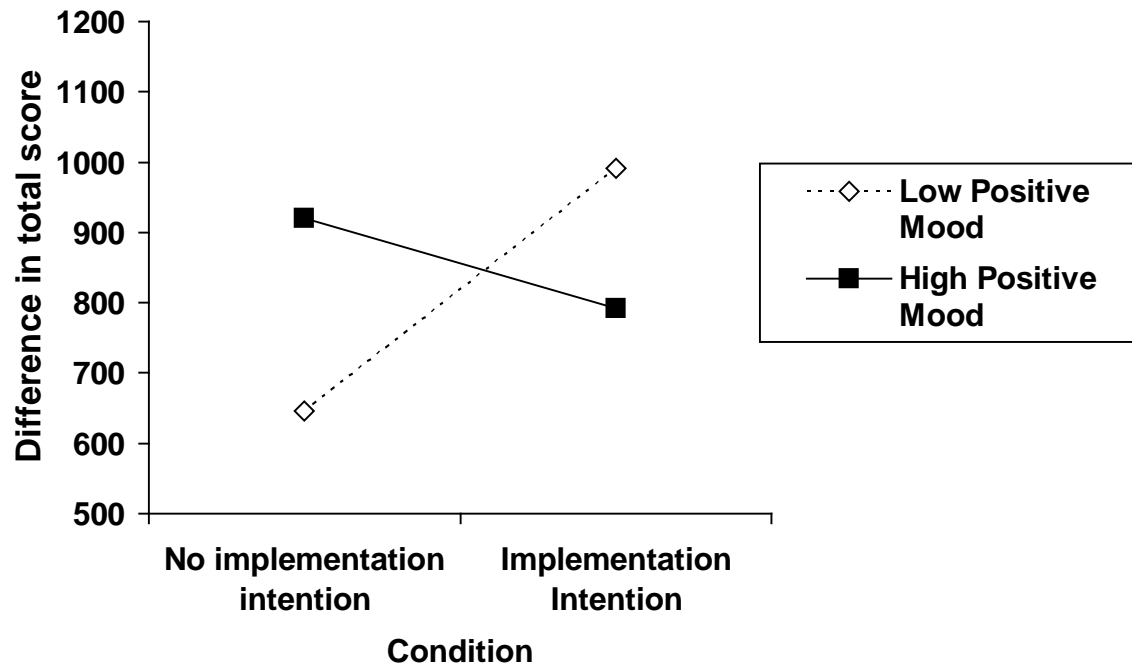


Figure 5. Implementation intention \times Positive mood interaction on difference in total score.

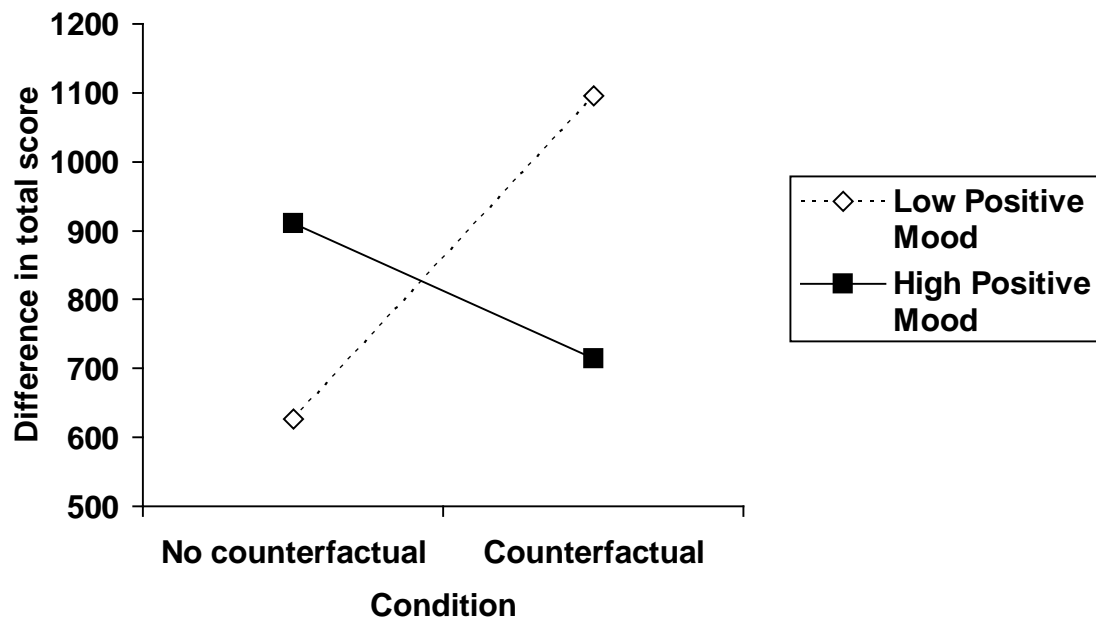


Figure 6. Counterfactual \times Positive mood interaction on difference in total score.

Discussion

As expected, counterfactual thoughts and implementation intentions had independent and additive effects on the use of a particular strategy and performance. The advantageous effects of upward counterfactuals not only were associated with the strategy mentioned in the thought, but additionally generalized to other elements of the task. On the other hand, the beneficial effects of implementation intentions were linked directly to the strategy identified in the plan. Moreover, as predicted the effects of the upward counterfactual thoughts were moderated by mood. Participants in the counterfactual condition who experienced decreased positive mood performed better on numerous components of the task. Those participants had faster reaction times on the critical trials, made less errors on the non-critical trials, and achieved a superior overall score on the second block of the task, in comparison to the first block. Participants in the implementation intention used the strategy mentioned in the plan and also experienced faster reaction times on critical trials and increased overall score on the second block, compared to the first block of the task.

This study supports the notion that the counterfactual effects on an upcoming performance result from the mobilization of effort, and not the identification of a specific strategy. Even though upward counterfactuals were found to affect reactions on the critical trials, further benefits were experienced by the creation of specific plans. This contradicts the conception that the benefits of upward counterfactuals can be linked to a content-specific pathway. The results from this study largely mirror those attained by Päßler and McCrea (2006), suggesting that the effects of counterfactual thinking and implementation intentions are independent. The present study extends this past work by demonstrating the same effects even when the strategy was effective, shows that the results cannot be attributed to variations in goal commitment or understanding of the task.

One finding that should be commented on is the fact that the effects of upward counterfactuals thoughts were moderated by positive mood, whereas previous studies have found the effects to be moderated by negative mood. Although no conclusion can be drawn at this point as to why this occurred, it is plausible that the actual task paradigm is somehow imperative in deciding whether negative or

positive mood is most pertinent for assessing goal progress. One possible explanation is that participants viewed the task in a different light; instead of thinking about it as a problem solving task, they may have thought about it in terms of identifying rewards. Thus, positive, rather than negative, affect may have been perceived as most suitable for performance evaluations (Friedman, Förster, & Denzler, 2007; Higgins, 2000). It should also be noted that the REM, as well as the findings from Markman and colleagues (2008) found that the counterfactual effects for performance were mediated, instead of moderated, by affect. Yet an important difference is that no reflection or evaluation instructions were given in this study, which was performed by Markman and colleagues (2008).

Nearly all the findings were in accordance with those predicted, with one exception. It was not expected that the implementation intention effect would be moderated by mood, such that only those in the implementation intention condition, who also experienced reduced positive mood, would had faster reaction times on the critical trials and improved overall score. Although mood moderation has not been frequently found in implementation intention research, a study by Bayer and Gollwitzer (2007) demonstrated that standard increases in stereotyping among participants in a positive mood (e.g. Bodenhausen, Kramer, & Suesser, 1994) were actually decreased when participants held the goal of preventing biases and complemented it with an implementation intention. Thus, it is unlikely that participants experiencing a positive mood are incapable of applying an implementation intention. It seems more plausible that those in a high positive mood were inadequately motivated and thus did not accept the plan, which could result from a weak goal intention (Sheeran, Webb, & Gollwitzer, 2005). Conversely, it has previously been argued that affect is used to test if there is a match or mismatch between an individual's current situation and the situation identified in the implementation intention (Schwarz & Bohner, 1996). Schwarz and Bohner (1996) posit that when an individual probes for discrepancies between the current state and the implementation intention, those experiencing positive affect are more probable to assess the current state as discrepant, which then results in diminished use of the identified strategy. Further research is needed to examine the role of mood

moderation in implementation intention effects and specifically investigate these two possible explanations.

Conclusion

Upward counterfactual thinking has valuable consequences for performance, which appear to be linked to their mobilization of effort and not to the identification of a particular strategy. Mood seems to play a central role in moderating these effects. Implementation intentions, alternatively, have important consequences for performance specifically associated with the planned behavior. According to the results from Study 1, the effects of counterfactual thoughts maintain the notion of a content-neutral pathway to performance.

Study 2: Self-Generating Counterfactuals and Implementation Intentions

Overview

After reviewing the previous study on counterfactual thoughts and implementation intentions, it appears that the benefits of counterfactual thinking for performance are independent of forming a corresponding plan. Instead, it seems that considering the upward counterfactual thought leads to enhanced effort mobilization. Study 1 was conducted in a controlled setting, in which participants were explicitly provided with the strategies, either in the form of counterfactuals or implementation intentions, or both. This was done to ensure that the strategy contained in the counterfactual and implementation intention were the same. However, it could be argued that, while they have independent effects on behavior, considering a counterfactual makes it more likely that a corresponding plan will be formed. It has previously been shown that considering counterfactuals may result in the creation of similar behavioral intentions (Smallman & Roese, 2007). Particularly when given a chance to freely generate an upward counterfactual, individuals may be more likely to create an implementation intention identifying the same strategy, which in turn leads to additional performance benefits. Accordingly, an additional study was designed to determine if individuals are more prone to make a matching implementation intention after generating their own counterfactual.

Study 2 was designed to be a short and concise study that was geared toward a target group, first semester students. It was assumed that first semester college students struggle with trying to make new friends, while maintaining their old friends back home when moving away to attend college. Therefore, Study 2 dealt with problems new students face regarding maintaining friendships and how to overcome these problems. Friendships were thus believed to be an important and relevant issue for all new students and one that the participants could easily generate thoughts about. Participants formed implementation intentions either after generating counterfactual thoughts or not. It was predicted that counterfactual thoughts and implementation intentions are two separate and independent processes. This prediction is also in accordance with the Rubicon model, which

emphasizes that goal pursuit is carried out in four distinct stages (Gollwitzer, 1990). Counterfactual thoughts transpire in the post-actional phase (Epstude & Roese, 2008), as they assist in judging whether the goal was attained or not and whether or not goal pursuit should resume (Gollwitzer, 1996; Heckhausen & Gollwitzer, 1987). Therefore, participants should not be more prone to generate corresponding implementation intentions after generating counterfactual thoughts.

Methods

Participants

Subjects were 33 University of Konstanz students recruited from an introductory psychology class geared toward first semester psychology students. All participants were recruited on a voluntary basis. The questionnaire was handed out at the beginning of class and collected later from those who were willing to participate in the study.

Design

Participants were randomly assigned to one of two conditions, producing a 2 (implementation intention, counterfactual x implementation intention) between-subjects design. Regarding the analyses, 15 participants were in the implementation intention condition and 18 were in the counterfactual by implementation intention condition.

Procedure

The experimenter received permission to distribute the questionnaires in one of the larger social psychology courses for new students. The experimenter arrived at the beginning of class and distributed the questionnaires to all students in the course. Participants were asked to read the instructions and fill out the questionnaires on their own. It was made clear that the experiment was anonymous and that the information would only be used for experimental purposes. Participants in the counterfactual condition then read about how when people move away, they often have difficulties both maintaining old friendships back home and trying to meet new people and make new friendships at the university. They also read about how people

frequently have thoughts about the past like “What would have happened if ...” Those in the counterfactual condition were asked think about a lost friendship or one that is difficult to maintain and write three different thoughts as to what they could have done to better maintain their friendship (“If I would have . . . , then I would have maintained my friendship better”). All participants received the implementation intention instructions and read about how people often think about the future and then make a plan in the form of “Every time when ... happens, then I will ...” They were asked to think about a friendship that they would like to rekindle or one that is momentarily difficult to maintain and then complete the three situations, indicating what they could do to rekindle or better maintain their friendship (“Whenever . . . , then . . .”). Lastly, participants were asked to indicate how important it is to them to maintain their friendships on a 5-point Likert scale ranging from 1 (very little or not at all) to 5 (a lot). After sufficient time was provided and all participants were finished filling out the questionnaire to the best of their ability, the experimenter collected the questionnaires from those students who were willing to participate in the study.

Results

Overview

The counterfactual thoughts and implementation intentions were coded by two independent raters, who were blind to the experimental hypotheses. Agreement for the counterfactuals and implementation intentions was moderately good (67%, $\kappa = .58$). The experimenter coded any items where there was a disagreement between the coders. The counterfactuals and implementation intentions were coded based on their content into six categories as follows: those related to “contact” (for example, “If my friend calls me, then I will immediately return her call”), related to “meeting” (for example, “If I go home for the weekend, then I will visit my friend”), related to “interest” (for example, “If I would have showed more interest in my friend, then I could have maintained our friendship better”), related to “thinking about someone” (for example, “If I would have thought about him more, then I could have maintained our friendship better”), related to their “new situation” (for example, “If I wasn’t so busy with my new life, then I could have maintained our friendship

better”), or those not related to one of the other five categories. Table 4 shows the correlations between the various six categories of upward counterfactual thoughts. Furthermore, Table 5 below illustrates the correlations between the six categories of upward counterfactual thoughts and implementation intentions among those who generated both counterfactuals and implementation intentions.

Table 4. Correlations between various counterfactual thought categories.

	Cf - contact	Cf - meet	Cf - interest	Cf - think about	Cf - new situation	Cf - other
Cf - contact	--	.305	.155	-.152	.463**	.300
Cf - meet		--	-.088	-.092	-.044	.181
Cf - interest			--	.341	-.044	.407*
Cf - think about				--	-.070	.139
Cf - new situation					--	-.092
Cf - other						--

* $p < .05$, ** $p < .01$

Table 5. Correlations between various counterfactual thoughts and implementation intentions.

	Imp - contact (<i>f</i> = 27)	Imp - meet (<i>f</i> = 21)	Imp - interest (<i>f</i> = 9)	Imp - think about (<i>f</i> = 3)	Imp - new situation (<i>f</i> = 3)	Imp - other (<i>f</i> = 7)
Cf - contact (<i>f</i> = 14)	.090	-.167	.239	.130	.189	-.120
Cf - meet (<i>f</i> = 7)	.212	.249	-.051	-.193	-.282	-.357
Cf - interest (<i>f</i> = 7)	.039	-.231	.255	-.193	.081	.255
Cf - think about (<i>f</i> = 1)	-.041	.417	-.108	-.059	-.086	-.108
Cf - new situation (<i>f</i> = 5)	.049	.180	-.258	-.140	.102	.000
Cf - other (<i>f</i> = 13)	-.357	-.172	.076	.410	.060	.302

A t-test was first conducted to examine if there was an effect of the opportunity to generate counterfactuals on the various categories of the implementation intentions created; however, no effects were found $t_s < 1.33$, $p_s > .19$. Thus, the generation of counterfactual thoughts did not appear to alter the plans made by individuals. Table 6 presents the means and standard deviations for the six categories by condition, meaning those who only generated implementation intentions and those who generated both implementation intentions and counterfactual thoughts.

Table 6. Means and standard deviations of various categories in the no counterfactual and counterfactual condition.

	No counterfactual	Counterfactual
Category 1 (contact)	$M = .93$ $SD = .70$	$M = 1.11$ $SD = .68$
Category 2 (meeting)	$M = .80$ $SD = .41$	$M = .78$ $SD = .73$
Category 3 (interest)	$M = .33$ $SD = .49$	$M = .17$ $SD = .38$
Category 4 (thinking about)	$M = .20$ $SD = .56$	$M = .06$ $SD = .24$
Category 5 (new situation)	$M = .00$ $SD = .00$	$M = .11$ $SD = .32$
Category 6 (other)	$M = .40$ $SD = .74$	$M = .17$ $SD = .38$

It was also examined whether participants were more likely to generate a particular implementation intention after generating a corresponding counterfactual thought. This was done by breaking down each of the counterfactual variables into three subcategories: those in the counterfactual condition who generated at least one thought in that particular category, those in the counterfactual condition who did not generate thoughts in that category, and those assigned to the control condition.³ Fisher's exact test⁴ was performed on each content category, as the sample size was relatively small. It was tested whether there was a significant association (contingency) between the three subcategories of counterfactual thoughts and whether or not individuals formed an implementation intention in that category. For

³ An additional fisher's exact test was also conducted by collapsing the breakdown of the counterfactual condition (those who made the thought and those who did not make the thought) into one category; however, no effects were found.

⁴ Chi-square test could not be performed, as less than 80% of the categories had a frequency of less than 5, and some cells had a frequency of 0.

all six categories, the probability of creating a parallel implementation intention after a counterfactual was not found to be significant. Table 7 provides a summary of the likelihood of making such parallel thoughts for each category. Thus, individuals were no more likely to form a particular implementation intention when they had generated a counterfactual in the same category as when they had not generated such a thought.

Table 7. Probability of generating matching counterfactuals and implementation intentions.

	<i>p</i> -values
Category 1 (contact)	.85
Category 2 (meeting)	.10
Category 3 (interest)	.28
Category 4 (thinking about)	.63
Category 5 (new situation)	.18
Category 6 (other)	.23

Discussion

As predicted, when participants were asked to generate their own upward counterfactual thought, they were no more likely to create a parallel implementation intention. Regardless of the content category, counterfactual thoughts were not predictive of the content of the subsequent implementation intentions. In fact, no relationship could be established between the content of the upward counterfactuals and that of the implementation intentions. Furthermore, the opportunity to create a counterfactual thought did not change the implementation intentions the participants made. This finding supports the notion that counterfactual thinking and implementation intentions are two separate and independent processes. Moreover, it is plausible that looking back on a performance and looking ahead to an upcoming performance are two different things. Consequently, after generating counterfactual thoughts, an individual may not generate parallel implementation intentions. Conversely, Smallman and Rouse (2007) found that upward counterfactuals resulted

in enhanced accessibility of behavioral intentions. Nevertheless, it should be noted that behavioral intentions, similar to goal intentions, are not exactly the same as implementation intentions (Gollwitzer, 1993). Moreover, according to the model of action phases, counterfactuals transpire in the post-actional phase, as they encompass evaluating, while implementation intentions encompass planning; hence, they comprise two different mindsets (Gollwitzer, 1996; Heckhausen & Gollwitzer, 1987). Thus, it is improbable that individuals in the counterfactual conditions formed matching implementation intentions in Study 1, suggesting their effects are truly independent. This finding is consistent with the view that the beneficial effects of implementation intentions are due to their content, whereas the advantageous effects of counterfactual thoughts are not necessarily based on the formation of a plan. Instead, the effects of upward counterfactual thinking seem to be due to effort mobilization, which has more far-reaching consequences for performance.

Conclusion

Counterfactual thoughts and implementation intentions are not interdependent processes; rather, they are two separate and independent processes. After generating a counterfactual thought, an individual is not more likely to make a corresponding implementation intention. Taken together with the findings from Study 1, it is most likely that counterfactual thoughts and implementation intentions have independent and additive consequences for performance.

Study 3: Role of Controllability and Affect in Counterfactual Thinking

Overview

Study 1 revealed that the beneficial effects of counterfactual thinking cannot be attributed merely to forming simple plans (i.e., implementation intentions). Furthermore, the findings from Study 1 demonstrated that upward counterfactuals appear to have broader consequences for performance that seem to be dependent on the mobilization of effort. However, it is still unclear whether the benefits of counterfactuals for performance are really due to effort mobilization. Assuming that the performance effects are a result of effort mobilization, then it is plausible that they are linked to the identification of a goal discrepancy, as discussed in the self-evaluative model of upward counterfactual thinking. It is unclear from Study 1 if participants viewed goal progress as insufficient, given that the goal was subjective. Moreover, the question remains open as to whether the salience of failure or rather thoughts indicating that superior performance outcome was possible are crucial in improving subsequent performance.

Research from diverse fields has indicated that affect can be used as input into goal progress assessments (Gendolla, 2000; Hirt et al., 1996; Martin et al., 1993). An individual would experience negative affect when the feedback denotes that insufficient goal progress is being made. If the individual believes goal attainment to be feasible, then more effort and persistence should be engaged, such that the likelihood of an improved performance and goal achievement would be augmented. On the other hand, an individual experiences positive affect when the feedback denotes that sufficient goal progress is being made. Positive affect indicates that a reduced amount of effort is sufficient for goal achievement, and therefore, effort and persistence should be decreased. This would imply that it is critical whether a performance outcome meets an objective goal standard or not. If goal progress is consequently viewed as insufficient, then this should be used to mobilize effort and lead to performance benefits. Therefore, the salience of failure (knowing that the goal has not been reached) or perhaps recognizing that a better performance was feasible could be the motivating force behind these effects.

According to this notion and the self-evaluative model of upward counterfactual thinking, it would then be expected that upward counterfactual thoughts would produce increases in negative affect by suggesting that goal pursuit is not advancing correctly. Thus, the individual should in turn use this negative affect as an indicator of insufficient goal progress and effort should be mobilized. Previous work conducted in the laboratory has pointed towards this notion (McCrea, 2008; Päßler & McCrea, 2006). McCrea and colleagues (2006) have explicitly demonstrated that upward counterfactuals only result in increased consequent effort when enhanced negative affect is experienced. Furthermore, past research has indicated that the experience of positive affect does not initiate subsequent increases in effort and can sometimes actually lead to a decline in effort.

Study 1 provided participants with a subjective goal, to achieve as many points as possible. Moreover, participants received accurate feedback; however, this feedback did not indicate how well or poorly they were doing, as there was no objective point of comparison. Accordingly, if participants are given a clear, objective performance standard and goal progress information is presented in the feedback, this information should be used to determine if their goal progression is sufficient or not. Martin and colleagues (1993) have purposed that when performance is objectively assessed and determined to be inadequate, then affect should not be taken into consideration. Thus, Study 3 implemented both an objective goal, in addition to goal progress information being provided in the feedback.

If the preparative effect of upward counterfactual thinking is considered from a control-based perspective, then it would be predicted that successful outcomes would lead to enhanced feelings of control and confidence (Tal-Or et al., 2004). Upward counterfactuals suggest the outcome could be better, which may in turn increase expectations of success or feelings of control for a future performance. Consequently, the greatest performance benefits should be experienced when upward counterfactuals are accompanied by a comparatively positive outcome. In doing so, this would allow the individual to be most confident when the possibility of repeating their previously successful performance exists. Conversely, more average performances and outcomes should decrease the individual's feeling of

confidence on upcoming performances, which would thereby undermine the benefits of counterfactual thoughts.

Another important factor to take into consideration is the idea of controllability, as proposed by the self-evaluative model of upward counterfactual thinking. If upward counterfactuals lead to improved performance via effort mobilization, then in order to mobilize those efforts, an individual has to deem increased effort as advantageous (Bandura, 1977; Bandura & Cervone, 1983; Vroom, 1964; Weiner, 1985). Hence, counterfactual thoughts that insinuate that the individual's own controllable actions were responsible for the outcome will trigger effort mobilization and result in performance benefits (see also Bandura, 1977; Bandura & Cervone, 1983; Vroom, 1964; Weiner, 1985). If the counterfactual insinuates that something out of the individual's control was responsible for the outcome, then it is doubtful that this will lead to effort mobilization.

The purpose of Study 3 was to systematically test the aforementioned potential explanations for the beneficial effects of upward counterfactual thinking. To examine these different accounts, the reaction time task paradigm from Study 1 was used. However, the conditions were set up differently, so that the role of goal discrepancy could also be tested. This study employed the following four conditions: counterfactual with antecedent, counterfactual without antecedent, goal discrepancy, and control. Furthermore, affect measures were calculated at two different time points. A very specific and objective goal was utilized instead of the subjective goal from Study 1. Relative performance was held constant, which should have implications for affect, perceived goal progress, and feelings of control. The counterfactual thought additionally linked an action within the participants' control to the insufficient performance outcome.

Study 3 first predicted that negative affect and dissatisfaction with goal progress would be highest in the counterfactual, moderate feedback condition. If negative affect is the key factor, then mood moderation effects should be found. If however the evaluation of goal progress is the key factor, then no mood effects should be found, as goal progress could be objectively assessed. The question of whether dissatisfaction with a performance outcome, plausibly in the form of increased salience of failure or thoughts suggesting a better outcome was possible, is

adequate to generate effort mobilization or whether the counterfactual needs to specify that the outcome was controllable was furthermore examined. Effort mobilization should only transpire if the chances of it ending in success are high. Lastly, if the effects really are due to mobilization of effort, as believed, then the effects of the counterfactual should be more far-reaching and not as specific.

Methods

Participants

Subjects were 107 (67 women and 40 men) University of Konstanz students recruited through posters hung around the university or were personally recruited to participate in the study. All participants were recruited on a voluntary basis. A total of 11 participants were excluded due to not following directions (e.g., wrote the wrong goal or wrote the wrong thought) or because they scored extremely low on the motivation and understanding of the task questions (they scored "1" on at least 6 of the 12 questions). Thus, 96 (62 women and 34 men) participants remained in the analyses. The majority of participants were between the ages of 21 and 25 years (52.1%) and the age breakdown was 27 in the 16-20 years of age category, 50 in 21-25 years of age category, 14 in the 26-35 years of age category, 2 in the 31-35 years of age category, 1 in the 36-40 years of age category, and 2 in the over 40 years of age category. The average length of the participants' studies thus far was 1st or 2nd semester and the breakdown was the following: 45 1st or 2nd semester students, 10 3rd or 4th semester students, 18 5th or 6th semester students, 13 7th or 8th semester students, and 10 students in their 9th or more semester. Participants were also categorized based on their major: 26 were majoring in psychology, 6 in lehrant deutsch, and 64 in one of the majors not mentioned.

The participants were met at the lab or were escorted to the lab. Afterwards, they were asked to carefully read and sign an informed consent before participating in the study. Participants were clearly instructed that they could end the experiment at any time and were furthermore encouraged to ask questions. After the experiment, all participants were debriefed, thanked, and paid for their participation. They were given the option of receiving 3€ or a half-hour of research participation credit.

Design

Participants were randomly assigned to one of four conditions (counterfactual with antecedent, counterfactual without antecedent, goal discrepancy, control) in a between-subjects design. After removing the 11 participants for extremely low motivation or for not following directions, 23 participants were in the counterfactual condition, 24 in the counterfactual without antecedent condition, 26 in the goal discrepancy condition, and 23 in the control condition.

Procedure

This study, as in Study 1, was also conducted in the social psychology lab and employed MediaLab and DirectRT. An Excel spreadsheet was utilized to calculate and supply feedback for participants.

Study 3 employed the same paradigm (reaction time task) as in Study 1 and the same cover story. Participants were tested in groups of one to four persons; however, generally only one or two participants were tested at a time. After being greeted by the experimenter, participants were required to sign an informed consent statement and were given the opportunity to ask questions. Following the explanation of the experiment, participants were instructed to again answer several questions before receiving the instructions for the task.

All participants were provided with the statement (“I want to be in the top 30 percent of participants on the test”) and asked to write it three times to ensure that all participants adhered to the same goal intention. The 30th percentile was chosen, as it would not be seen as too difficult. To ensure that participants understood the reaction time task instructions and scoring, participants were required to answer three questions regarding the task. For example, “It is ok to make a few mistakes in order to work quickly on the task.” These three questions asked participants to what degree they agreed or disagreed with the statements based on a 7-point Likert scale ranging from 1 (not at all) to 7 (very much).

Study 3 utilized the same mood scale as in Study 1, the Mood Adjective Scale (McFarland & Ross, 1982); however, a trimmed down scale was used. The mood adjectives were the following: active, alert, attentive, determined, enthusiastic, inspired, interested, prepared, angry, ashamed, distressed, guilty, hostile,

inadequate, jittery, scared, and worried. The mood scale then consisted of 17 mood adjectives and had the same scoring as Study 1. Participants filled out the questionnaire and had one minute to look over the pictures.

As in Study 1, participants completed the first block of the reaction time task, but with the goal of being in the top 30th percentile of participants (“I want to be in the top 30 percent of participants on the test”). Participants then received feedback indicating that they just missed their goal and were instead in the top 33rd percentile of participants on the test. Here the 33rd percentile was selected because it was believable and made eventual success appear possible. They were additionally provided with accurate feedback on their average speed, percentage of trials correct, and number of points earned on that block (round).

At this point, participants were randomly assigned to one of four conditions. In the counterfactual thought with antecedent behavior condition, participants were provided with a statement explaining that people often come up with various thoughts when they think about a past performance, and frequently think “If I had only done X, then I would have performed better.” Participants were additionally told that past participants often had the following thought “If I had pressed the corresponding key as soon as I saw the water lily, then I could have been in the top 30 percent of participants on the test.” They were then asked to write this thought three times and related the thought to their own behavior.

In the counterfactual thought without antecedent behavior condition, participants were provided with similar instructions, but were told that past participants often had the following thought “I could have been in the top 30 percent of participants on the test.” They were also required to write this thought three times and relate the thought to their own performance.

In the goal discrepancy condition, comparable instructions were presented; however, participants received and wrote the thought “I was not in the top 30 percent of participants on the test” three times and related it to their own performance.

In an attempt to keep the conditions comparable, participants in the control condition were provided with a statement explaining that people often come up with various thoughts when they think about a future performance, and frequently think

“I would like to know how . . .” Participants were informed that past participants often had the following thought “I would like to know how my friends would do on the test.” They were asked to consider the thought and write it three times. All participants again wrote the goal intention (“I want to be in the top 30 percent of participants on the test”) three times.

Participants then completed the modified mood adjective scale and had 30 seconds to once again look over the pictures and their corresponding point values. They then completed the second block of the reaction time task and answered several questions about the task. Specifically, they were asked if they used a particular strategy on the task, if they found anything about the task strange, what they thought the experiment was about, to what extent they were dissatisfied with their performance on the first half of the test, and to what extent they were motivated to improve on the second half of the test. Participants were then provided with feedback, as after block 1.

Results

Overview

The effects of mood and condition on change from the first block to the second block in overall score, as well as average reaction time and error rate for critical (in which the target picture appeared) and non-critical trials, was investigated. Regression analyses were conducted, as in Study 1. Regression analyses were conducted due to the inclusion of continuous mood scores. Table 8 provides an overview of the dummy codings used in this study, namely comparing each of the three various conditions against the control condition. Separate analyses including positive and negative mood scores were conducted, respectively. Following the recommendations of Aiken and West (1991), continuous variables were mean-centered. Below are tables illustrating the means and standard deviations of the dependent variables from block 1 (Table 9) and block 2 (Table 10), as well as the correlations between the various dependent variables (Table 11).

Table 8. Dummy codings.

	Counterfactual	Counterfactual without antecedent	Goal discrepancy	Control
Dummy 1	1	0	0	0
Dummy 2	0	1	0	0
Dummy 3	0	0	1	0

Table 9. Means and standard deviations of dependent variables from first block.

	Mean	Standard Deviation
Critical reaction times (ms)	986.50	327.27
Critical error rates	.16	.15
Non-critical reaction times (ms)	1143.17	322.78
Non-critical error rates	.23	.10
Score	6323.71	902.21

Table 10. Means and standard deviations of dependent variables from second block.

	Mean	Standard Deviation
Critical reaction times (ms)	757.19	171.57
Critical error rates	.07	.09
Non-critical reaction times (ms)	974.71	246.64
Non-critical error rates	.16	.10
Score	7229.48	711.10

Table 11. Correlations between dependent variables.

	Δ Critical trial reaction times	Δ Critical trial error rates	Δ Non-critical trial reaction times	Δ Non-critical trial error rates	Δ Overall score
Δ Critical trial reaction times	--	-.247*	.676**	.114	-.361**
Δ Critical trial error rates		--	.051	.010	.482**
Δ Non-critical trial reaction times			--	.157	-.230*
Δ Non-critical trial error rates				--	.689**
Δ Overall score					--
<i>M</i>	229.31	-.09	168.47	-.07	905.77
<i>SD</i>	302.03	.12	252.86	.07	547.94

* $p < .05$, ** $p < .01$

Importance items and mood scales

Positive and negative mood scales were combined and based on the scales used in Study 1. Positive mood items (i.e., active, alert, attentive, determined, enthusiastic, inspired, interested, prepared) were summed to create a single index for each block; although, only that from block 2 was used in the analyses, as in Study 1. The Cronbach's alpha of positive mood for block 2 was 0.86. Negative mood items (i.e., angry, ashamed, distressed, guilty, hostile, inadequate, jittery, scared, worried) were also summed into a single index for each block. The Cronbach's alpha of negative mood for block 2 was 0.78.⁵ The regressions below were performed using negative mood from the second measurement (as done in Study 1) and when controlling for the two importance measurements (also parallel to Study 1) as

⁵ The Cronbach's alpha of positive mood block 1 was 0.79 and of negative mood for block 2 was 0.78.

covariates. No mood effects were found; the main effects are considered below in detail.

Difference in critical trial reaction times

The average reaction time (in milliseconds) on the critical trials in block 1 was subtracted from the average reaction time (in milliseconds) on the critical trials in block 2. No significant differences were found between the various conditions, all $t_s < .04$, $p_s > .43$.

Difference in critical trial error rates

The percentage of errors on critical trials in block 2 was subtracted from the percentage of errors on critical trials in block 1. The regression model, using negative mood from the second measurement, revealed a significant main effect of dummy 1, $\beta = -.283$, $t(86) = 2.28$, $p < .05$, $f^2 = .06$. Participants in the counterfactual condition made fewer errors on the critical trials in comparison to those in the control condition. No other significant effects were found, $t_s < .78$, $p_s > .43$.

Difference in non-critical trial reaction times

The reaction time (in milliseconds) on the non-critical trials in block 1 was subtracted from the reaction time (in milliseconds) on the non-critical trials in block 2. No significant differences were found between the various conditions, $t_s < .99$, $p_s > .33$.

Difference in non-critical trial error rates

The percentage of errors on non-critical trials in block 2 was subtracted from the percentage of errors on non-critical trials in block 1. The regression model, using negative mood, revealed a significant main effect of dummy 1, $\beta = -.294$, $t(86) = 2.27$, $p < .05$, $f^2 = .06$. Participants in the counterfactual condition made fewer errors on the non-critical trials compared to participants in the control condition. No other significant effects were found, $t_s < .89$, $p_s > .38$.

Overall score

The total score in block 1 was subtracted from the total score in block 2. The regression model, using the second negative mood measurement, also revealed a significant effect of dummy 1, $\beta = .397$, $t(86) = 3.22$, $p < .01$, $f^2 = .11$. Those in the counterfactual condition improved their overall score significantly more than the control condition. No other significant effects were found, $ts < .28$, $ps > .78$.

Table 12. Breakdown of dependent variable means by condition.

	Counterfactual with Antecedent	Counterfactual without Antecedent	Goal Discrepancy	Control
Δ Critical trial reaction times	-199.43	-236.50	-272.20	-203.20
Δ Critical trial error rate	-0.15	-0.09	-0.05	-.07
Δ Non-critical trial reaction times	-192.05	-93.06	-219.45	165.94
Δ Non-critical trial error rate	-0.10	-0.06	-0.07	-.05
Δ Overall score	1248.50	818.44	797.55	776.51

Discussion

As predicted, the counterfactual with antecedent resulted in the most performance benefits. Participants in this condition made fewer errors on both the critical target and non-critical target trials, in addition to experiencing the most overall performance benefits, compared to the control condition. Thus, the beneficial effects of the upward counterfactual went beyond that of the strategy mentioned in the thought, consistent with the mobilization of effort.

According to the findings, increased salience of failure was not the crucial factor in mobilizing effort. All three thought conditions suggested that the goal was either not met or could have been better (i.e., that there was goal discrepancy), but participants in the counterfactual without antecedent and goal discrepancy conditions did not consistently outperform those in the control condition. Therefore, it is not the case that just any thought about the task is sufficient for improving performance. This contradicts the notion that goal discrepancy information is the only aspect required to initiate performance benefits. Moreover, participants receiving the counterfactual with antecedent did noticeably better on the task (especially on the second block) compared to those receiving the counterfactual without antecedent. Thus, it was not the case that the mere suggestion that a better outcome was possible, which could also be connected to higher expectations, was sufficient to produce these performance effects. Thus, it appears crucial that the upward counterfactual thought mentioned a behavior that was within the participants' control. Taking the aforementioned aspects into consideration, the counterfactual with antecedent may have been the most effective due to mobilizing effort. Specifically, this type of upward counterfactual can focus individual's attention on the fact that goal progress is not sufficient and that effort mobilization (something within the individual's control) will result in performance benefits. This reasoning is also comparable to theories of effort mobilization proposed by previous researchers (Bandura, 1977; Bandura & Cervone, 1983; Vroom, 1964; Weiner, 1985). As a result, counterfactual effects are content-neutral, rather than reflecting a content-specific pathway. In other words, their benefits generalize to aspects of the task not mentioned in the thought.

Taken together, the results from this study were in accordance with the hypotheses; however, two findings may be viewed as surprising by critics. It was predicted that the counterfactual effects would not be moderated by mood, on the contrary to Study 1 and the results of Päßler and McCrea's (2006) previous research. In fact, the effects of counterfactuals were not moderated by mood in this study. Consistent with the self-evaluation model of upward counterfactual thinking, it is likely that the inclusion of an objective goal and specific goal progress information being provided in the feedback led to this finding. Martin and colleagues (1993) have

argued that inadequate goal progress should no longer result in mood moderation when an individual can objectively assess performance because affect is no longer taken into account. Future studies should directly compare the effects of objective and subjective goal standards for counterfactual thinking. A somewhat unexpected finding, or lack thereof, was that the counterfactual with antecedent did not have any significant benefits for reaction times. In Study 1, upward counterfactual led to improvements on the critical target reaction times. Based on the paradigm, it was difficult to predict exactly how participants would choose to improve, given that there was a speed accuracy trade-off. Although these findings provide new explanations to the upward counterfactual effects, additional research looking at the role of objective goals and mood moderation within counterfactual thinking is required. One potentially improved measurement to examine the counterfactual effects and notion of effort mobilization would be persistence.

Conclusion

Upward counterfactual thoughts bring attention to the fact that goal progress was insufficient and that effort mobilization will result in enhanced subsequent performance. Nonetheless, it is important that the behavior mentioned in the counterfactual is within the individual's control. Moreover, mood no longer appears to moderate the effects of counterfactual thoughts when an objective goal standard and feedback are provided. These findings offer additional support for the content-neutral pathway to performance.

Study 4: The Effects of Counterfactual Thinking on Persistence

Overview

Studies 1 and 2 tested demonstrated that the preparative effects of upward counterfactual thoughts can be attributed to the mobilization of effort and not to the identification of a particular strategy. Moreover, in Study 3 it was determined that the effects of counterfactual thoughts may increase effort mobilization by directing attention to the goal discrepancy and suggesting that performance is controllable. Up to this point, these studies have focused primarily on performance and not directly on the amount of effort put forth on the task. Study 4 was thus designed to further probe the notion of effort mobilization being the driving force behind the performance effects, however, in this case persistence.

Previous research has revealed how mood information is integrated with other incoming information to determine how task progress is proceeding (Gendolla, 2000; Gendolla, Abele, & Krüsken, 2001; Gendolla & Krüsken, 2002). The mood-behavior model (Gendolla, 2000), reasons that behavior is affected by an informational value of mood (Gendolla et al., 2001). In other words, moods impact evaluations and judgments that are made regarding an individual's behavior. When the individual is assessing the situation, mood is taken into account, in addition to any other accessible information. It has been found that individuals' judgments demonstrate mood-congruency effects (Gendolla et al., 2001; Gendolla & Krüsken, 2002). This would imply that an individual in a positive mood would be more likely to assess the situation positively, whereas an individual in a negative mood would be more likely to assess the situation negatively. The mood-behavior model posits that these mood congruency effects additionally transpire when making assessments concerning the demand or difficulty of a task (Gendolla et al., 2001; Gendolla & Krüsken, 2002). Therefore, if an individual views goal discrepancy and experiences negative mood, then the task may also be viewed as requiring more effort. The individual will therefore mobilize more effort to be successful.

An interesting line of research has investigated the effects of mood on effort mobilization using physiological measures. Brehm's theory of motivational intensity

(Brehm & Self, 1989) has shown that individuals' systolic blood pressure (SBP) is dependent on the level of subjective demands. The theory of motivational intensity also makes a clear distinction between potential motivation, the greatest amount of effort an individual would employ to fulfil a motive, and motivational intensity, the actual amount of effort an individual employs (Brehm & Self, 1989). This distinction can then be viewed in terms of willingness and action. Willingness entails the concept of potential motivation (the strength of the motivation), whereas action entails the concept of motivation intensity (what is needed to fulfil the motive). Consequently, motives that are easily fulfilled should not require much effort and should be relatively independent of willingness. On the other hand, motives that require much effort (for example, of increased difficulty), will employ more effort until the individual deems success as unlikely or the individual is no longer willing to put forth the necessary effort. This idea mirrors the principle of conservation: the amount of effort allotted will correspond with the task demand provided that the individual views success as possible and the individual's willingness is not surpassed. Accordingly, cardiovascular changes are considered to be denotive of an individual's level of effort. Systolic blood pressure (SBP) has been demonstrated to be a marker of effort mobilization, such that SBP increases to meet the subjective demand until either the individual's abilities are exceeded or the amount of effort necessary can no longer be justified by the potential outcome. This principle can also be reflected in the REM model, which posits that insufficient goal progress initiates the mobilization of effort (Markman & McMullen, 2003); it is furthermore imperative for corrective action (see also Bandura, 1977; Carver & Scheier, 1999).

The goal of Study 4 was to investigate the effects of counterfactual thinking on persistence, specifically if more effort was being put forth via effort mobilization. In accordance with theories of motivational intensity and the self-evaluative model of upward counterfactual thinking, Study 4 hypothesized that these persistence effects should be explained by the counterfactual condition persisting longer on the task (attempt more items), in that they should put forth the necessary effort needed to improve. Participants in the control condition should not engage more effort in the task, and thus not increase their persistence. Furthermore, participants in the counterfactual condition should have increased negative affect stemming from the

counterfactual generation, and this will likely be accompanied by an increase in SBP compared to those in a control condition. Participants in the counterfactual condition should additionally buy more clues (the strategy provided in the thought) and consequently complete more words, which should lead to higher overall scores than those in the control condition.

Methods

Participants

Forty-five (31 women and 14 men) University of Konstanz students were recruited via posters hung around the university or were personally asked to participate in the study. All participants were recruited on a voluntary basis. Four participants were not included in the analyses for either scoring extremely low on the motivation questions or for being outliers on the mood scales (as done in the previous studies). Therefore, 41 (30 females, 11 males) participants were used in the final analyses. The age breakdown was as follows: 13 participants were between the ages of 16 and 20, 23 participants were between 21 and 25 years of age, 4 participants were between the ages of 26 and 30, and 1 participant was between 31 and 35 years of age.

Subjects were greeted by the experimenter upon arrival in the laboratory and run one at a time. All participants were asked to carefully read and sign the informed content. Participants were encouraged to ask questions and were informed that they could end the task at any point. Afterwards, participants' blood pressure was measured while they read through the directions, filled out several questionnaires, and completing the two rounds of the word completion task. Afterwards, participants were debriefed, thanked and compensated. They were either given 4€ or a half-hour of research participation credit.

Design

Participants were randomly assigned to one of two conditions (counterfactual, control) in a between-subjects design. The word completion items were counterbalanced to ensure that both parts of the task were equal in their level of

difficulty. A total of 21 participants were in the counterfactual condition and 20 participants were in the control condition.

Paradigm

A new paradigm was used in Study 4; a word completion task, similar to the commonly known game of hangman. The task was separated into two parts, each consisting of a series of incomplete German words. The task was to successfully complete as many words as possible in the allotted five minutes. To ensure that the blood pressure machine started at the exact moment each participant began the task, the experimenter entered a password to begin each portion of the experiment. Each word was comprised of eight letters. Participants were provided with the category to which the word belonged and two of the letters to assist them in solving the words. There was only one possible solution for each word. Participants had the option of buying a clue or solving the word at any time. Every time a clue was bought, the next missing letter appeared, and up to four clues (totalling six of the eight letters) could be bought for each word. After buying a clue, participants could solve the word, buy another clue, or skip the word.

Scores were based on the number of correctly solved words. For each correctly completed word, participants were awarded with six points; however, for every clue bought, one point was deducted from their score. Meaning, if they correctly completed a word, then they would be awarded six points for the correct solution. If they had bought two clues to solve that word, then two points would be deducted from their score and they would earn four total points for that word. If, however, they bought two clues, but did not correctly solve the word, then two points would be deducted from their final score. No points were awarded for incorrect or incomplete solutions. It was therefore important for participants to work both quickly and accurately.

After each set of 10 words, participants were provided with accurate feedback on their performance. They did not have the possibility of viewing which words were correctly solved or not. The feedback specified how many words were correctly solved in the allotted five minutes, how many clues were bought, and their total score for that round.

Procedure

This study was again conducted in the social psychology laboratory at the university. A personal computer was again employed and the experiment was run using a Pascal program. The blood pressure machine was a GE Dinamap Pro 200 Vital Signs Monitor, which non-invasively measures both blood pressure and pulse rate. It has a feature that prints out the individual's blood pressure and heart rate after each reading, which was utilized in this study.

Participants were met in the lab and were run one at a time, due to the availability of only one blood pressure machine. The procedure for the measurement of blood pressure (baseline measurement, habituation period, etc.) was based on previous research conducted by Gendolla and colleagues (see also Gendolla et al., 2001; Gendolla & Krüsken, 2002). Participants were first hooked up to the blood pressure machine; the experimenter ensured that the cuff was placed over the brachial arteries of the participant's arm, which is located above the elbow. Participants were encouraged to inform the experimenter if at any time the cuff was too tight or uncomfortable, and were requested to keep their arm resting on the table and as motionless as possible. The cuff automatically inflated in intervals of two minutes during the three various measurement periods (habituation period, first half of the task, second half of task). A print out of each measurement that included SBP, DBP, and heart rate was collected by the experimenter at the conclusion of the session.

Participants were first asked to read and sign the informed consent. They then read that the study involved physiological activity during relaxation and task completion. It was first explained that an individual's blood pressure provides accurate information regarding physiological activity. Participants were made aware of the machine and that it would measure their blood pressure and heart rate at two minute intervals. They were asked to relax and try to ignore the machine as much as possible. The "relaxation" portion would entail them reading the instructions and answering a few questions. The "task" portion would involve them completing a problem solving task. Between the first and second set of words, participants would be asked to fill out some questionnaires and during that time period, the blood pressure machine would be turned off. Furthermore, the experimenters were

interested in the effect of practice on problem solving; therefore, participants would be asked to complete the task twice. It was additionally mentioned that participants would receive feedback after the first half of the experiment. Participants were also told that the experimenters were not only interested in how individuals fare, but also groups; therefore, they would be asked to answer a few questions regarding their self-perception and expectations.

With the commencing of the experiment, the blood pressure machine was turned on and the habituation readings were established. The habituation period was approximately six to eight minutes, depending on the participant, which provided three to four blood pressure readings per participant. During the habituation period, participants were asked to read the instructions, answer several demographic questions, and fill out a few short questionnaires which are described in detail below.

Participants were reminded that since their blood pressure was going to be measured, they needed to answer several yes or no questions about their health and blood pressure history. They were specifically asked if they had high blood pressure or any other cardiovascular diseases. It was furthermore asked if they had smoked any cigarettes, consumed any alcohol, engaged in some type of vigorous physical activity, or consumed caffeine in the previous two hours before coming to the experiment. Afterward, the experiment was explained in detail, including the scoring and feedback. Participants were provided with an example item demonstrating how their score would be calculated.

Participants then completed the Rosenberg (1965) Self-Esteem Scale, as in the prior studies. All participants then received the same goal ("I want to achieve as many points as possible") and wrote the goal three times to ensure its internalization. As in Study 3, the modified mood scale (McFarland & Ross, 1982) consisting of 17 mood adjectives was again employed in this study and participants responded using a 5-point Likert scale ranging from 1 (very little or not at all) to 5 (very strongly).

Participants in this study were also asked to indicate how motivated they were to do well on the exam, if they were willing to put forth the necessary effort, if their expectations were high, if it was important to do well, if they expected to achieve many points, and if they knew what they were supposed to do on the task. These questions were modified from the standards and concern scale (Hirt et al., 2000) and

had participants respond using a 7-point Likert scale ranging from 1 (not at all) to 7 (very much).

The first half of the task then began, in addition to the second blood pressure measurement period. A password was required to begin the task, which allowed the blood pressure measurement to commence at the same time for every participant and synchronized it with the actual task. This period lasted five minutes for each participant, which provided three blood pressure readings. Half of the participants in each condition received word set A for the first half of the task and the other half received word set B for the first half. This was done to ensure counterbalancing of the items (words).

After completing as many words as possible in the allotted five minutes, participants were given feedback on their performance, namely how many words they got correct, how many clues they bought, and their total score. Before completing the second half of the task, participants were randomly assigned to either the counterfactual or control condition. It was also during this time period that the blood pressure machine was stopped by the experimenter, giving participants a short pause from having their blood pressure taken.

Those in the counterfactual condition read about how people often think about different thoughts when considering a past performance and that people often think "If I had only done X, then I would have performed better." Participants were specifically told that past participants frequently wrote the following thought, "If I had bought more clues, then my overall performance on the test would have been better." They were also asked to write this exact thought three times and relate it to their own previous performance.

Those in the control condition read about how participants often think of various things when contemplating a future performance. Such thoughts often take the form, "I would like to know how . . ." Participants additionally read how past participants frequently wrote the subsequent statement "I would like to know how my friends would do on the test." They then wrote that statement three times.

All participants were then required to write the goal intention ("I want to achieve as many points as possible") three times to ensure that all the participants

had the same goal. Afterwards, participants completed the modified mood adjective scale and the measures of importance, motivation, feeling prepared, etc.

Another five minutes were then allotted to solve the second set of words. During this time period, the third and final blood pressure measurements were taken. Again, three blood pressure readings were collected for each participant. The experimenter entered a password to commence the task and synchronize the blood pressure measurement. Upon completion of the second word set, participants were provided with feedback on the second task and asked to answer a few questions before ending the experiment. For instance, participants were asked to write what they thought the experiment was about and if something during the experiment seemed strange. Afterwards, participants were thanked, debriefed and paid for their participation.

Results

Overview

The effects of mood (after completing the first half of the experiment) and counterfactual thoughts on the change from the first half to the second half of the task in number of clues bought, number of times attempted, number of words correct, overall score, and blood pressure, was investigated. Regression analyses were performed, as continuous mood scores were utilized. The negative mood scale was found to be skewed; therefore, negative mood scores were log-transformed. Separate analyses were performed using positive and negative mood scores, respectively. Following the recommendations of Aiken and West (1991), continuous variables were mean-centered, and effects coding was utilized for the counterfactual (no counterfactual condition = 0; counterfactual condition = 1) independent variables.

Average blood pressure scores were also calculated for the three various measurement periods (see also Gendolla et al., 2001; Gendolla & Krüsken, 2002). The baseline score was the average blood pressure taken during the habituation period and consisted of three or four readings per participant. The second measurement period comprised the three blood pressure readings taken during the five minutes while completing the first half of the task. The third measurement period then

comprised the last three blood pressure readings taken during the five minutes allotted to complete the second half of the task. The average baseline blood pressure score was then used to control for each participant's initial blood pressure, as blood pressure may vary across individuals.

Table 13. Means and standard deviations of dependent variables from first half of the task.

	Mean	Standard Deviation
Number of items attempted	7.20	3.78
Number of items correct	5.24	3.13
Number of clues bought	17.80	9.83
Total score	13.66	11.06
Average blood pressure	342.51	41.73

Table 14. Means and standard deviations of dependent variables from second half of the task.

	Mean	Standard Deviation
Number of items attempted	11.39	6.01
Number of items correct	8.71	5.47
Number of clues bought	27.95	16.64
Total score	24.29	18.15
Average blood pressure	333.83	38.21

Table 15. Correlations between dependent variables.

	Δ Items attempted	Δ Items correct	Δ Clues bought	Δ Total score	Δ Blood pressure
Δ Items attempted	--	.794**	.786**	.658**	-.068
Δ Items correct		--	.864**	.924**	-.185
Δ Clues bought			--	.606**	-.095
Δ Total score				--	-.220
Δ Blood pressure					--
<i>M</i>	4.20	3.46	10.15	10.63	-8.68
<i>SD</i>	3.61	3.41	9.81	12.95	16.18

** $p < .01$

Mood scales

Positive and negative mood scales were based on the scales used in Study 1 and Study 3. Positive mood items (i.e., active, alert, attentive, determined, enthusiastic, inspired, interested, prepared) were summed to create a single index for the first half and second half of the task; however, only the second measurement was used in the analyses, as in the prior studies. The Cronbach's alpha of positive mood for the second half was 0.81. Negative mood items (i.e., angry, ashamed, distressed, guilty, hostile, inadequate, jittery, scared, worried) were also summed into a single index for the first half and second half. The Cronbach's alpha of negative mood for the second half was 0.75.⁶

⁶ The Cronbach's alpha of positive mood for the first half was 0.68 and of negative mood for the first half was 0.70.

Regressions

Regression analyses were performed using both positive mood and the log of negative mood. However, no significant effects were found for either mood scale. The analyses were also computed when controlling for the various importance and motivation factors; however, no significant interactions were revealed. When entering the log of negative mood, several main effects of counterfactuals were however found on the various dependent variables. There was a main effect on the difference in items attempted, $\beta = .345$, $t(37) = 2.25$, $p < .05$, $f^2 = .12$, such that those in the counterfactual condition attempted more items on the second round compared to those in the control condition. A second main effect on the difference in number of items (words) correct was also revealed, $\beta = .378$, $t(37) = 2.48$, $p < .05$, $f^2 = .14$, thus indicating that those in the counterfactual group got more items correct on the second half of the task than those in the control group. Furthermore, those in the counterfactual condition also bought more clues on the second half of the task in comparison to the control condition, $\beta = .367$, $t(37) = 2.38$, $p < .05$, $f^2 = .13$. Lastly, the counterfactual group also experienced the greatest improvement in score compared to the control group, $\beta = .318$, $t(37) = 2.07$, $p < .05$, $f^2 = .10$. Unfortunately, no effects were found on the blood pressure measure. For simplicity of presentation, the means on the various dependent variables between the two conditions are illustrated in Table 16.

Table 16. Means of various dependent variables by condition.

	Counterfactual	Control
Δ Items attempted*	5.43	2.90
Δ Items correct*	4.71	2.15
Δ Clues bought*	13.61	6.50
Δ Total score*	14.67	6.40
Δ Blood pressure	-8.81	-8.55

* $p < .05$

Discussion

In line with the predictions, the beneficial effects of upward counterfactual thinking not only led to improvements in performance, but to increased persistence. Participants attempted more items in the allotted five minutes. Furthermore, the counterfactual effects were again found to be broad, not just connected to the strategy mentioned in the thought. Participants in the counterfactual condition did implement the strategy by purchasing more clues on the second round of the task, compared to those in the control condition. However, they also attempted more items, and got more items correct, in comparison to participants in the control condition. Lastly, the counterfactual condition also experienced the most improvement in total score compared to the control condition.

This study again provided support for the notion that upward counterfactual thoughts are advantageous for overall performance, above and beyond the strategy provided. This study specifically demonstrated that counterfactuals are beneficial for persistence. Not only did those participants mobilize more efforts (attempt more items), but they improved their performance (by getting more items correct and hence improving their score). This demonstrates that they put forth more effort, allowing them to improve on the second round of the task. Consistent with the prior studies, the behavior identified in the upward counterfactual was controllable, which may have led participants to view increased effort as useful. This is most likely an important factor in the counterfactual effects on effort mobilization (see also Bandura, 1977; Bandura & Cervone, 1983; Vroom, 1964; Weiner, 1985). These findings are yet again consistent with the content-neutral pathway of counterfactual effects on performance, as opposed to an entirely content-specific pathway.

Although the abovementioned results are in line with the hypotheses and previous research, two of the predicted effects were not found. The counterfactual effects were not moderated by mood, as hypothesized. One possible explanation is that the blood pressure machine used in this study was rather loud. In addition, it is possible that the participants found the blood pressure cuff to be a nuisance and found it rather uncomfortable and disturbing. As a result, participants may have attributed any negative mood they were experiencing to the machine, instead of to

their feedback on the task. The blood pressure machine might have given them a salient reason to misattribute their negative affect. Past research has shown that individuals experience a great deal of difficulty when trying to pinpoint the cause of their affect; therefore, the affect resulting from one event can frequently be misattributed to that of another. For example, it has been shown that the arousal effects of exercise can be misattributed to another individual's instigation, and trigger aggressive behavior (Zillmann, Katcher, & Milavsky, 1972). It has additionally been demonstrated that both positive and negative attitudes can be misattributed to novel objects (Payne, Cheng, Govorun, & Stewart, 2005).

Second, the predicted effects on blood pressure were not observed. This study employed the blood pressure measurement to probe the idea that physiological changes would reflect effort mobilization after counterfactual thinking. Even though no blood pressure effects were uncovered in this study, these initial results should be interpreted with caution. It should be said that the blood pressure machine used for this study was not the most reliable machine on the market. The machine was previously found to be somewhat sensitive to movement, and the participants may have not kept their arm as still as necessary to reliably measure blood pressure. Moreover, the machine is not up to the same standards as some of the new machines on the market. These newer machines are extremely reliable and unobtrusive, and use electrodes in addition to the blood pressure cuff. For instance, Gendolla and colleagues employ a computer-aided monitor (Par Electronics Physioport III) and compatible software that can take into account potential inflation errors and movement artifacts (Gendolla et al., 2001; Gendolla & Krüsken, 2002; Gendolla & Richter, 2006). Taken together, further research is essential to investigate the possible counterfactual effects for performance via physiological effort mobilization.

Conclusion

Study 4 explicitly investigated the effects of upward counterfactuals for persistence by directly examining the amount of effort put forth on the task. The advantageous performance, or in this case persistence, effects of upward counterfactual thinking are propelled by their ability to mobilize effort. The behavior

presented in the thought was again controllable. The findings were again in accordance with the content-neutral pathway to performance.

General Discussion

Overview

Previous research has established that upward counterfactual thinking generally results in performance benefits, yet the reasons underlying these effects are rather unclear (Markman et al., 2008; Roese, 1994). By identifying how an outcome could have ended better, upward counterfactuals increase negative affect and make the individual aware of ways to improve on subsequent outcomes (Markman et al., 1995; Roese, 1994; Roese & Olson, 1993). One proposition as to how upward counterfactual lead to performance benefits has been suggested by Epstude and Roese (2008), who theorize that there are two distinct pathways to performance. The content-specific pathway identifies remedial behaviors that can easily be translated into a strategy to improve in the future (Smallman & Roese, 2007). Conversely, the content-neutral pathway has advantageous effects for performance that are independent of the mentioned behavior or strategy (Epstude & Roese, 2008). Another supposition, as put forth by the REM, posits that the affect stemming from counterfactuals can serve as an indicator of an individual's goal progress (Markman & McMullen, 2003); hence, affect has particular relevance for both motivation and persistence. Indeed, a number of lines of research have established that affect is employed as a type of input, for instance, when making judgements about the progression of a goal (Gendolla, 2000; Hirt et al., 1996; Martin et al., 1993). Thus, an individual's current mood can be used to estimate the proximity or progress towards a specific goal. Specifically, individuals are likely to put forth more effort when they perceive that current progress is insufficient. The self-evaluation model of upward counterfactual thinking presented here deviates a bit from the other models by proposing that affect and performance are influenced by upward counterfactuals via effort mobilization. Effort mobilization is posited to be increased when the upward counterfactual identifies a controllable behavior responsible for the performance outcome. Nonetheless, affect should only be considered for judgments of goal progress when no objective goal standard is afforded.

The goal of the present research was to investigate the validity of the various explanations for the performance effects of upward counterfactuals. The first

purpose of this dissertation was to systematically test the relative importance of the two pathways to performance posited by Epstude and Roese (2008). The second purpose of this dissertation was to systematically test three aspects of the proposed self-evaluation model of upward counterfactual thinking. This was accomplished by thoroughly examining whether the performance and persistence effects of upward counterfactual result from increased effort mobilization or planning. Furthermore, the role of affect and controllability of the counterfactual were also taken into consideration.

Present Findings

1. Counterfactual effects are independent of the effects of forming a specific plan.

Study 1 began by examining whether a useful strategy contained in a counterfactual thought would lead to increased application of that strategy, and thus have similar performance effects as a parallel implementation intention. The findings here dismiss the notion that the counterfactual effects are produced by the identification of a useful strategy, as the effects of counterfactual thinking went beyond the strategy mentioned in the thought. That counterfactuals have more far-reaching benefits is in accordance with the content-neutral pathway to performance. Conversely, the effects of the implementation intention were linked to the plan, as anticipated. This study furthermore suggests that counterfactuals and implementation intentions have independent and additive effects.

Study 2 was designed to test whether upward counterfactuals and implementation intentions are two separate, rather than interconnected, processes. According to the content-specific pathway, generating a counterfactual should increase the likelihood of generating a matching implementation intention, which would then initiate additional performance benefits. However, the findings from Study 2 indicate that after generating counterfactuals, participants were not more prone to generate a corresponding implementation intention. The content of the upward counterfactuals were not predictive of the successive implementation intention's content. Consequently, it is highly unlikely that there were cumulative content-specific effects of implementation intentions and counterfactuals in Study 1; rather the effects of these thoughts were likely unconnected and therefore additive.

Thus, the findings from these studies imply that the effects of counterfactual thinking and implementation intentions are two separate and independent processes. Whereas implementation intentions increase the use of a particular strategy, upward counterfactuals increase effort mobilization.

2. Upward counterfactual effects are broad, and driven by effort mobilization.

Study 1 furthermore examined whether the performance effects of upward counterfactuals could be attributed to effort mobilization or to identifying a useful strategy. The findings indicated that the effects of upward counterfactuals went beyond the strategy mentioned and appear to be linked to the mobilization of effort. Similarly, the performance effects observed in Study 3 seem caused by enhanced effort mobilization. The effects of the counterfactual again went beyond the content of the thought, and are in keeping with the idea of a content-neutral pathway to performance. Study 4 did not investigate performance in general, but rather was specifically aimed at measuring persistence and the amount of effort participants engaged on a task. This study was conducted to provide further evidence for the notion that the effects of upward counterfactuals are driven by effort mobilization. The findings from Study 4 were once again in agreement with the content-neutral pathway to performance, as the effects of upward counterfactuals were broad. Moreover, upward counterfactuals increased persistence, providing direct evidence of increased mobilization of effort. Moreover, Study 4 utilized a word completion task, whereas Studies 1 and 3 both employed the same reaction time paradigm, suggesting these effects are not tied to a particular kind of task.

3. The role of affect in counterfactual thinking.

In Study 1, it was also predicted that the effects of upward counterfactual thinking would be contingent on dissatisfaction with the previous performance. That is, those participants who experienced augmented negative affect or diminished positive affect would have the greatest performance benefits after engaging in counterfactual thinking. It was hypothesized that participants who were holding a self-improvement goal and who were provided with a subjective goal and feedback would use their current mood as input into judgments of their current progress. As a

result of any ensuing dissatisfaction, increased effort would be put forth and performance would be enhanced. As expected, the performance effects of upward counterfactual thoughts were moderated by mood, such that upward counterfactuals improved performance only among those reporting less positive affect. Study 3, on the other hand, provided participants with an objective goal, rather than a subjective goal, and moderate feedback. In this study, mood was no longer found to moderate the counterfactual effects. Thus, mood moderation appears to play a crucial role in the performance effects of upward counterfactuals only when a subjective goal standard is provided. As soon as an objective goal standard is granted, the quality of the performance is clear and mood is no longer informative.

As previously mentioned, it was hypothesized in Study 1 that dissatisfaction with a previous performance would be used as input when assessing current goal progress. Study 3 subsequently aimed to determine whether the salience of failure or goal discrepancy (most likely via dissatisfaction with the previous performance outcome) is decisive in improving future performance. This led to the formation of four conditions: counterfactual with antecedent, counterfactual without antecedent, goal discrepancy and control. The findings discount the proposal that the salience of failure or goal discrepancy is solely responsible for the performance effects of upward counterfactuals. It seems most likely that a discrepancy alone is insufficient to provide such effects. Instead, the controllability of the performance also needs to be taken into consideration.

4. Upward counterfactuals need to include a controllable antecedent.

Studies 1, 3 and 4 included an upward counterfactual thought that identified a behavior within the participants' control as responsible for the poor performance outcome. It is believed that a necessary aspect of the performance benefits of an upward counterfactual is that it suggests that a controllable action is accountable for the outcome. The mobilization of effort is presumably augmented by upward counterfactuals that attribute the poor performance to something within the individual's control. The three dissertation studies indicate that upward counterfactuals advocating that a controllable behavior is to blame for a poor performance most likely initiated effort mobilization and thereby enhanced

performance and persistence. Indeed, when a counterfactual without such a controllable antecedent was provided in Study 3, there was no improvement in performance.

In summary, the four studies presented here demonstrate that the effects of counterfactual thoughts and implementation intentions are both independent and additive. The effects of upward counterfactuals cannot be attributable to the strategy alone, but are rather far-reaching. Furthermore, the performance effects of upward counterfactuals that identify a controllable behavior as responsible for a poor performance outcome are caused by increases in effort mobilization. The effects of the implementation intentions are rather increased by the execution of the specified behavior.

Implications for counterfactual research

The self-evaluation model of upward counterfactual thinking, as proposed here, aims to disentangle how upward counterfactuals improve performance and tease apart the affective and performance effects of upward counterfactuals. The model makes propositions concerning how counterfactuals can influence performance. The first proposition indicates that upward counterfactuals can influence assessments of goal progress via affect when a subjective goal standard is provided. Conversely, affect should no longer serve as input when an objective goal standard is afforded. Furthermore, upward counterfactuals have beneficial effects for performance and persistence dependent on increases in effort mobilization. The second proposition states that upward counterfactuals attributing a poor performance to a factor or behavior within the individual's control is required for the mobilization of effort. Finally the third proposition denotes that these effects driven by effort mobilization are far-reaching and indicative of a content-neutral pathway to performance. The findings reported here are quite consistent with the self-evaluation model.

1. Implications for the REM.

The notion that upward counterfactuals influence judgments of how goal striving is progressing via affect has been established by previous research. The findings here are fairly consistent with past work demonstrating that affect plays an important role in establishing the effects of counterfactuals (Markman & McMullen, 2003; McCrea, 2008; Myers & McCrea, in prep.). For instance, the Reflection Evaluation Model (Markman & McMullen, 2003), in addition to theories of mood as input (Gendolla, 2000; Hirt et al., 1996; Martin et al., 1993), suggests that an individual's current mood indicates how progression towards a goal is proceeding and whether it has successfully been achieved or not. The results from Study 1 are in concordance with the suggestions of the REM, as well as findings from Markman and colleagues (2008). Moreover, this is also in keeping with the self-evaluation model of upward counterfactual thinking that affect is an important determinant of the performance effects, in addition to the proposition that the mobilization of effort is decisive for the performance benefits. Thus, individuals are likely to improve upon the performance when motivated and sufficient effort is mobilized. It appears that this was also the case for the dissertation studies; when a subjective goal standard was provided, the individuals who were motivated to improve likely assessed the performance outcome and the resulting negative affect led to more effort mobilization.

The results from Study 3 expand on the REM by examining the role of affect when an objective goal standard was provided. As argued by Martin and colleagues (1993), insufficient goal progress should not lead to mood moderation when an objective standard is provided, given that affect is no longer taken into consideration. Furthermore, the results from Study 1 found that the counterfactual effects for performance were moderated by mood, whereas other research has shown that the effects are mediated (Markman et al., 2008). Nevertheless, no evaluation or reflection instructions were provided here, as was the case in the study reported by Markman and colleagues (2008). It is likely that the participants in the current studies freely evaluated or reflected. Had specific evaluation instructions been provided, mediation effects would have been expected.

Another important feature of the upward counterfactuals appears to be that the behavior mentioned in the thought must focus on some type of controllable action in order to improve performance. This point is where the self-evaluation model and the current findings diverge from REM. All of the counterfactual thoughts provided in the dissertation involved controllable behaviors. When no controllable action was included in the thought (as in Study 3), performance did not improve. The idea of controllability of action is in accordance with much of Bandura's research linking self-efficacy to improved performance (Bandura, 1977; Bandura & Cervone, 1983; Weiner, 1985). Moreover, Tal-Or and colleagues (2004) found that upward counterfactuals fostered increases in self-efficacy. It has also been shown that feelings of control were predicted by upward counterfactuals and were thereby connected to enhanced subsequent performance (Nasco & Marsh, 1999). Additional research should nevertheless examine this notion further.

2. Implications for the Functional Theory of Counterfactual Thinking.

Another goal of this dissertation was to systematically test the two pathways to performance, as proposed by Epstude and Roese (2008). The content-specific pathway to performance is involved when individuals engage in upward counterfactual thinking and thereby identify a potential explanation as to how the outcome could have been better. Thus, corrective actions for performance can easily be translated into an intention to improve on future performances (Smallman & Roese, 2007). This pathway is linked to the information effect, as indicated by Roese (1994). In contrast, the content-neutral pathway works independent of the corrective action or behavior identified in the upward counterfactual, such that the effects on performance are rather extensive (Epstude & Roese, 2008).

The findings from the studies presented here undoubtedly support the idea of a content-neutral pathway to performance. Study 1 specifically tested whether the effects of upward counterfactual thoughts were dependent on the strategy identified in the thought; however, the results were inconsistent with the notion of a content-specific pathway. The results from the three studies where the counterfactuals were provided clearly demonstrated that the performance effects of the upward counterfactuals went beyond the strategy contained in the thought. It was found that

the consequences for performance were far-reaching and were dependent on the mobilization of effort.

3. Implications for theories of self-regulation.

The present findings also have implications for various models of self-regulation. Upward counterfactuals help individuals decide whether or not a performance outcome has been achieved, and if not, whether a successful outcome is attainable. Upward counterfactuals should in this manner assist individuals in deciding whether or not to continue their goal efforts by indicating that a better performance outcome is possible. Such thoughts can then be implemented to support attempts to better subsequent performance (see also Locke & Latham, 1990). The notion of affect functioning as a form of input into goal-related decisions has been established in various contexts (Markman & McMullen, 2003; Markman et al., 2008; McCrea, 2008; McMullen & Markman, 2000). Both Control Theory (Carver & Scheier, 1999) and Social Cognitive Theory (Bandura & Cervone, 1983; Bandura & Locke, 2003) suggest that more effort is engaged when an individual perceives a discrepancy between the current state and the goal state, and when self-efficacy is experienced. Upward counterfactuals fit nicely into such theories by providing an explicit means for how individuals make these judgments. Furthermore, upward counterfactuals can be used to improve future performance in a manner that is independent of the thought's content. Thus, upward counterfactuals can serve as powerful self-regulatory tools that are easily implemented, allowing individuals to enhance their subsequent performance.

4. Implications for goal discrepancy research.

An additional related area of research has focused on the idea that negative affect stems from apparent goal discrepancy (Carver, 2003; Carver & Scheier, 1999; Lawrence, Carver, & Scheier, 2002). These theories diverge from the REM and mood as input theories, as here the negative affect is suggestive of an underlying goal discrepancy. According to these theories, affect results from dissatisfaction with an outcome, and does not necessarily impact motivation. Evidence for such theories was not reliably obtained in this dissertation. In Study 3, increases in the salience of

failure or even the salience of a goal discrepancy could not account for the effects of upward counterfactuals on performance. Future research should further probe the role of goal discrepancy in counterfactual thinking, in particular whether negative affect is truly necessary for counterfactuals to improve performance.

Implications for implementation intention research

The present research also has important implications for implementation intention theory and the model of action phases (Gollwitzer, 1996; Heckhausen, 2003). The model of action phases categorizes goal pursuit into four separate phases: a pre-decisional phase, a post-decisional phase, an action phase, and a post-actional phase. The middle two stages deal with the implementation of behavioral strategies; the first and last phases are motivational, as they include goal setting (see also Lewin et al., 1944; Locke & Latham, 1990). Counterfactuals transpire in the post-actional phase (see also Epstude & Roese, 2008), as this phase encompasses assessing goal progress concerning whether the goal has been achieved, and if goal efforts should continue (Gollwitzer, 1996; Heckhausen & Gollwitzer, 1987). This framework more clearly explains why counterfactuals influence performance via effort mobilization. An upward counterfactual denotes that the goal was not achieved, and normally suggests that a better outcome was feasible. Persistence, or the mobilization of effort, should be augmented if the individual is discontented with the previous outcome and goal commitment remains elevated. In this case, the pre-actional phase should be revisited to allow the formation of detailed plans of action. This theory provides a viable explanation of the effort mobilization effects found in the studies presented here.

Research on implementation intentions has found that when used appropriately, they are effective in dealing with problems that frequently arise during goal striving. For instance, implementation intentions are useful in triggering a specific motivational effort (Bayer & Gollwitzer, 2007) or can be helpful in shielding an individual from unwanted or disruptive inner states during goal completion (Achtziger, Gollwitzer, & Sheeran, 2008). Nevertheless, some shortcomings have been acknowledged in regard to implementation intentions' effectiveness. If an individual does not have a strong commitment to the goal intention, then the success

of the implementation intention will be undermined (Sheeran et al., 2005). Another example is when an individual excessively ponders over the when and why when forming an implementation intention (Gollwitzer, Wieber, Myers, & McCrea, in press). Mindsets are broadly defined as cognitive orientations that occur during the action phases (Gollwitzer, 1990). A deliberative mindset is needed throughout goal setting, as the individual needs to be open to new information (Gollwitzer & Bayer, 1999). Conversely, an implemental mindset is required throughout goal striving, as the individual no longer needs to be open to new information, but rather needs to focus on goal realization (Taylor & Gollwitzer, 1995). Furthermore, deliberative mindsets are optimal for creating goal intentions, whereas implemental mindsets are optimal for creating implementation intentions (Gollwitzer et al., in press). Therefore, goal achievement is most likely when these two mindsets are matching (Gollwitzer et al., in press).

As was found in the studies presented here, upward counterfactuals and implementation intentions have additive effects; therefore, one way of overcoming the problem of mismatching mindsets would be to first create an upward counterfactual and then the implementation intention. By first creating the counterfactual, pondering over the when and why should subsequently be reduced. Moreover, motivation should be enhanced and the subsequent robustness of the implementation intention should also be superior. By first recognizing how a particular performance outcome could have turned out better, implementation intentions may become more effective. They may also be more effective, as the upward counterfactual first increases effort mobilization. It has already been shown that a strong commitment to the goal intention is needed for implementation intentions to be successful (e.g., Sheeran et al., 2005). A related area of research on future simulations has determined that when an individual mentally contrasts a desired outcome to the current reality, then effort mobilization is increased (Oettingen, Pak, & Schnetter, 2001; Stadler, Oettingen, & Gollwitzer, in press). By mentally contrasting beforehand, the effects of implementation intentions are additionally improved. Therefore, mental contrasting can have important consequences for motivation in the pre-decisional phase, whereas counterfactual thinking can have important consequences for motivation in the post-actional phase

(see also Gollwitzer et al., in press). Thus, a likely means of attaining strong goal commitment would be to first form an upward counterfactual. However, additional research is needed to pinpoint the most practical way of achieving this.

Future Research

An exciting new self-evaluation model of upward counterfactual thinking was proposed in this dissertation. Although the studies presented here began to systematically test the various proposals put forth by the model, future research should examine the assumptions in more detail and in various contexts. The initial findings suggest that the theoretical model is both sound and appears to explain the performance effects of upward counterfactuals. Additional research should, for instance, investigate the notion that the benefits brought about by effort mobilization are likely associated with the identification of controllable actions (as opposed to uncontrollable actions). Future research is also needed to specifically assess the role of objective versus subjective goal standards, as well as mood moderation in counterfactual thinking. In the research presented here, these factors were examined across the studies. It would be more beneficial to manipulate the goal standards and examine the mood moderation effect within a single study.

One way to pull apart the roles of affect and goal discrepancy in the performance effects of upward counterfactuals would be to examine the effects of mood misattribution. If affect is really a causal factor in the performance effects, and not just a consequence of goal discrepancy, then the performance effects should be undermined by the misattribution of mood to another task. Past studies have, for instance, established that individuals cannot easily identify sources of their experienced affect. As a result, affect from one source can be misattributed to another potential source (Zanna & Cooper, 1974; Zillmann et al., 1972). Similarly, it has been shown that both positive and negative attitudes can be misattributed to unique objects (Payne et al., 2005). Thus, a study in which affect is attributed to a source other than the task would allow one for the examination of whether current mood is serving as input into judgments of goal progress.

One potential limitation to the current studies could be that participants were provided with the counterfactual thought rather than generating them themselves.

One could argue that the effects would have been different in this case. However, after the conclusion of these dissertation studies, an additional study was conducted to further examine the role of self-generated upward counterfactual thoughts and implementation intentions on a persistence task (Myers & McCrea, in prep.). The procedure was similar to that of Study 1, except that participants self-generated the upward counterfactuals and implementation intentions, as in Study 2, and persistence was measured. As expected, participants in the implementation intention condition persisted longer on the second part of the task, compared to the first part. Participants in the counterfactual condition who experienced amplified negative affect also persisted longer on the second part of the task than the first part, in comparison to the control condition. When analyzing the content of the thoughts, implementation intentions that were related to patience and time were found to lead to increases in persistence; as in Study 1, the implementation intention benefits were attributable to their content. In contrast, the counterfactual effects were not found to be contingent on their content. Rather, persistence was determined by the interaction of negative mood and exposure to the counterfactual thought. This study again provides support for the notion that counterfactuals and implementation intentions are two independent processes. The performance effects were additionally found to be far-reaching and caused by the mobilization of effort when a controllable action was identified in the thought. Consistent with Study 2, it did not appear that generating counterfactual thoughts led to the generation of corresponding implementation intentions. Thus, future research should continue to investigate how upward counterfactuals and implementation intentions can best complement one another, in particular whether there are conditions under which counterfactuals will be used to form more specific plans.

Finally, the present work focused on academic and cognitive tasks. It would be exciting to extend this research to other contexts, such as goal striving in school or at work. The application of counterfactual thinking in classrooms has unfortunately not received much attention; therefore, their application in educational settings should be one area of focus for future research. Moreover, counterfactual thinking appears to have significant implications at varying levels. For instance, upward counterfactuals serve as a type of self-regulatory tool that can be implemented to

improve specific behaviors that were previously ineffective. Regarding regret, counterfactuals serve as a means of avoiding future regret by learning from past outcomes. Future research should continue to examine the benefits of counterfactual thinking to improve performances and learn from past experiences and mistakes.

Conclusion

Counterfactual thoughts can serve as potent tools to help individuals identify their affective reaction to a particular experience and its causes. Upward counterfactuals are particularly valuable after a negative outcome, as they generally help individuals distinguish how an outcome could have turned out better, and in doing so pinpoint behaviors or actions that would result in more favorable outcomes. A new self-evaluation model of upward counterfactual thinking concerning how upward counterfactual thoughts improve performance was proposed in this dissertation and preliminary studies testing the model were presented. Upward counterfactuals and implementation intentions were found to be complementary and to have independent, but additive effects for performance. The studies suggest that upward counterfactuals' consequences for performance are extensive and are determined by the mobilization of effort, rather than the identification of a useful strategy. Lastly, the performance effects of upward counterfactuals were primarily due to judgments of inadequate goal progress and the belief that performance is controllable.

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Appendix A

Appendix A: Instructions

Order of screen shots from Study 1, as they appeared.

Bevor wir mit der eigentlichen Studie beginnen, möchten wir Ihnen einige Informationen zum besseren Verständnis geben.

Mit nachfolgendem Test möchten wir das Thema "Entscheidungsaufgabe unter Zeitdruck" untersuchen. Des Weiteren interessieren wir uns auch für die Auswirkung von Erfahrung bzw. Übung beim Bearbeiten von Problemen. Zu diesem Zweck, werden Sie unter Zeitdruck bestimmte Entscheidungsaufgabe zweimal bearbeiten. Nach dem ersten Durchgang werden Sie eine Rückmeldung zu Ihren Ergebnissen erhalten.

Neben den generellen Auswirkungen von Zeitdruck auf das Leistungsvermögen von Personen interessieren uns im Besonderen Unterschiede zwischen einzelnen Individuen und Gruppen. Deshalb werden wir Ihnen im Folgenden u.a. auch einige Fragen zu Ihrer Selbstwahrnehmung und Ihren Erwartungen stellen.

Demographic Questions

Bitte geben Sie hier Ihre Altersgruppe an, indem Sie auf den entsprechenden Knopf klicken:

- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- über 40

Bitte geben Sie hier Ihr Geschlecht an, indem Sie auf den entsprechenden Knopf klicken:

- Weiblich
- Männlich

Appendix A: Demographic Questions

Was studieren Sie?

- Psychologie
- Philosophie
- Lehramt Deutsch
- Andere

In welchem Semester sind Sie?

- 1 - 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 oder mehr

Rosenberg's Self-Esteem Scale

Bitte geben Sie an, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen. Antworten Sie bitte entsprechend Ihrer Auffassung darüber, was für ein Typ von Person Sie meistens zu sein glauben.

1. Alles in allem bin ich mit mir selbst zufrieden.
2. Hin und wieder denke ich, dass ich gar nichts taue.
3. Ich besitze eine Reihe guter Eigenschaften.
4. Ich kann vieles genauso gut wie die meisten anderen Menschen auch.
5. Ich fürchte, es gibt nicht viel, worauf ich stolz sein kann.
6. Ich fühle mich von Zeit zu Zeit richtig nutzlos.
7. Ich halte mich für einen wertvollen Menschen, jedenfalls bin ich nicht weniger wertvoll als andere auch.
8. Ich wünschte, ich könnte vor mir selbst mehr Achtung haben.
9. Alles in allem neige ich dazu, mich für einen Versager zu halten.
10. Ich habe eine positive Einstellung zu mir selbst gefunden.

Skala:

- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Appendix A: Instructions

Das Experiment wird folgendermaßen ablaufen:

Zwei Bilder werden gleichzeitig auf dem Bildschirm präsentiert, eines auf der linken und eines auf der rechten Seite. Ihre Aufgabe ist es, das Bild mit dem höheren Punktwert durch Drücken der jeweiligen Taste auszuwählen. Dazu haben Sie 5 Sekunden Zeit. Falls das Bild auf der linken Seite des Bildschirms den höheren Punktwert besitzt, drücken Sie bitte die "F"-Taste. Besitzt das Bild auf der rechten Seite den höhere Punktwert, so drücken Sie die "J"-Taste.

Für jedes Bilderpaar haben Sie die Chance, Punkte zu gewinnen, wenn Sie das Bild mit dem höheren Punktwert korrekt identifizieren. Sollten Sie einen Fehler machen, so bekommen Sie für dieses Bilderpaar keine Punkte. Die Bilder haben Punktwerte von 0 bis 110 Punkten. Ihre gesammelten Punkte werden zu einem Gesamt-Score aufaddiert.

Pro Bilderpaar haben Sie maximal fünf Sekunden Zeit, um sich zu entscheiden und die entsprechende Taste zu drücken. Sollte diese Zeit nicht ausreichen, erhalten Sie für dieses Bilderpaar keine Punkte und der Computer präsentiert automatisch das nächste Bilderpaar.

Wie viele Punkte Sie für eine richtige Antwort erhalten, hängt außer von dem Punktwert der Bilder von der Zeit ab, die sie zur Antwort benötigen. Im Durchschnitt werden pro halber Sekunde Verzögerung 10 % vom Wert des Bildes abgezogen.

Das Experiment beginnt mit einem Probedurchgang, in dem Sie sich mit dem Spiel und Bewertungssystem vertraut machen können. Im Anschluss werden Sie zwei "richtige" Durchgänge absolvieren. Nach jedem Durchgang wird der Computer Ihre Gesamtpunktzahl berechnen und Ihnen mitteilen.

Die Gesamtpunktzahl ergibt sich aus allen von Ihnen nach dem oben erklärten System gesammelten Punkten. Sie bekommen 0,50 € pro 3000 gesammelte Punkte!

Appendix A: Example

Ein Bild eines Elefanten ist beispielsweise 90 Punkte Wert, das eines Apfels 30 Punkte. Der Elefant und der Apfel werden gemeinsam präsentiert, links der Elefant ("F"-Taste) und rechts der Apfel ("J"-Taste). Sie müssten nun die richtige Antwort - Elefant - durch möglichst schnelles Drücken der "F"-Taste geben. Bräuchten Sie 1,5 Sekunden, um die richtige Taste zu drücken, so würden Sie 63 Punkte für dieses Bilderpaar bekommen, nämlich 90 Punkte für die korrekte Antwort minus 27 Punkte, weil sie 1,5 Sekunden gebraucht haben (10 % pro halbe Sekunde).

Understanding Check

Hinsichtlich der folgenden Entscheidungsaufgabe, glaube ich das folgendes der Wahrheit entspricht.

- Es ist wichtig präzise zu sein.
- Es ist wichtig schnell und präzise zu sein.
- Es ist wichtig schnell und präzise zu sein.

Goal Manipulation

Ihre Zielstellung für die folgenden Entscheidungsaufgaben lautet:

Ich will so viele Gesamtpunkte wie möglich erreichen.

Um sicher zu stellen, dass alle Teilnehmer das gleiche Ziel verfolgen, bitten wir Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut Ihrer Zielstellung zu schreiben. Nach jeder Eingabe drücken Sie die Enter-Taste. Vielen Dank.

1. _____.

2. _____.

3. _____.

Appendix A: *Task Understanding*

Bitte geben Sie an, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen.

1. Um so schnell wie möglich antworten zu können, ist es in Ordnung, wenn einige Fehler gemacht werden.
2. Eine schnelle Bearbeitung wird mir helfen einen höheren Punktestand zu erreichen.
3. Es ist wichtig, dass ich schnell und genau arbeite, dennoch ist es OK ein paar Fehler zu machen.

Skala:

- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Appendix A: *Expectations Questionnaire*

Bevor Sie mit der nachfolgenden Entscheidungsaufgabe beginnen, möchten wir Sie bitten einzuschätzen, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen.

1. Ich bin motiviert, im Test gut abzuschneiden.
2. Ich bin gewillt, mich so sehr wie nötig anzustrengen, um gut im Test abzuschneiden.
3. Ich habe mir für diesen Test hohe Ansprüche an meine Leistung gesetzt.
4. Es ist wichtig für mich, dass ich bei diesem Test gut abschneide.
5. Ich erwarte, dass ich bei diesem Test schlecht abschneide.
6. Ich weiß genau, was ich während des Tests mache.

Skala:

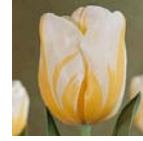
- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Instructions

Ihnen wird jetzt eine Minute gegeben, um sich Bilder und deren entsprechenden Punktwert anzuschauen.

Appendix A: *Preview 1***BILDER UND PUNKTWERT**

Rose = 0 Punkte



Tulpe = 60 Punkte



Schmetterling = 10 Punkte



Pilz = 70 Punkte



Margerite = 20 Punkte



Sonnenblume = 80 Punkte



Paprika = 30 Punkte



Sternfrucht = 90 Punkte



Löwenzahn = 40 Punkte



Narzisse = 100 Punkte



Blatt = 50 Punkte



Seerose = 110 Punkte

Appendix A: Instructions

Vielen Dank! Nun starten wir mit dem eigentlichen Test.

TASK 1 COMPLETED

Feedback

Versuchsperson	
Prozent richtig	
Geschwindigkeit (Millisekunden)	
Gesamtpunktzahl	

Counterfactual Manipulation

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre vorangegangene Leistung nachdenken.

Sehr häufig werden dabei Gedanken wie "Wenn ich nur X getan hätte, dann wäre meine Leistung besser gewesen." geäußert.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Hätte ich nur die entsprechende Taste gedrückt, als ich die Seerose gesehen habe, dann wäre ich besser gewesen."

Appendix A: *Counterfactual Manipulation*

Bitte schreiben Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut des Gedanken. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene vorangegangene Leistung zu beziehen!

"Hätte ich nur die entsprechende Taste gedrückt, als ich die Seerose gesehen habe, dann wäre ich besser gewesen."

1. _____.

2. _____.

3. _____.

Control Manipulation

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre zukünftige Leistung nachdenken.

Sehr häufig werden dabei Gedanken wie "Ich würde gerne wissen, wie..." geäußert.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Ich würde gerne wissen, wie meine Freunde bei dem Test abschneiden."

Appendix A: Control Manipulation

Bitte schreiben Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut des Gedanken. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene zukünftige Leistung zu beziehen! Dieser Gedanke wird später für die Tests wichtig sein.

"Ich würde gerne wissen, wie meine Freunde bei dem Test abschneiden."

1. _____.

2. _____.

3. _____.

Goal Manipulation

Vielen Dank! Sie werden nun mit dem zweiten Teil des Experiments beginnen. Zuvor möchten wir Sie noch bitten nachfolgende Fragen zu beantworten.

Ihre Zielstellung für die folgenden Entscheidungsaufgaben lautet:

"Ich will so viele Gesamtpunkte wie möglich erreichen."

Um sicher zu stellen, dass alle Teilnehmer das gleiche Ziel verfolgen, bitten wir Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut Ihrer Zielstellung zu schreiben. Nach jeder Eingabe drücken Sie die Enter-Taste. Vielen Dank.

1. _____.

2. _____.

3. _____.

Appendix A : *Implementation Intention Manipulation*

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre zukünftige Leistung nachdenken.

Sehr häufig werden dabei Gedanken wie "Wenn ich nur X sehe, führe ich das Verhalten Y aus." geäußert.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Immer wenn ich die Seerose sehe, werde ich sofort die entsprechende Taste drücken."

Bitte schreiben Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut des Gedanken. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene zukünftige Leistung zu beziehen! Dieser Gedanke wird später für die Tests wichtig sein.

"Immer wenn ich die Seerose sehe, werde ich sofort die entsprechende Taste drücken."

1. _____.
2. _____.
3. _____.

Appendix A : Mood Questionnaire

Vielen Dank! Um sicher zu stellen, dass Ihr Gefühlszustand nicht Ihre Leistung im Test beeinflusst hat, bitten wir Sie nun, ein paar Fragen zu beantworten. Sie werden auf den nächsten Seiten Wörter sehen, die Gefühlszustände beschreiben. Bitte lesen Sie jedes Wort durch und geben Sie an, wie stark Sie den jeweiligen Zustand im Moment fühlen.

Appendix A : Mood Questionnaire

1. interessiert
2. bekümmert
3. aufgeregt
4. aufgebracht
5. stark
6. schuldig
7. verängstigt
8. feindselig
9. enthusiastisch
10. stolz
11. reizbar
12. wachsam
13. beschämt
14. inspiriert
15. nervös
16. entschlossen
17. aufmerksam
18. überspannt
19. aktiv
20. besorgt
21. kompetent
22. zuversichtlich
23. intelligent
24. einfallsreich
25. tüchtig
26. leistungsfähig
27. mangelhaft
28. unfähig
29. dumm
30. wertlos
31. verärgert
32. vorbereitet

Skala:

- sehr wenig oder überhaupt nicht
- ein bisschen
- mäßig
- ziemlich
- sehr stark

Appendix A: *Expectations Questionnaire*

Bevor Sie mit der zweiten Durchführung der Entscheidungsaufgabe beginnen, möchten wir Sie bitten einzuschätzen, zu welchem Grad Sie jeder der folgenden Aussagen in Hinblick auf die zweite Durchführung der Entscheidungsaufgabe zustimmen.

1. Ich bin motiviert, im Test gut abzuschneiden.
2. Ich bin gewillt, mich so sehr wie nötig anzustrengen, um gut im Test abzuschneiden.
3. Ich habe mir für diesen Test hohe Ansprüche an meine Leistung gesetzt.
4. Es ist wichtig für mich, dass ich bei diesem Test gut abschneide.
5. Ich erwarte, dass ich bei diesem Test schlecht abschneide.
6. Ich weiß genau, was ich während des Tests mache.

Skala:

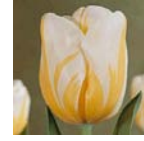
- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Vielen Dank! Nun starten wir mit dem eigentlichen Test.

Ihnen werden jetzt 30 Sekunden gegeben, um sich Bilder und deren entsprechenden Punktwert anzuschauen.

Appendix A: *Preview 2***BILDER UND PUNKTWERT**

Rose = 0 Punkte



Tulpe = 60 Punkte



Schmetterling = 10 Punkte



Pilz = 70 Punkte



Margerite = 20 Punkte



Sonnenblume = 80 Punkte



Paprika = 30 Punkte



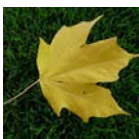
Sternfrucht = 90 Punkte



Löwenzahn = 40 Punkte



Narzisse = 100 Punkte



Blatt = 50 Punkte



Seerose = 110 Punkte

Appendix A

TASK 2 COMPLETED

End Questions

Vielen Dank!

Wenn Sie für den zweiten Teil des Experiments eine besondere Strategie angewendet haben, worin bestand dann diese Strategie?

_____.

Zum Schluss möchten wir Sie bitten, in dem Kasten unten kurz aufzuschreiben, was Ihrer Meinung nach der Inhalt des Experiments war.

_____.

Kam Ihnen im Verlauf des Experiments etwas seltsam vor?

_____.

Feedback

Versuchsperson	
Prozent richtig	
Geschwindigkeit (Millisekunden)	
Gesamtpunktzahl	

Appendix B

Appendix B: *Instructions*

Order of handouts from Study 1, as they appeared.

Liebe/r Versuchsteilnehmer/in,

Wir möchten Sie darum bitten, den folgenden Fragebogen auszufüllen. Bitte folgen Sie den Instruktionen und bearbeiten Sie eine Seite nach der anderen in der vorgegebenen Reihenfolge.

Alle Daten werden **anonym** erhoben und aufgezeichnet. Die Daten werden zu rein wissenschaftlichen Zwecken genutzt und nicht an Dritte weitergegeben. Bitte antworten Sie überlegt und gewissenhaft.

Mit dieser Studie möchten wir herausfinden, welche Probleme neue Studenten dabei haben, Freundschaften zu erhalten und wie diese überwunden werden.

Bitte blättern Sie nun um.

Appendix B: *Instructions & Counterfactual Manipulation*

Wenn man umzieht, z.B. um zu studieren, ist es oft schwierig, Freundschaften zu erhalten. Häufig hat man Probleme dabei, die Freundschaften Zuhause zu erhalten, während man versucht neue Leute kennenzulernen und neue Freundschaften an der Universität zu schließen.

Personen machen sich ganz verschiedene Gedanken, wenn sie über die Vergangenheit nachdenken. Sehr häufig werden dabei Gedanken wie "Was wäre wenn _____." Oder "Wäre doch nur _____." geäußert.

Bitte denken Sie an eine Freundschaft, die verloren gegangen ist oder schwierig zu erhalten ist. Was hätten Sie machen können, um diese Freundschaft besser zu erhalten? Bitte schreiben Sie einen Gedanken dieser Art über Ihre vergangene Freundschaft auf. Schreiben Sie dabei auf, was Sie hätten machen können, um diese Freundschaft besser zu erhalten.

Bitte schreiben Sie Ihren Gedanken in die dafür vorgesehenen Felder.

1. Hätte ich _____
 _____ dann hätte ich meine Freundschaft besser erhalten.

2. Hätte ich _____
 _____ dann hätte ich meine Freundschaft besser erhalten.

3. Hätte ich _____
 _____ dann hätte ich meine Freundschaft besser erhalten.

Bitte blättern Sie nun um.

Personen machen sich auch ganz verschiedene Gedanken, wenn sie über ihre Zukunft nachdenken. Oft sind die Gedanken in der Form eines Plans: „Immer wenn _____ passiert, dann mache ich _____.“

Bitte denken Sie an eine Freundschaft, die Sie gerne erneuern würden oder die momentan schwierig zu erhalten ist. Was könnten Sie in Zukunft machen, um diese Freundschaft zu erneuern oder besser zu erhalten? Schreiben Sie einen Gedanken dieser Art über Ihre zukünftige Freundschaft auf. Bitte schreiben Sie auf, was Sie in einer bestimmten Situation machen können, um diese Freundschaft besser zu erhalten.

Bitte schreiben Sie Ihren Gedanken in die dafür vorgesehenen Felder.

1. Immer wenn _____

dann mache ich _____

2. Immer wenn _____

dann mache ich _____

3. Immer wenn _____

dann mache ich _____

Wie wichtig ist es Ihnen, Ihre Freundschaften zu erhalten?

- sehr wenig oder überhaupt nicht
- ein bisschen
- mäßig
- ziemlich
- sehr

Vielen Dank für Ihre Mithilfe!

Appendix C

Appendix C: *Instructions*

Order of screen shots from Study 3, as they appeared.

Bevor wir mit der eigentlichen Studie beginnen, möchten wir Ihnen einige Informationen zum besseren Verständnis geben.

Mit nachfolgendem Test möchten wir das Thema "Entscheidungsaufgabe unter Zeitdruck" untersuchen. Des Weiteren interessieren wir uns auch für die Auswirkung von Erfahrung bzw. Übung beim Bearbeiten von Problemen. Zu diesem Zweck, werden Sie unter Zeitdruck bestimmte Entscheidungsaufgabe zweimal bearbeiten. Nach dem ersten Durchgang werden Sie eine Rückmeldung zu Ihren Ergebnissen erhalten.

Außerdem möchten wir sehen, ob Sie es unter die besten 30 Prozent der Teilnehmer schaffen können.

Neben den generellen Auswirkungen von Zeitdruck auf das Leistungsvermögen von Personen interessieren uns im Besonderen Unterschiede zwischen einzelnen Individuen und Gruppen. Deshalb werden wir Ihnen im Folgenden u.a. auch einige Fragen zu Ihrer Selbstwahrnehmung und Ihren Erwartungen stellen.

Demographic Questions

Bitte geben Sie hier Ihre Altersgruppe an, indem Sie auf den entsprechenden Knopf klicken:

- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- über 40

Appendix C: Demographic Questions

Bitte geben Sie hier Ihr Geschlecht an, indem Sie auf den entsprechenden Knopf klicken:

- Weiblich
- Männlich

Was studieren Sie?

- Psychologie
- Philosophie
- Lehramt Deutsch
- Andere

In welchem Semester sind Sie?

- 1 - 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 oder mehr

Appendix C: Rosenberg's Self-Esteem Scale

Bitte geben Sie an, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen. Antworten Sie bitte entsprechend Ihrer Auffassung darüber, was für ein Typ von Person Sie meistens zu sein glauben.

1. Alles in allem bin ich mit mir selbst zufrieden.
2. Hin und wieder denke ich, dass ich gar nichts taue.
3. Ich besitze eine Reihe guter Eigenschaften.
4. Ich kann vieles genauso gut wie die meisten anderen Menschen auch.
5. Ich fürchte, es gibt nicht viel, worauf ich stolz sein kann.
6. Ich fühle mich von Zeit zu Zeit richtig nutzlos.
7. Ich halte mich für einen wertvollen Menschen, jedenfalls bin ich nicht weniger wertvoll als andere auch.
8. Ich wünschte, ich könnte vor mir selbst mehr Achtung haben.
9. Alles in allem neige ich dazu, mich für einen Versager zu halten.
10. Ich habe eine positive Einstellung zu mir selbst gefunden.

Skala:

- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Instructions

Das Experiment wird folgendermaßen ablaufen:

Zwei Bilder werden gleichzeitig auf dem Bildschirm präsentiert, eines auf der linken und eines auf der rechten Seite. Ihre Aufgabe ist es, das Bild mit dem höheren Punktwert durch Drücken der jeweiligen Taste auszuwählen. Dazu haben Sie 5 Sekunden Zeit. Falls das Bild auf der linken Seite des Bildschirms den höheren Punktwert besitzt, drücken Sie bitte die "F"-Taste. Besitzt das Bild auf der rechten Seite den höhere Punktwert, so drücken Sie die "J"-Taste.

Appendix C: Instructions

Für jedes Bilderpaar haben Sie die Chance, Punkte zu gewinnen, wenn Sie das Bild mit dem höheren Punktwert korrekt identifizieren. Sollten Sie einen Fehler machen, so bekommen Sie für dieses Bilderpaar keine Punkte. Die Bilder haben Punktwerte von 0 bis 110 Punkten. Ihre gesammelten Punkte werden zu einem Gesamt-Score aufaddiert.

Pro Bilderpaar haben Sie maximal fünf Sekunden Zeit, um sich zu entscheiden und die entsprechende Taste zu drücken. Sollte diese Zeit nicht ausreichen, erhalten Sie für dieses Bilderpaar keine Punkte und der Computer präsentiert automatisch das nächste Bilderpaar.

Wie viele Punkte Sie für eine richtige Antwort erhalten, hängt außer von dem Punktwert der Bilder von der Zeit ab, die sie zur Antwort benötigen. Im Durchschnitt werden pro halber Sekunde Verzögerung 10 % vom Wert des Bildes abgezogen.

Das Experiment beginnt mit einem Probedurchgang, in dem Sie sich mit dem Spiel und Bewertungssystem vertraut machen können. Im Anschluss werden Sie zwei "richtige" Durchgänge absolvieren. Nach jedem Durchgang wird der Computer Ihre Gesamtpunktzahl berechnen und Ihnen mitteilen.

Die Gesamtpunktzahl ergibt sich aus allen von Ihnen nach dem oben erklärten System gesammelten Punkten. Sie bekommen 0,50 € pro 3000 gesammelte Punkte!

Example

Ein Bild eines Elefanten ist beispielsweise 90 Punkte Wert, das eines Apfels 30 Punkte. Der Elefant und der Apfel werden gemeinsam präsentiert, links der Elefant ("F"-Taste) und rechts der Apfel ("J"-Taste). Sie müssten nun die richtige Antwort - Elefant - durch möglichst schnelles Drücken der "F"-Taste geben. Bräuchten Sie 1,5 Sekunden, um die richtige Taste zu drücken, so würden Sie 63 Punkte für dieses Bilderpaar bekommen, nämlich 90 Punkte für die korrekte Antwort minus 27 Punkte, weil sie 1,5 Sekunden gebraucht haben (10 % pro halbe Sekunde).

Appendix C: *Understanding Check*

Hinsichtlich der folgenden Entscheidungsaufgabe, glaube ich das folgendes der Wahrheit entspricht.

- Es ist wichtig präzise zu sein.
- Es ist wichtig schnell und präzise zu sein.
- Es ist wichtig schnell und präzise zu sein.

Goal Manipulation

Ihre Zielstellung für die folgenden Entscheidungsaufgaben lautet:

Ich möchte in dem Test unter den besten 30 Prozent der Teilnehmer sein.

Um sicher zu stellen, dass alle Teilnehmer das gleiche Ziel verfolgen, bitten wir Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut Ihrer Zielstellung zu schreiben. Nach jeder Eingabe drücken Sie die Enter-Taste. Vielen Dank.

1. _____.
2. _____.
3. _____.

Appendix C: *Task Understanding*

Bitte geben Sie an, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen.

1. Um so schnell wie möglich antworten zu können, ist es in Ordnung, wenn einige Fehler gemacht werden.
2. Eine schnelle Bearbeitung wird mir helfen einen höheren Punktestand zu erreichen.
3. Es ist wichtig, dass ich schnell und genau arbeite, dennoch ist es OK ein paar Fehler zu machen.

Skala:

- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Mood Questionnaire

Vielen Dank! Um sicher zu stellen, dass Ihr Gefühlszustand nicht Ihre Leistung im Test beeinflusst hat, bitten wir Sie nun, ein paar Fragen zu beantworten. Sie werden auf den nächsten Seiten Wörter sehen, die Gefühlszustände beschreiben. Bitte lesen Sie jedes Wort durch und geben Sie an, wie stark Sie den jeweiligen Zustand im Moment fühlen.

Appendix C : *Mood Questionnaire*

1. interessiert
2. bekümmert
3. aufgebracht
4. schuldig
5. verängstigt
6. feindselig
7. enthusiastisch
8. wachsam
9. beschämt
10. inspiriert
11. entschlossen
12. aufmerksam
13. überspannt
14. aktiv
15. besorgt
16. mangelhaft
17. vorbereitet

Skala:

- sehr wenig oder überhaupt nicht
- ein bisschen
- mäßig
- ziemlich
- sehr stark

Appendix C: *Expectations Questionnaire*

Bevor Sie mit der nachfolgenden Entscheidungsaufgabe beginnen, möchten wir Sie bitten einzuschätzen, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen.

1. Ich bin motiviert, unter den besten 30 Prozent der Teilnehmer zu sein.
2. Ich bin gewillt, mich so sehr wie nötig anzustrengen, um unter den besten 30 Prozent der Teilnehmer zu sein.
3. Ich habe mir für diesen Test hohe Ansprüche an meine Leistung gesetzt.
4. Es ist wichtig für mich, unter den besten 30 Prozent der Teilnehmer zu sein.
5. Ich erwarte, dass ich unter den besten 30 Prozent der Teilnehmer zu sein.
6. Ich weiß genau, was ich während des Tests mache.

Skala:

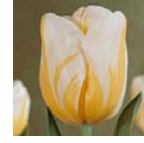
- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Instructions

Ihnen wird jetzt eine Minute gegeben, um sich Bilder und deren entsprechenden Punktwert anzuschauen.

Appendix C: *Preview 1***BILDER UND PUNKTWERT**

Rose = 0 Punkte



Tulpe = 60 Punkte



Schmetterling = 10 Punkte



Pilz = 70 Punkte



Margerite = 20 Punkte



Sonnenblume = 80 Punkte



Paprika = 30 Punkte



Sternfrucht = 90 Punkte



Löwenzahn = 40 Punkte



Narzisse = 100 Punkte



Blatt = 50 Punkte



Seerose = 110 Punkte

Appendix C: Instructions

Vielen Dank! Nun starten wir mit dem eigentlichen Test.

TASK 1 COMPLETED

Feedback

Versuchsperson	
Prozent richtig	
Geschwindigkeit (ms)	
Prozent erreicht	
Gesamtpunktzahl	

Counterfactual Manipulation

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre vorangegangene Leistung nachdenken.

Sehr häufig werden dabei Gedanken wie "Wenn ich nur X getan hätte, dann wäre meine Leistung besser gewesen." geäußert.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Wenn ich die entsprechende Taste gedrückt hätte, sobald ich die Seerose gesehen habe, hätte ich unter den besten 30 Prozent der Teilnehmer sein können."

Appendix C: *Counterfactual Manipulation*

Bitte schreiben Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut des Gedanken. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene vorangegangene Leistung zu beziehen!

"Wenn ich die entsprechende Taste gedrückt hätte, sobald ich die Seerose gesehen habe, hätte ich unter den besten 30 Prozent der Teilnehmer sein können."

1. _____.

2. _____.

3. _____.

Counterfactual without Antecedent Manipulation

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre vorangegangene Leistung nachdenken.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Ich hätte in dem Test unter den besten 30 Prozent der Teilnehmer abschneiden können."

Appendix C: Counterfactual without Antecedent Manipulation

Bitte schreiben Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut des Gedanken. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene vorangegangene Leistung zu beziehen!

"Ich hätte in dem Test unter den besten 30 Prozent der Teilnehmer abschneiden können."

1. _____.

2. _____.

3. _____.

Goal Discrepancy Manipulation

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre vorangegangene Leistung nachdenken.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Ich war in dem Test nicht unter den besten 30 Prozent der Teilnehmer."

Appendix C: Goal Discrepancy Manipulation

Bitte schreiben Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut des Gedanken. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene vorangegangene Leistung zu beziehen!

"Ich war in dem Test nicht unter den besten 30 Prozent der Teilnehmer."

1. _____.

2. _____.

3. _____.

Control Manipulation

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre zukünftige Leistung nachdenken.

Sehr häufig werden dabei Gedanken wie "Ich würde gerne wissen, wie..." geäußert.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Ich würde gerne wissen, wie meine Freunde bei dem Test abschneiden."

Appendix C: Control Manipulation

Bitte schreiben Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut des Gedanken. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene zukünftige Leistung zu beziehen! Dieser Gedanke wird später für die Tests wichtig sein.

"Ich würde gerne wissen, wie meine Freunde bei dem Test abschneiden."

1. _____.

2. _____.

3. _____.

Goal Manipulation

Vielen Dank! Sie werden nun mit dem zweiten Teil des Experiments beginnen. Zuvor möchten wir Sie noch bitten nachfolgende Fragen zu beantworten.

Ihre Zielstellung für die folgenden Entscheidungsaufgaben lautet:

Ich möchte in dem Test unter den besten 30 Prozent der Teilnehmer sein.

Um sicher zu stellen, dass alle Teilnehmer das gleiche Ziel verfolgen, bitten wir Sie in die folgenden leeren Zeilen dreimal den genauen Wortlaut Ihrer Zielstellung zu schreiben. Nach jeder Eingabe drücken Sie die Enter-Taste. Vielen Dank.

1. _____.

2. _____.

3. _____.

Appendix C: Mood Questionnaire

Vielen Dank! Um sicher zu stellen, dass Ihr Gefühlszustand nicht Ihre Leistung im Test beeinflusst hat, bitten wir Sie nun, ein paar Fragen zu beantworten. Sie werden auf den nächsten Seiten Wörter sehen, die Gefühlszustände beschreiben. Bitte lesen Sie jedes Wort durch und geben Sie an, wie stark Sie den jeweiligen Zustand im Moment fühlen.

1. interessiert
2. bekümmert
3. aufgebracht
4. schuldig
5. verängstigt
6. feindselig
7. enthusiastisch
8. wachsam
9. beschämt
10. inspiriert
11. entschlossen
12. aufmerksam
13. überspannt
14. aktiv
15. besorgt
16. mangelhaft
17. vorbereitet

Skala:

- sehr wenig oder überhaupt nicht
- ein bisschen
- mäßig
- ziemlich
- sehr stark

Appendix C: *Expectations Questionnaire*

Bevor Sie mit der zweiten Durchführung der Entscheidungsaufgabe beginnen, möchten wir Sie bitten einzuschätzen, zu welchem Grad Sie jeder der folgenden Aussagen in Hinblick auf die zweite Durchführung der Entscheidungsaufgabe zustimmen.

1. Ich bin motiviert, unter den besten 30 Prozent der Teilnehmer zu sein.
2. Ich bin gewillt, mich so sehr wie nötig anzustrengen, um unter den besten 30 Prozent der Teilnehmer zu sein.
3. Ich habe mir für diesen Test hohe Ansprüche an meine Leistung gesetzt.
4. Es ist wichtig für mich, unter den besten 30 Prozent der Teilnehmer zu sein.
5. Ich erwarte, dass ich unter den besten 30 Prozent der Teilnehmer zu sein.
6. Ich weiß genau, was ich während des Tests mache.

Skala:

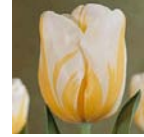
- stimmt überhaupt nicht
- stimmt nicht
- stimmt nicht ganz
- weder falsch noch richtig
- stimmt teilweise
- stimmt
- stimmt voll und ganz

Vielen Dank! Nun starten wir mit dem eigentlichen Test.

Ihnen werden jetzt 30 Sekunden gegeben, um sich Bilder und deren entsprechenden Punktwert anzuschauen.

Appendix C: *Preview 2***BILDER UND PUNKTWERT**

Rose = 0 Punkte



Tulpe = 60 Punkte



Schmetterling = 10 Punkte



Pilz = 70 Punkte



Margerite = 20 Punkte



Sonnenblume = 80 Punkte



Paprika = 30 Punkte



Sternfrucht = 90 Punkte



Löwenzahn = 40 Punkte



Narzisse = 100 Punkte



Blatt = 50 Punkte



Seerose = 110 Punkte

Appendix C

TASK 2 COMPLETED

End Questions

Vielen Dank!

Wenn Sie für den zweiten Teil des Experiments eine besondere Strategie angewendet haben, worin bestand dann diese Strategie?

Zum Schluss möchten wir Sie bitten, in dem Kasten unten kurz aufzuschreiben, was Ihrer Meinung nach der Inhalt des Experiments war.

Kam Ihnen im Verlauf des Experiments etwas seltsam vor?

Appendix C: End Questions

1. Inwieweit waren Sie mit Ihrer Leistung in der ersten Hälfte des Tests nicht zufrieden?

2. Inwieweit waren Sie motiviert, im zweiten Teil des Tests besser abzuschneiden?

Skala:

- sehr wenig oder überhaupt nicht
- ein bisschen
- mäßig
- ziemlich
- sehr stark

Feedback

Versuchsperson	
Prozent richtig	
Geschwindigkeit (ms)	
Prozent erreicht	
Gesamtpunktzahl	

Appendix D

Appendix D: *Instructions*

Order of screen shots from Study 4, as they appeared.

Bevor wir mit der eigentlichen Studie beginnen, möchten wir Ihnen einige Informationen zum besseren Verständnis geben.

Mit nachfolgendem Test möchten wir das Thema "Physiologische Aktivität während Entspannung und Bearbeitung von Aufgaben" untersuchen. Des Weiteren interessieren wir uns auch für die Auswirkung von Erfahrung bzw. Übung beim Bearbeiten von Problemen. Zu diesem Zweck, werden Sie unter Zeitdruck bestimmte Entscheidungsaufgabe zweimal bearbeiten. Nach dem ersten Durchgang werden Sie eine Rückmeldung zu Ihren Ergebnissen erhalten.

Bitte drücken Sie die Leertaste.

Die Blutdruckmessung liefert genaue Informationen über physiologische Aktivität ohne dabei die Leistung zu beeinträchtigen. In dem "Entspannungsteil" des Tests wird sowohl Ihr Blutdruck als auch Ihr Puls (alle 2 Minuten) gemessen, während Sie die Instruktionen lesen und die Fragebögen ausfüllen. Bitte versuchen Sie sich dabei zu entspannen. In dem "Aufgabenteil" des Tests wird wiederum Ihr Blutdruck und Puls gemessen (alle 2 Minuten) während Sie eine Problemlöseaufgabe bearbeiten. Versuchen Sie dabei bitte, die Geräte zu ignorieren und sich auf den Test zu konzentrieren. Vorangegangene Studien haben gezeigt, dass dieser Versuchsaufbau die Leistung der Teilnehmer nicht beeinträchtigt.

Bitte drücken Sie die Enter-Taste.

Wir interessieren uns im Besonderen für Unterschiede zwischen einzelnen Individuen und Gruppen. Deshalb werden wir Ihnen im Folgenden u.a. auch einige Fragen zu Ihrer Selbstwahrnehmung und Ihren Erwartungen stellen.

Bitte drücken Sie die Leertaste.

Appendix D: Demographic Questions

Bitte geben Sie hier Ihr Geschlecht an.

- Männlich
- Weiblich

Drücken Sie die Enter-Taste um zu bestätigen oder "c" um Ihre Antwort zu

Bitte geben Sie hier Ihre Altersgruppe an.

- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- über 35

Drücken Sie die Leertaste um zu bestätigen oder "c" um Ihre Antwort zu ändern.

Instructions

Wir werden im Rahmen dieser Studie eine Blutdruckmessung bei Ihnen durchführen. Es ist daher erforderlich, dass wir Ihnen einige Fragen zu Ihrer Gesundheit und weiteren Faktoren, die ihren Blutdruck beeinflussen könnten, stellen.

Bitte drücken Sie die Enter-Taste.

Appendix D: Health Questions

1. Leiden Sie unter hohem Blutdruck oder anderen kardiovaskulären Erkrankungen?
2. Haben Sie in den 2 Stunden vor diesem Test geraucht?
3. Haben Sie in den 2 Stunden vor diesem Alkohol getrunken?
4. Haben Sie sich in den 2 Stunden vor diesem Test stark körperlich verausgabt?
5. Haben Sie in den 2 Stunden vor diesem Test Koffein zu sich genommen?

1 = Ja

2 = Nein

Drücken Sie die Leertaste um zu bestätigen oder "c" um Ihre Antwort zu ändern.

Instructions

Die Aufgabe ist in zwei Teile getrennt. Jeder Teil besteht aus einer Serie von unvollständigen Wörtern. Ihre Aufgabe besteht darin, so viele Wörter wie möglich innerhalb von 5 Minuten richtig zu ergänzen, d.h., dass Sie Schnell und genau arbeiten müssen. Jedes Wort besteht aus 8 Buchstaben. Um Ihnen dabei zu helfen, werden Ihnen die Kategorie, zu der das Wort gehört, und 2 Buchstaben gegeben. Die anderen Wörter können nur auf eine Art richtig gelöst werden. Sie können jederzeit einen Hinweis kaufen oder das Wort ergänzen.

Bitte drücken Sie die Enter-Taste.

Wenn Sie einen Hinweis kaufen, wird Ihnen der erste fehlende Buchstabe angezeigt. Sie können bis zu vier Hinweise kaufen wie Sie brauchen, um das Wort zu vervollständigen. Nach jedem gegebenen Hinweis, haben Sie die Möglichkeit das Wort zu lösen.

Bitte drücken Sie die Leertaste.

Appendix D: *Instructions*

Sie bekommen für jedes vervollständigte Wort 6 Punkte. Jedoch wird für jeden gekauften Hinweis ein Punkt vom Endstand abgezogen. Also, wenn Sie 2 Hinweise kaufen, bevor Sie das Wort vervollständigen, bekommen Sie zuerst 6 Punkte. Es werden jedoch 2 Punkte abgezogen, sodass Sie insgesamt 4 Punkte erzielt haben. Wenn Sie 2 Hinweise kaufen, das Wort jedoch nicht lösen, werden Ihnen 2 Punkte vom Endstand abgezogen. Sie bekommen für falsche Antworten keine Punkte.

Nach jeder Serie von Wörtern erhalten Sie ein Feedback zu Ihrer Leistung. Ihnen werden sowohl die Anzahl der korrekt gelösten Wörter als auch die Anzahl der gekauften Hinweise und Ihr derzeitiger Punktestand angezeigt.

Bitte drücken Sie die Enter-Taste.

Rosenberg's Self-Esteem Scale

Bitte geben Sie an, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen. Antworten Sie bitte entsprechend Ihrer Auffassung darüber, was für ein Typ von Person Sie meistens zu sein glauben.

1. Alles in allem bin ich mit mir selbst zufrieden.
2. Hin und wieder denke ich, dass ich gar nichts taue.
3. Ich besitze eine Reihe guter Eigenschaften.
4. Ich kann vieles genauso gut wie die meisten anderen Menschen auch.
5. Ich fürchte, es gibt nicht viel, worauf ich stolz sein kann.
6. Ich fühle mich von Zeit zu Zeit richtig nutzlos.
7. Ich halte mich für einen wertvollen Menschen, jedenfalls bin ich nicht weniger wertvoll als andere auch.
8. Ich wünschte, ich könnte vor mir selbst mehr Achtung haben.
9. Alles in allem neige ich dazu, mich für einen Versager zu halten.
10. Ich habe eine positive Einstellung zu mir selbst gefunden.

Skala:

1. stimmt überhaupt nicht
2. stimmt nicht
3. stimmt nicht ganz
4. weder falsch noch richtig
5. stimmt teilweise
6. stimmt
7. stimmt voll und ganz

Drücken Sie die Leertaste um zu bestätigen oder "c" um Ihre Antwort zu ändern.

Appendix D: *Goal Manipulation*

Ihre Zielstellung für die folgenden Entscheidungsaufgaben lautet:

Ich will so viele Gesamtpunkte wie möglich erreichen.

Um sicher zu stellen, dass alle Teilnehmer das gleiche Ziel verfolgen, bitten wir Sie dreimal den genauen Wortlaut Ihrer Zielstellung zu schreiben. Nach jeder Eingabe drücken Sie bitte die Enter-Taste.

Ziel: _____.

Ziel: _____.

Ziel: _____.

Mood Questionnaire

Sie werden auf den nächsten Seiten Wörter sehen, die Gefühlszustände beschreiben. Bitte lesen Sie jedes Wort durch und geben Sie an, wie stark Sie den jeweiligen Zustand im Moment fühlen.

Bitte drücken Sie die Leertaste.

Appendix D: Mood Questionnaire

1. interessiert
2. bekümmert
3. aufgebracht
4. schuldig
5. verängstigt
6. feindselig
7. enthusiastisch
8. wachsam
9. beschämt
10. inspiriert
11. entschlossen
12. aufmerksam
13. überspannt
14. aktiv
15. besorgt
16. mangelhaft
17. vorbereitet

Skala:

1. sehr wenig oder überhaupt nicht
2. ein bisschen
3. mäßig
4. ziemlich
5. sehr stark

Drücken Sie die Leertaste um zu bestätigen oder "c" um Ihre Antwort zu ändern.

Expectations Instructions

Bevor Sie mit der nachfolgenden Aufgabe beginnen, möchten wir Sie bitten einzuschätzen, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen.

Bitte drücken Sie die Leertaste.

Appendix D: *Expectations Questions*

1. Ich bin motiviert so viele Punkte wie möglich zu erreichen.
2. Ich bin dazu bereit, mich so sehr wie nötig anzustrengen, um viele Punkte zu erreichen.
3. Ich habe mir für diesen Test hohe Ansprüche an meine Leistung gesetzt.
4. Es ist wichtig für mich so viele Punkte wie möglich zu erreichen.
5. Ich erwarte, dass ich viele Punkte erreichen werde.
6. Ich weiß genau, was ich während des Tests mache.

Skala:

1. stimmt überhaupt nicht
2. stimmt nicht
3. stimmt nicht ganz
4. weder falsch noch richtig
5. stimmt teilweise
6. stimmt
7. stimmt voll und ganz

Drücken Sie die Leertaste um zu bestätigen oder "c" um Ihre Antwort zu ändern.

Bitte sagen Sie der Versuchsleiterin, dass Sie fertig sind.

At this point, the experimenter synchronized the start of the task and the blood pressure machine for each participant.

Bitte drücken Sie die Enter-Taste um den Test zu beginnen.

Appendix D: *List of incomplete words and categories for Task 1*

Note: Words were presented one at a time, as indicated below, in addition to the category that the word belongs to.

1. (**S****G) - AKTION
2. (*E****F*) - STANDARD
3. (*****DI*) - PERSON
4. (**H****L) - GEFÄß
5. (E*****R) - PERSON
6. (****ST**) - FRIST
7. (*I****U*) - PFLANZE
8. (**SP****) - AKTION
9. (*I*****R) - BERUF
10. (*AH*****) - MASCHINE
11. (*C**L***) - GEGENSTAND
12. (**L****R) - KLEIDUNGSSTÜCK
13. (S*****E*) - KLEIDUNGSSTÜCK
14. (*E***S**) - TON
15. (*E*****R) - UMWELT
16. (*C*****E) - SCHMUCK
17. (**O***M*) - FERNSEHEN
18. (**N**I**) - MATHEMATIK
19. (***H***G) - ORIENTIERUNG
20. (**UA****) - GEFÄß
21. (*A***A**) - SPORT
22. (**I*L***) - PERSON
23. (R****U**) - MEDIEN
24. (**G****H) - SCHRIFTSTÜCK

Sie können versuchen dieses Rätsel zu (l)ösen oder einen (H)inweis kaufen.

Bitte geben Sie Ihre Lösung ein:

Bitte drücken Sie die Leertaste zu bestätigen oder C um Ihre Antwort zu ändern.

Appendix D: *List of words incomplete words and their solution for Task 1*

1. ANSCHLAG (**S****G)
2. VERNUNFT (*E****F*)
3. FREUNDIN (*****DI*)
4. SCHÜSSEL (**H****L)
5. EUROPÄER (E*****R)
6. SEMESTER (****ST**)
7. HIBISKUS (*I****U*)
8. GESPRÄCH (**SP****)
9. DIREKTOR (*I*****R)
10. FAHRZEUG (*AH*****)
11. SCHALTER (*C**L***)
12. PULLOVER (**L****R)
13. SANDALEN (S*****E*)
14. GERÄUSCH (*E***S**)
15. GEWITTER (*E*****R)
16. SCHLEIFE (*C*****E)
17. PROGRAMM (**O***M*)
18. FUNKTION (**N**I**)
19. RICHTUNG (**H***G)
20. AQUARIUM (**UA****)
21. LANGLAUF (*A***A**)
22. ZWILLING (**I*L***)
23. RUNDFUNK (R****U**)
24. TAGEBUCH (**G****H)

Feedback for Task 1

Die Zeit für den Test ist jetzt um.

Richtige Antworten:

Hinweise:

Punkte:

Bitte drücken Sie die Enter-Taste.

Appendix D: *Counterfactual Manipulation*

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch darum, einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre vorangegangene Leistung nachdenken. Häufig werden dabei Gedanken wie "Wenn ich nur X getan hätte, dann wäre meine Leistung besser gewesen." geäußert.

Bei vorangegangenen Durchführungen dieser Entscheidungsaufgabe haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Hätte ich nur mehr Hinweise verwendet, dann wäre meine Gesamtleistung bei diesem Test besser geworden."

Bitte schreiben Sie diesen Gedanken dreimal in das dafür vorgesehene Feld. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene vorangegangene Leistung zu beziehen.

Bitte drücken Sie die Leertaste.

Bitte wiederholen Sie diesen Gedanken dreimal in den dafür vorgesehenen Feldern.

"Hätte ich nur mehr Hinweise verwendet, dann wäre meine Gesamtleistung bei diesem Test besser geworden."

: _____.

: _____.

: _____.

Appendix D: *Control Manipulation*

Bevor wir mit dem zweiten Teil des Experiments beginnen, bitten wir Sie noch darum, einige Fragen zu beantworten.

Personen machen sich ganz verschiedene Gedanken, wenn sie über ihre zukünftige Leistung nachdenken. Häufig werden dabei Gedanken wie "Ich würde gerne wissen, wie . . ." geäußert.

Bei vorangegangenen Durchführungen dieses Experiments haben Teilnehmer häufig den folgenden Gedanken niedergeschrieben:

"Ich würde gerne wissen, wie meine Freunde bei dem Test abschneiden. "

Bitte schreiben Sie diesen Gedanken dreimal in das dafür vorgesehene Feld. Nach jeder Eingabe drücken Sie die Enter-Taste. Versuchen Sie dann intensiv diesen Gedanken auf Ihre eigene zukünftige Leistung zu beziehen.

Bitte drücken Sie die Leertaste.

Bitte wiederholen Sie diesen Gedanken dreimal in den dafür vorgesehenen Feldern.

"Ich würde gerne wissen, wie meine Freunde im Test abschneiden."

: _____.

: _____.

: _____.

Appendix D: Goal Manipulation

Ihre Zielstellung für die folgenden Aufgaben lautet:

Ich will so viele Punkte wie möglich erreichen.

Um sicher zu stellen, dass alle Teilnehmer das gleiche Ziel verfolgen, bitten wir Sie dreimal den genauen Wortlaut Ihrer Zielstellung zu schreiben. Nach jeder Eingabe drücken Sie die Enter-Taste. Vielen Dank.

Ziel: _____.

Ziel: _____.

Ziel _____.

Mood Questionnaire

Sie werden auf den nächsten Seiten Wörter sehen, die Gefühlszustände beschreiben. Bitte lesen Sie jedes Wort durch und geben Sie an, wie stark Sie den jeweiligen Zustand im Moment fühlen.

Bitte drücken Sie die Leertaste.

Appendix D: Mood Questionnaire

1. interessiert
2. bekümmert
3. aufgebracht
4. schuldig
5. verängstigt
6. feindselig
7. enthusiastisch
8. wachsam
9. beschämt
10. inspiriert
11. entschlossen
12. aufmerksam
13. überspannt
14. aktiv
15. besorgt
16. mangelhaft
17. vorbereitet

Skala:

1. sehr wenig oder überhaupt nicht
2. ein bisschen
3. mäßig
4. ziemlich
5. sehr stark

Drücken Sie die Leertaste um zu bestätigen oder "c" um Ihre Antwort zu ändern.

Expectation Questions

Bevor Sie mit der nachfolgenden Aufgabe beginnen, möchten wir Sie bitten einzuschätzen, zu welchem Grad Sie jeder der folgenden Aussagen zustimmen.

Bitte drücken Sie die Leertaste.

Appendix D: *Expectation Questions*

1. Ich bin motiviert so viele Punkte wie möglich zu erreichen.
2. Ich bin dazu bereit, mich so sehr wie nötig anzustrengen, um viele Punkte zu erreichen.
3. Ich habe mir für diesen Test hohe Ansprüche an meine Leistung gesetzt.
4. Es ist wichtig für mich so viele Punkte wie möglich zu erreichen.
5. Ich erwarte, dass ich viele Punkte erreichen werde.
6. Ich weiß genau, was ich während des Tests mache.

Skala:

1. stimmt überhaupt nicht
2. stimmt nicht
3. stimmt nicht ganz
4. weder falsch noch richtig
5. stimmt teilweise
6. stimmt
7. stimmt voll und ganz

Drücken Sie die Leertaste um zu bestätigen oder "c" um Ihre Antwort zu ändern.

Bitte sagen Sie der Versuchsleiterin, dass Sie fertig sind.

At this point, the experimenter synchronized the start of the task and the blood pressure machine for each participant.

Bitte drücken Sie die Enter-Taste um den Test zu beginnen.

Appendix D: *List of incomplete words and categories for Task 2*

Note: Words were presented one at a time, as indicated below, in addition to the category that the word belongs to.

1. (*A***A**) - GEBÄUDE
2. (L*****E*) - GEGENSTAND
3. (**O**R) - PERSON
4. (*A***D**) - AUFSTELLUNG
5. (*****IT) - ZEITDAUER
6. (****HA**) - PLAN
7. (**KT**) - APPARATUR
8. (!**S**C**) - ANSCHAUUNG
9. (**H**T**) - BODENBELAG
10. (K****K**) - PERSON
11. (*U****U*) - EREIGNIS
12. (!**T**R**) - GEGENSTAND
13. (*I*****E) - WERKZEUG
14. (G*****E*) - UMWELT
15. (**HS**) - BAUWERK
16. (**T***A*) - PERSON
17. (S*****K) - GEOMETRIE
18. (**N****L) - SPORT
19. (**F**C*) - KLEIDUNGSSTÜCK
20. (*E***A**) - KUNST
21. (**KU**) - SCHULE
22. (**H***H*) - STRAÙE
23. (*E****T*) - PERSON
24. (**LM**) - HIMMEL

Sie können versuchen dieses Rätsel zu (l)ösen oder einen (H)inweis kaufen.

Bitte geben Sie Ihre Lösung ein:

Bitte drücken Sie die Leertaste zu bestätigen oder C um Ihre Antwort zu ändern.

Appendix D: *List of incomplete words and their solutions for Task 2*

1. KAUFHAUS (*A***A**)
2. LEUCHTER (L*****E*)
3. BEWOHNER (**O***R)
4. KALENDER (*A***D**)
5. KINDHEIT (*****IT)
6. HAUSHALT (****HA**)
7. ELEKTRIK (**KT***)
8. AUSSICHT (!*S**C**)
9. SCHOTTER (**H**T**)
10. KRITIKER (K****K**)
11. JUBILÄUM (*U****U*)
12. BATTERIE (!**T**R**)
13. PINZETTE (*I*****E)
14. GEWÄSSER (G*****E*)
15. HOCHSITZ (**HS***)
16. FOTOGRAF (**T***A*)
17. SECHSECK (S*****K)
18. HANDBALL (**N****L)
19. KOPFTUCH (**F**C*)
20. LEINWAND (*E***A**)
21. ERDKUNDE (**KU***)
22. FAHRBAHN (**H***H*)
23. GEFÄHRTE (*E****T*)
24. VOLLMOND (**LM***)

Feedback for Task 2

Die Zeit für den Test ist jetzt um.

Richtige Antworten:

Hinweise:

Punkte:

Bitte drücken Sie die Enter-Taste.

Appendix D: *End Questions*

Vielen Dank. Zum Schluss möchten wir Sie bitten, in dem Kasten unten kurz aufzuschreiben, was Ihrer Meinung nach der Inhalt des Experiments war.

_____.

Kam Ihnen im Verlauf des Experiments etwas seltsam vor?

_____.

1. Inwieweit waren Sie mit Ihrer Leistung im ersten Teil des Tests unzufrieden?

2. Inwieweit waren Sie motiviert, im zweiten Teil des Tests besser abzuschneiden?

Skala:

1. sehr wenig oder überhaupt nicht
2. ein bisschen
3. mäßig
4. ziemlich
5. sehr stark

Vielen Dank! Das Experiment ist jetzt zu Ende.