



**The role of self-regulatory individual
differences in counterfactual thinking.**

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Thesis submitted to

Mary Immaculate College
University of Limerick
For the degree of

Doctor of Philosophy

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**Submitted to Mary Immaculate College, University of Limerick,
July 2013**

Abstract

The aim of this research was to investigate the role of self-regulatory individual differences in counterfactual thinking. In particular, we examined individual differences in autonomy, action/state orientation and cognitive self-affirmation inclination over the course of seven experiments. Autonomy, which emphasizes intrinsic motivation and reduced preoccupation with external outcomes, was explored in Experiments 1, 2, and 3. The results showed that autonomy influenced counterfactual controllability and that the method of eliciting counterfactual responses was important to observe this association. Additionally, the experiments demonstrated the adaptiveness of controllable counterfactuals in performance improvement. Experiments 4 and 5 examined action/state orientation which is the capacity to view self-representations as unthreatened following negative outcomes. We found that an action-orientation was associated with counterfactual controllability when participants encountered prolonged difficulty in a cognitive task. Also, by experimentally manipulating action/state orientation we found that innately action-oriented and state-oriented participants differed in the counterfactuals they generated. Finally, Experiments 6 and 7 demonstrated that individuals high in cognitive self-affirmation inclination, a tendency to self-affirm, generated more controllable counterfactuals, compared to individuals without this tendency. The findings from the seven experiments indicate that individual differences in self-regulatory traits are important in the types of counterfactual thoughts that people generate. We discuss the implications of the findings for the functional theory of counterfactual thinking and for the use of counterfactual thought in applied settings.

Declaration of Originality

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Declaration: I hereby declare that this thesis is the result of my own original research and does not contain the work of any other individual. All sources that have been consulted have been identified and acknowledged in the appropriate way.

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Acknowledgements

A number of people have been instrumental in the completion of this research and I wish to acknowledge their help and support. Firstly, special thanks are extended to my host institution Mary Immaculate College, Limerick for awarding me the teaching assistantship that helped make this research possible. I would like to thank my examiners Dr. Clare Walsh, Plymouth University and Dr. Veronica Cullinan, Mary Immaculate College for agreeing to participate in my Viva Voce. I would also like to acknowledge the Psychological Society of Ireland and the British Psychological Society for affording me the opportunity to present the findings of this research in the public domain.

I would like to thank my research supervisor Dr. Suzanne Egan for being a continued source of expertise and encouragement throughout the entirety of this research. Her involvement and guidance have been essential, for which I am very grateful. Thanks are also owing to Dr. Marek McGann who provided some helpful insights at an important stage of the research. Thank you to Aoife, Deirdre, Steve, Michelle, Alan, Mary, and all the postgraduate students I have had the pleasure of studying with over the past few years. I am also grateful to the undergraduate students of Mary Immaculate College for agreeing to participate in this research.

Finally, I would like to thank my family and friends for seeing the best in me. I offer my sincerest gratitude to my parents Carmel and Paudge for their constant reassurance and support. Thank you both for everything.

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Chapter One

Overview and Summary

The overall aim of this research is to investigate whether self-regulatory individual differences influence the functionality of counterfactual thought. We examine a number of potentially important individual difference variables which have previously not been examined in relation to counterfactual thinking. Specifically, we examine individual differences that describe variation in self-motives (Sedikides & Strube, 1997). Self-motives describe how individuals perceive or maintain a self-concept in relation to various situations. An individual difference perspective is used in conjunction with related experimental manipulations. We suggest that self-regulatory individual differences that describe variation in the capacity to view the self as unthreatened during negative situations may be particularly important in terms of counterfactual functionality. Over the course of 7 experiments utilizing a variety of cognitive tasks, counterfactual thought listing exercises, experimentally induced cognitive styles, and measures of individual difference variables, evidence is presented in support of this argument. The remainder of this chapter provides a brief overview and summary of the thesis.

In the next chapter, Chapter 2, we introduce the area of counterfactual thinking. Firstly, in a review of the relevant literature, important concepts and studies carried out relating to counterfactual thinking are outlined. A clear definition of counterfactual thinking is provided. We examine pervasive categorizations used within the social psychological literature used to classify mental mutations of the past by their structure, direction, and focus. Types of counterfactuals identified in existing studies as being particularly adaptive are given special consideration. We

described factors that are known to influence the amount and type of counterfactual thinking people engage in such as negative affect and cognitive evaluations of outcome valence. Situational or environmental determinants of counterfactual thinking such as outcome closeness, involvement, controllability, and whether action or inaction led to an outcome are also touched upon.

Next, we introduce some important theories put forward to explain the underlying processes involved in counterfactual thinking. Moving on from descriptions of counterfactual thinking as a potential source of cognitive bias, the evidence for counterfactual functionality is outlined. The varying pathways that facilitate performance improvement via counterfactual thinking are described, helping to illuminate the general idea that behavioural intentions may be influenced by counterfactual thinking.

A number of existing studies of individual differences in counterfactual thinking helped inform the present research. Thus, a brief review of this subset of studies is provided. Following this introduction to individual differences in counterfactual thinking, special consideration is given to the handful of studies that have examined self-regulatory individual difference factors in relation to counterfactual thinking. In introducing the objectives of the present research, the mixed findings from studies on self-regulatory individual differences in counterfactual thinking are discussed. Explanations as to why some of the self-regulatory constructs studied in the past demonstrated weak associations with functional counterfactual thinking are put forward. Potential problems with the particular individual difference constructs used and the means of eliciting counterfactual responses are addressed. To conclude the literature review, we introduce previously unexamined individual difference variables as potentially

important candidates to demonstrate any association between self-regulatory individual differences and functional counterfactual thinking.

Chapters 3, 4 and 5 report findings from seven experiments conducted for the present research. In Chapter 3 a potential link between functional counterfactual thinking and autonomy is examined. As an individual difference variable, autonomy generally describes the degree to which an individual's behaviour is self-motivated and self-determined (Bekker & van Assen, 2006; Deci & Ryan, 2008). Experiment 1 examines whether high autonomy individuals display any propensity toward functional counterfactual thoughts after failure. A number of counterfactual elicitation methodologies are used.

Experiment 2 builds on Experiment 1 by investigating whether counterfactual thinking and individual differences in autonomy might influence performance improvement. Specifically, we examined whether any potential performance improvement associated with counterfactual thinking may be dependent on this individual difference factor. Experiment 2 also considers any potential association between individual differences in autonomy and control perceptions after generating counterfactual thoughts. We investigated whether any potential control enhancing effect of counterfactual thinking might be mediated by individual differences in autonomy.

In a final investigation into the role of autonomy in counterfactual thinking, Experiment 3 also examines whether individual differences in this variable are associated with functional types of counterfactual thinking and whether it mediates the performance improving effects of counterfactual thinking. We also examine different ways of eliciting counterfactual responses from participants. By

manipulating the means by which counterfactuals were elicited, it could be observed whether these means mediate any potential findings for functionality.

Chapter 4 examines whether findings observed for the self-regulatory individual difference of autonomy might be generalized to other self-regulatory individual differences. For this reason, individual differences in action/state orientation are examined (Diefendorff, Hall, Lord, & Streat, 2000). Action/state orientation is thought to be highly correlated with autonomy and according to Kuhl (2000), individuals are predisposed to either an action or state-orientation, a stable personality trait over time. Experiment 4 investigates whether individual differences in this trait influence counterfactual thinking. We also examine in Experiment 4 whether potential differences between action-oriented and state-oriented individuals in terms of counterfactual functionality may be dependent of the degree of failure participants experience.

Building from Experiment 4, Experiment 5 measures individual differences in action/state orientation and also experimentally induces a temporary action or state-orientation. Action-oriented individuals typically get over negative events quickly and focus on taking action to solve problems. State-oriented individuals typically find it difficult to overcome a negative event, and keep ruminating about it and how it affects their current state. This experiment addresses whether fostering an action-orientation facilitates the use of potentially functional counterfactuals and investigates whether individual difference factors interact significantly with related experimental manipulations.

In the final experimental chapter, Chapter 5, the focus turns to cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012). Cognitive self-

affirmation inclination describes an individual difference in how people spontaneously generate positive self-images that may be used when the self is threatened. There is currently little empirical research pertaining to the influence of self-affirmations on counterfactual thoughts. Experiment 6 examines individual differences in cognitive self-affirmation inclination and whether this variable influences functional types of counterfactual thoughts generated after a negative outcome. Experiment 6 also experimentally manipulates self-affirmations to observe the effect of this manipulation on subsequent counterfactual generation and focus. We investigate whether individual differences in cognitive self-affirmation inclination and related experimental manipulations might influence observable performance improvement that occurs after counterfactual thinking.

Continuing from Experiment 6, Experiment 7 attempts to investigate any potential association between cognitive self-affirmation inclination and counterfactual thinking about a personally salient life event. Again, we examine whether this individual difference factor is associated with more functional types of counterfactual thinking. Experiment 7 examines whether findings from earlier experiments of the present research which typically elicited counterfactual responses utilizing cognitive tasks might also extend to events that people find important and are currently committed to achieving success in.

Finally, the findings of all seven experiments are outlined in a general discussion in Chapter 6. Here, we synthesize our findings and highlight implications for existing theories and research. We suggest a number of ways in which this research may be continued and built upon in the future.

Chapter Two

Literature review

The present research focuses on counterfactual thinking – the general cognitive process of imagining alternative outcomes to past events. This category of thought has been the focus of considerable psychological research in recent decades (e.g., Byrne, 2005; Epstude & Roese, 2011; Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Roese & Olsen, 1995). However, from a non-psychological perspective, alternative versions of past events have been contemplated from at least as early as the ancient Greek philosophers. Perhaps most notably, subjunctive suppositions and unseen yet tangible ideal forms were examined in the writings of both Plato and Aristotle. Later, during the 17th century, the German philosopher Leibniz argued that as long as they contradict no formal laws of logic, alternative “possible worlds” may exist. For many decades, historians have also utilized counterfactual scenarios to consider ‘what might have been’ had important past events been different (e.g., Squire & Churchill, 1931) and to illustrate objections to deterministic theories of history (e.g., Ferguson, 2000).

The present research stems from existing counterfactual research within the area of social psychology. Of all disciplines, social psychology is perhaps the area in which counterfactual thinking has received the greatest attention. Social psychologists are concerned with the global cognitive functioning of people within a broad, social context. Unlike philosophers, social psychologists are not typically concerned with the objective nature of reality, but in the perceptions of individuals. They examine an individual’s interpretation of a situation. In addition to how

individuals interpret or utilize counterfactual thoughts, social psychologists are concerned with their global psychological impact. For instance, social psychologists have examined the relationships between counterfactuals and coping strategies (e.g., Davis, Lehman, Wortman, Silver, & Thompson, 1995), functionality (e.g., Roese, 1994), responsibility (e.g., Markman & Tetlock, 2000), emotions (e.g., Coricelli & Rustichini, 2010), and blame (e.g., Branscombe, Wohl, Owen, Allison, & N'gbala, 2003) to name but a few.

The remainder of this chapter is divided into three sections. The first section describes previous research on, and theories of, counterfactual thinking. The second section focuses on the role of individual differences in counterfactual thinking and the final section discusses the current research.

2.1 Introduction to counterfactual thinking

Why is counterfactual thinking important?

Counterfactual thinking is a pervasive element of everyday human cognition (Summerville & Roese, 2008). Previous research shows that people regularly and spontaneously generate counterfactual thoughts about all sorts of events (Roese, 1997). For example, after failing an exam someone might think 'If only had studied more I would have done better'. Likewise, after winning the lottery someone might think 'If I hadn't stopped to buy a lottery ticket I wouldn't have won'. Counterfactual thoughts typically focus on mutating both an outcome and an event leading to that outcome in thinking about how things could have turned out differently.

The question as to whether counterfactuals are of benefit or not has been considered in much of the literature (Byrne, 2005; Epstude & Roese, 2008; Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Roese, 1994). Both positive and negative features of counterfactual thinking have been identified. In terms of potential drawbacks to counterfactual thinking, severely depressed individuals who experience diminished control perceptions and low self-efficacy tend to generate less reasonable and feasible counterfactuals than non-depressed individuals (Markman & Miller, 2006; Markman & Weary, 1998). According to Epstude and Roese (2008), excessive counterfactual thinking about how things could have been different may also cause people to worry more and increase levels of stress. Other negative behaviours such as procrastination have been associated with less effective use of counterfactual thinking (Sirois, 2004). Procrastinators tend to use counterfactuals to make themselves feel better about their current situation and may therefore become complacent and lack motivation to bring about positive change. Perfectionism, also, has been shown to impact negatively on counterfactual thinking (Sirois, Monforton, & Simpson, 2010).

However, despite these potential downsides to counterfactual thinking, research has identified important functions associated with the construction of mental alternatives to past events. These functions include learning from past mistakes (Morris & Moore, 2000), making sense of life events (Bingham, 2003) and playing a role in emotions (Roese & Hur, 1997). For example, counterfactual thinking is regarded as a key psychological process underlying emotions such as regret, relief, disappointment, shame, and guilt (Kahneman & Miller, 1986; Niedenthal, Tangney, & Gavanski, 1994). The relationship between counterfactual thought and emotion is thought to be bi-directional; emotions can influence

counterfactual thinking and counterfactual thinking can influence emotions (Roese & Hur, 1997). Thinking about how a scenario could have been better may lead to negative affective experience (Davis et al., 1995; Markman, Gavanski, Sherman, & McMullen, 1993). On the other hand, generating counterfactuals about how a scenario could have been worse may improve a persons' affective evaluation of an outcome (Mandel, Hilton, & Catellani, 2005; Markman, Klein, & Suhr, 2008). Contrast effects of this kind were examined by Medvec, Gilovich, and Madey (1995) who demonstrated that Olympic bronze medallists tend to experience positive affect due to the 'might have been' of finishing fourth with no medal, whereas silver medallists experience negative affect due to the salient counterfactual of almost winning the gold medal.

Regret is an intrinsically aversive emotion and there exists a basic motivation to avoid it. However, regrets can serve a useful purpose. In a study that explored people's attitude toward negative emotions, Saffrey, Summerville, and Roese (2008) found that regret was generally regarded as being favourable rather than unfavourable. Regret, in contrast to other negative emotions, was dominated by positive evaluations by participants. The study revealed that regret was in fact viewed as the most beneficial of twelve negative emotions, particularly in terms of making sense of past experiences, facilitating approach behaviours, facilitating avoidance behaviours, and gaining insights into the self. Participants' responses also revealed the self-serving nature of regret, reporting greater regret for their own experiences than for others. It seems that while people acknowledge that regret is a negative emotion, they value it as a tool in discerning life experiences. Without the ability to think counterfactually, people would not be able to imagine how negative life events could have turned out differently.

Similarly, counterfactual thinking may serve to instil a sense of meaning about important life events. Research by Kray et al. (2010) asked participants to reflect on a pivotal event in their lives. Some participants considered counterfactual alternatives to the event. Generating counterfactuals increased the likelihood that the event was seen as meaningful. Counterfactual thinking may also help people make sense of traumatic life events (Bingham, 2003; Davis et al., 1995). Learning from and making sense of a traumatic life experience seems to be hindered in individuals who cannot easily bring salient counterfactuals to mind. Bingham (2003) used a verbal fluency methodology to examine prospective positive and negative thinking patterns about traumatic events. The study noted that many participants who were asked to generate reasons for a positive conclusion to a difficult personal situation in their life could only generate one alternative. Typically, this alternative conclusion focused simply on the undoing of the difficulty rather than on the construction of a positive alternative outcome. Similarly, El Leithy, Brown, and Robbins (2006) postulate that not fully engaging in broad-based counterfactual thinking lends itself to maintaining a memory of a past event that draws focus to the event's most traumatic/negative elements.

Counterfactual thinking has also been demonstrated to be important in learning (Kahneman & Tversky, 1982; Roese & Olson, 1995). People cannot always rely on repeated experience to learn from events. Counterfactual thoughts about what "might have been" offer a prime example of how learning may occur due to imaginative mental simulation rather than through trial and error. For example, Roese (1994, Experiment 2) demonstrated that counterfactuals effect intentions to perform success-facilitating behaviours in future. Participants generated counterfactuals about a recent exam they had performed poorly in. Compared to a

no-counterfactual control group, participants who generated counterfactuals subsequently reported higher intention ratings to perform success facilitating behaviours for future exams. Roese (1994, Experiment 3) also showed that participants induced to generate counterfactuals later performed better in an anagram task compared to a no-counterfactual control group.

However, categorizing counterfactual thoughts as learned lessons may not be conceptually accurate. Morris and Moore (2000) have suggested that the definition of 'learning' is important in this context. If learning is vaguely defined as any cognition resulting from experience, then all counterfactual thoughts may indeed be understood as learned lessons. However, applying a more restrictive definition of learning - developing specific plans for future outcome improvement - counterfactual thoughts should not be thought of as lessons learned because they focus exclusively on past events. The focus of a performance improving lesson conversely, is a future event. Thus, rather than being finalized learned lessons; counterfactual thoughts may instead serve to focus attention in such a way as to facilitate learning. In support of this idea, Egan and Byrne (2012) found that some counterfactual statements (e.g., if you had been bold I would have grounded you) have an illocutionary force that may guide future behaviour.

Classifications of counterfactual thought

There are a number of ways in which counterfactual thoughts have been categorized in the literature (e.g., Davis et al., 1995; Giroto, Ferrante, Pighin, & Gonzalez, 2007; Roese, 1997). However, counterfactual thoughts are typically classified according to their direction, structure and content (Roese, 1997). Imagine a situation in which an

individual is driving along a motorway when their car breaks down and they are stuck on the roadside. There are many types of thoughts they may generate to imagine an alternative situation. Direction describes whether a counterfactual portrays a better or worse alternative reality (e.g., Roese, 1994). When a counterfactual suggests an alternative that is comparatively preferable to actuality, it is termed an *upward* counterfactual (e.g., “if only I made it a few more kilometres, I’d have been near a mechanic”). Likewise, when a counterfactual portrays a somewhat less desirable alternative to the past, it is termed a *downward* counterfactual (e.g., “If the engine had blown, I might have been in a serious accident”).

Upward counterfactuals have been demonstrated to be more beneficial in terms of learning than downward counterfactuals. Roese (1994, Experiment 2) showed that students who generated upward counterfactuals after receiving academic feedback were more likely than those who generated downward counterfactuals to articulate intentions to take improvement-facilitating, preparative actions ahead of their next exam. These results were also replicated in a laboratory experiment in which upward counterfactuals facilitated learning in a puzzle task more effectively than downward counterfactuals (Roese, 1994, Experiment 3).

More generally, people’s intentions to prepare, improve performance, and apply greater effort have all been shown to increase via the application of upward counterfactual thinking (Markman et al., 1993; Markman, McMullen, & Elizaga, 2008; Roese, 1994). Some research also shows that while the generation of upward counterfactuals may often be associated with negative affect, when there remains a chance that a future situation may be changed, upward counterfactuals result in relatively positive affect (McMullen & Markman, 2000). Likewise,

Boninger, Gleicher, and Strathman (1994) found that participants who were focused on the future were less likely to experience the negative affective consequences of upward counterfactual thinking relative to those who were not focused on actions that could be taken in the future.

Upward counterfactuals may facilitate performance improvement by influencing perceptions of control. In a study by Nasco and Marsh (1999), the influence of upward counterfactuals on perceptions of control was examined. This study was particularly important as counterfactuals generated were self-salient and generated in an ecologically valid setting over a 30-day period; the role of counterfactual thinking was examined in a study of real-life academic performance. The researchers suggested that perceived control was a mediator of the link between upward counterfactuals and improved performance. Data revealed that the tendency to generate upward counterfactuals was correlated with later changes in circumstances. These changes in circumstances were in turn, associated with higher perceptions of control. This finding indicates that those who generated more upward counterfactual thoughts engaged in adaptive behavioural change and experienced a heightened sense of control.

Another dimension of counterfactual categorization, counterfactual structure, refers to whether the thought is additive or subtractive in nature (Kray, Galinsky, & Markman, 2009). An additive counterfactual focuses on adding in things that could have been done to alter events. In such instances, the stem 'If only I had' is common as in: "If only I had serviced my car regularly..." Conversely, subtractive counterfactuals typically focus on the undoing of actions or events. For instance, a person may think: "If only I had not taken that route home..." Counterfactuals may also be composed of a mixture of both additive and subtractive

antecedents such as: “If only I had been smarter and not rushed, I would have avoided the accident.”

Some evidence suggests that additive counterfactuals may be more conducive to performance improvement than subtractive counterfactuals. Roese and Olson (1993b) showed that when undoing success, people typically remove a successful antecedent action (“If I hadn’t studied I wouldn’t have passed the exam”) but when undoing failure, a new antecedent action is introduced (“If I had used my own calculator I wouldn’t have failed the exam”). Thus, when adaptation is required due to failure, additive counterfactuals are more readily generated.

Roese and Olson (1993b) offer an explanation as to why additive counterfactuals may be more functional than subtractive counterfactuals. They suggest that additive counterfactuals are drawn from several potential responses while subtractive counterfactuals merely remove one previous response from consideration. Additive counterfactuals may be inherently more creative than subtractive counterfactuals. Subtractive counterfactuals are restricted to the original set of premises but additive counterfactuals go beyond this restriction to construct novel options. In research by Roese (1994), participants induced to focus on regrets of inaction rather than regrets of action subsequently demonstrated greater performance improvement. Markman, Lindberg, Kray, and Galinsky (2007) found that regrets of inaction promote a more expansive processing style, associated with broader conceptual attention and creativity. Essentially these studies indicate that additive counterfactuals may be useful in identifying adaptive strategies that facilitate behaviour modification.

In addition to the direction and structure of counterfactual thoughts, researchers are often interested in the focus of the thoughts. Typically, counterfactual focus can be categorized in a variety of ways depending on the particular aim of the study. For example, one distinction was made by Mandel (2003) who categorized participants' counterfactuals as either self-referent or other-referent. This distinction is also discussed by Epstude and Roese (2008). Other classifications have included whether or not individuals focus on actions or inactions (e.g., Medvec et al., 1995) or on controllable or uncontrollable events (e.g., Markman & Miller, 2006).

In terms of counterfactual focus, controllable counterfactuals are thought to be particularly adaptive (Morris & Moore, 2000). When regret is experienced it is likely that the focus of counterfactual thoughts will be on one's own behaviour. This was highlighted by Davis et al. (1995) who examined counterfactual thoughts in victims of traumatic events. Across two complimentary studies, results indicated that the focus of counterfactuals was typically on one's own behaviour rather than on the behaviour of other people. Similarly, the emotion of shame has also been demonstrated as a prompt to counterfactually alter qualities of the self (Niedenthal et al., 1994). Even though controllable counterfactuals are associated with negative affective reactions, by their very nature they may also be facilitative. For controllable counterfactuals, there is a direct link from an upward comparison to a behavioural intention (Roese, 1997). This is not the case for uncontrollable counterfactuals. The thought, 'If only I had practiced more, I would have won the tennis match', translates directly into an action one could take to improve future performance. A thought about someone else's behaviour (e.g., 'If only he wasn't so athletic, I would have won') or an uncontrollable aspect of oneself (e.g., 'if only I was taller I would have won') does not directly translate into mutable actions to

improve one's own future behaviour. Uncontrollable counterfactuals may in fact divert attention away from actions a person may be in control of (Morris & Moore, 2000).

The number of features people may focus on when thinking counterfactually is limited only by imagination (Byrne, 2005). Thus, developing a definitive list of classifications would be onerous. Instead, it is worthy of note that counterfactual focus is often categorized in relation to a salient dependent variable, with counterfactuals not falling into a nominal category labelled as miscellaneous. For instance, after participants selected and attempted a mental multiplication task, Girotto et al. (2007) categorized participants' counterfactuals as being choice-focused, problem-focused, or other.

Besides the focus of counterfactual thought being limited only by imagination, so too is the number of counterfactual thoughts people can generate about an event. In response to an event people may think of a number of different ways in which it could have turned out differently. Some of these thoughts may be upward counterfactuals while some may be downward. Some may focus on controllable aspects of behaviour while others may focus on uncontrollable aspects. Most thoughts will probably be a combination of the classifications described above (e.g., a counterfactual thought that is upward, additive and controllable). In counterfactual thinking research, individuals are usually given the opportunity to generate more than one counterfactual thought about an event (Roese, 1994; Nasco & Marsh, 1999; Roese & Olson, 1993a). However, the first counterfactual generated is considered to be the most salient aspect of the event that individuals think of when undoing it (Wells & Gavanski, 1989). For this reason, and because real world situations typically don't involve multiple counterfactual responses, some research

has examined the focus of initial or isolated counterfactual responses (e.g., Morris & Moore, 2000).

Factors influencing counterfactual thinking

In conceptualizing the determinants of counterfactual thinking, a distinction has been made between factors that influence counterfactual activation and factors that influence counterfactual focus (Roese, 1997). Counterfactual activation refers to whether the process of counterfactual thinking is initiated or ‘switched on’, while counterfactual focus describes the specific informational make-up and content of the thought. In order for determinants of counterfactual focus to take effect, activational factors must first be encountered or experienced. That is to say, Bill will not form the statement, “If only I had concentrated harder, I would have won the prize”, unless some factor stimulates him to think counterfactually in the first place. The factors that initiate or influence counterfactual thinking are numerous. What follows is an outline of a number of important counterfactual determinants.

Much of the existing research has identified catalysts that stimulate and shape counterfactual thinking (e.g., Boninger et al., 1994; Haynes et al., 2007; Meyerslevy & Maheswaran, 1992). In terms of actually sparking counterfactual thoughts, outcomes that are in some way inconsistent with expectations are considered important (Kahneman & Miller, 1986). For instance, if a highly unusual course of action was taken by a student leading up to an exam, then that is typically the action they will tend to focus on or undo. For example, if the student usually manages to get eight hours sleep each night but only slept for three hours the night prior to an exam, they may well construct the counterfactual, “If only I had gone to

bed at my usual time, I would have performed much better”. Numerous studies have indicated that the focus of counterfactual thought is determined by perceptions of situational normality (e.g., Buck & Miller, 1994; Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Miller, Turnbull, & McFarland, 1990). Studies such as these demonstrate that individuals tend to undo unusual factual antecedents, bringing them back into line with normal expectations or behaviour.

Negative affect is also thought to be particularly important. A review by Roese and Olson (1997) points to numerous studies demonstrating that counterfactuals are most often prompted by negative emotional reactions – the “affect-driven hypothesis.” People typically construct counterfactuals when faced with adversity. Studies on traumatic life events carried out by Davis et al. (1995) suggest that negative affect experienced by parents shortly after suffering bereavement can be predictive of the number of self-reported counterfactuals generated at a later stage of the grieving process. Simply put, the more negative affect experienced by a parent, the more ‘if only’ type statements will be produced. In this sense, affect has an important influence on whether or not counterfactuals are generated or ‘switched on’. This methodological approach of examining counterfactual thought frequency is not uncommon when examining activation factors.

Closely related to the factor of negative affect is outcome valence. Overall, a great deal of evidence now supports the claim that negative outcomes (as opposed to positive outcomes) result in greater counterfactual thinking (Boninger et al., 1994; Gleicher et al., 1990; Wells & Gavanski, 1989). Evidence provided by Sanna and Turley (1996), observing emotionally neutral cases, suggests that outcome valence plays a crucial role in the activation of counterfactuals. Their research

demonstrated that counterfactuals were more frequently generated after negative outcomes in a number of experimental tasks ranging from academic type assessment to performance on an anagram task. There is some conflicting evidence however. Roese and Olsen (1993b, 1995) reported that regardless of whether a scenario is perceived as positive or negative, participants generated counterfactual thoughts with similar frequency. These studies seem to be somewhat exceptional however, with most of the empirical research supporting the notion that counterfactual thinking is most likely to occur after negative events (Davis et al., 1995; Grieve, Houston, Dupuis, & Eddy, 1999).

It may be however, that outcome valence effects are in fact mediated by changes in affect. Roese and Olson (1997) attempted to examine the impact of outcome valence on counterfactual thought generation, but investigated whether it was affective experiences or changes in cognitive perceptions of outcome valence that mitigated changes in counterfactual generation frequency. Response times were used as a measure of counterfactual generation; yes/no agreement responses to counterfactual statements were timed after both negative and positive outcomes. Over a range of experiments, self-report ratings of affect were shown to mediate the effects of outcome valence on activation. Negative emotions in particular, were shown to account for a significant portion of the variance in counterfactual activation. Importantly, the direction of a counterfactual thought may often be determined by outcome valence; various research has shown that people are more likely to generate upward counterfactuals following failure, and downward counterfactuals following success (Gleicher et al., 1990; Grieve et al., 1999; Markman et al., 1993; Sanna et al., 2001).

Outcome closeness – how an outcome almost, but did not quite occur – has been shown to influence counterfactual thought generation (e.g., Johnson, 1986; Kahneman & Tversky, 1982; Meyerslevy & Maheswaran, 1992). Take, for instance, the case of a person who forgets to file a fire insurance policy on time. This scenario was presented to participants in an experiment carried out by Meyerslevy and Maheswaran (1992). In one trial, participants considered how things could have been different when the insurance form was due to be filed three days before a fire occurred. In another trial, participants considered alternatives when the form was due to be filed six months prior to the fire. Results indicated that when the missed opportunity – not filing the insurance form – was temporally close, counterfactuals were more frequently produced in a subsequent thought-listing task.

Other studies examining the determinant of temporal closeness have utilized a scenario in which a person misses a plane/train by either a few minutes or a few hours (Johnson, 1986; Kahneman & Tversky, 1982). These studies also suggest that temporal closeness influences the number of counterfactual thoughts being generated. Other studies have shown that outcome closeness is influential even in the absence of plausible causal factors. For instance, Turnbull (1981) found that participants whose lottery numbers were close to the winning numbers, experienced greater disappointment than participants whose numbers were more remote from the winning numbers. Outcome closeness may also refer to distance: missing a touchdown by a single yard as opposed to 15 yards; or it may refer to numerical quantity: being the 999th customer when the 1000th customer wins a prize (Roese, 1997).

The degree of involvement a person has in determining an outcome has also been shown to influence counterfactual generation. Meyerslevy and

Maheswaran (1992) examined this factor. The study mainly involved participants reading advertisements from charitable aid organizations. They were informed that their input was required in determining how charitable funds may be allocated. Highly involved participants were told that a university was interested in their opinion regarding which charitable organization should receive funding and that they were part of a very select group of people whose assistance was being sought. Low involvement participants were informed that their contributions might be added to a list of possible organizations in a nationwide study of opinion. An outcome closeness variable was also introduced in the study. Participants read a harrowing story of children who had been orphaned due to a recent military coup in Chile. Depending on the experimental condition allocated, participants learned that plans by the charitable organization to offer assistance had been halted either one day or nine months before they could take effect. The researchers postulated that in cases where personal involvement was low, people should produce more counterfactuals when short rather than long temporal distance separate actual and alternative outcomes. However, if an individual had high personal involvement, the temporal distance variable should have little effect on the amount of counterfactuals generated. Analysis of participants' responses revealed that temporal distance effects on counterfactual generation were only important when personal involvement with the situation was low. In other words, issue involvement superseded the temporal distance factor in counterfactual activation.

Counterfactual thoughts may also be influenced by whether it is an action or some perceived inaction that leads to an outcome (Byrne & McEleney, 2000; Kahneman & Tversky, 1982; Landman & Petty, 2000). People may more typically focus counterfactually on actions rather than inactions. In fact, studies have

controlled this variable when manipulating counterfactual focus (Gleicher et al., 1990; Miller et al., 1990). To say that counterfactuals typically tend to focus on actions rather than inactions may however be something of an oversimplification. While some studies have failed to detect any tendency toward action-focused counterfactuals (e.g., Davis et al., 1995), others have suggested that outcome valence (Roese & Olson, 1993a) and temporal distance (Medvec et al., 1995) moderate whether people focus on action rather than inaction. For instance, the argument made by Medvec et al. (1995) suggests that while people may tend to undo actions taken in the short term, over the long term it is inaction that constitutes the greatest source of regret. However, this temporal switch is thought to occur only for particular sorts of situations (Byrne & McEleney, 2000). Research by Walsh and Byrne (2007) also suggests that counterfactuals about actions tend to vary depending on whether or not there is a clear and justifiable reason behind the action taken.

Controllability has been identified as an important factor in counterfactual thinking (Egan, Frosh, & Hancock, 2008; Markman & Miller, 2006; Markman, Gavanski, Sherman, & McMullen, 1995; Walsh & Byrne, 2005). Controllability refers to the perception of personal control an individual had over an outcome. For instance, after receiving a negative grade, a student may feel they had more control over going to bed on time as opposed to whether their teacher was effective that semester. Research has shown that people are indeed more likely to mutate preoutcome features that they personally have control over (Giroto, Legrenzi, & Rizzo, 1991; McCloy & Byrne, 2000; Miller et al., 1990).

The influence of controllability has also been highlighted by Markman et al. (1995) who developed a “controllability hypothesis” suggesting that controllable aspects of an event take precedence over uncontrollable aspects in being

counterfactualized due to the fact that the former typically receive more attention. Markman et al. (1995) argue that judgements of controllability may influence the ease with which counterfactuals are generated. Compared to other mental simulations however, such as thinking about what might happen in the future (i.e., prefactuals), counterfactuals may not be as likely to focus on controllable elements. Recent research suggests that after experiencing failure, counterfactuals tend to focus on uncontrollable antecedents more so than prefactuals (Ferrante, Giroto, Stragà, & Walsh, 2013).

Theories of counterfactual thinking

A number of theories have been put forward to explain the underlying processes involved in counterfactual thinking. From a theoretical perspective, counterfactuals were originally thought of as a form of biased judgement in heuristics. For instance, norm theory (Kahneman & Miller, 1986) largely describes counterfactual thinking as a hindrance to sound reasoning and decision making. Norm theory purports that counterfactual thinking is the activation from memory of positive examples of how present similar situations should be handled. Abnormal outcomes, or those that are inconsistent with expectancies, elicit representations that are counterfactual and congruent with expectations. In other words, when faced with unusual or unfortunate events, people generate “if only” type thoughts which aid in bringing events back to normal. Essentially, norm theory addresses the comparison between a cognitive anchor and an existing outcome. A variety of cognitive and affective reactions are based on the difference between the two items being compared. In this context, judgmental standards (norms) are constructed from both a priori beliefs and actual

outcomes. Instead of viewing anchors as global and fixed, norms are specific and can be variable depending on the situation.

The postulated bias of norm theory results when judgements of relatively objective outcomes become distorted due to the presence of a counterfactual alternative. Even in instances when decisions are made relatively soundly, the realization that a more favourable outcome may have occurred had some alternative course been selected, results in a harsher evaluation of the action or actor. Thus, the presence of a counterfactual thought may distort reactions that stem from reasonable judgement. This view of counterfactual thinking as bias has been supported and developed by subsequent research. For instance, the “counterfactual fallacy” put forward by Miller et al. (1990) also suggests a judgemental bias. This fallacy refers to the tendency to think that what *need* not have occurred *ought* not to have occurred. Further cognitive flaws have been highlighted by McCloy and Byrne (2000) who suggest that in addition to the “counterfactual fallacy” heuristic, the converse of this fallacy may also be true: people think that what *ought* not have been *need* not have been.

Another approach that has helped shape the nature of counterfactual research is that of the simulation heuristic proposed by Kahneman and Tversky (1982). The simulation heuristic was developed chiefly to explain counterfactual thinking and regret. The simulation heuristic posits that the ease with which an event can be cognitively undone determines cognitive judgements regarding the likelihood of the event actually happening. This heuristic explains why people generally experience greater regret after “near misses” than if the outcome were more difficult to mentally undo. For instance, Miller and McFarland (1986) observed that baseball players experienced greater frustration when their opponent made a hit with two outs

than when they made a hit with no outs. The pitcher could more easily counterfactually simulate success because the batter was almost out. Thus, the simulation heuristic describes a means by which individuals may assess probabilities.

An important theory put forward to explain counterfactual thinking was proposed by Byrne (2005) who outlined a set of cognitive principles that govern what people typically consider when thinking counterfactually. Based on the mental models theory (Johnson-Laird & Byrne, 1991, 2002), Byrne suggests that people can easily imagine alternatives to events because they think about multiple possibilities to understand the event from the outset. For Byrne, counterfactual or imaginative thoughts are largely guided by the same principles that underlie rational thoughts. This theory of rational imagination approaches counterfactual thinking in terms of the basic rules used in reasoning and how individual pieces of information may be pieced together to form inferences. Unlike earlier work which emphasized that counterfactual thinking may frequently be a hindrance to sound judgement (Gleicher et al., 1990; Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Wells & Gavanski, 1989), Byrne emphasized how counterfactuals may be constructed using formal laws of logic and may frequently be reasonable. Similarly, the reflection and evaluation theory of counterfactual thinking (Markman & McMullen, 2003) which integrates cognitive processes of assimilation and contrast in counterfactual judgement, suggests that counterfactuals may typically facilitate sound judgement.

More formally, the idea that counterfactuals may largely be of benefit to people in terms of everyday cognition and behaviour modification is referred to as the functional theory of counterfactual thinking (Epstude & Roese, 2008, 2011; Markman & McMullen, 2003; Roese & Olson, 1997; Roese, 1994, 1997). While

functional accounts of counterfactual thinking suggest that mental simulations of the past are largely adaptive, instances when they become less than functional are acknowledged. For example, when individuals focus only on a narrow range of counterfactuals, perhaps simply undoing an outcome rather than proposing salient alternatives, counterfactual thinking may become chronically dysfunctional. Also, for depressed individuals, there exists an adverse cost-benefit ratio of emotional discomfort relative to successful behavioural adjustment (Bingham, 2003). However, according to Roese and Olsen (1997), under normal circumstances there is a trade-off between the negative emotional consequences associated with counterfactual thinking and the logical inferences gained from it. For Roese and Olsen, counterfactual thinking is normally functional because the logical inferences generated continue to be available while the associated negative affect becomes less frequent over time. In support of this view, additional research (e.g., Epstude & Roese, 2008; Epstude & Roese, 2011; Kray & Galinsky, 2003; Markman et al., 2008; Roese, 1994) has argued that counterfactual thinking can be beneficial in terms of self-regulation and planning.

Research has demonstrated that counterfactuals can help people to learn from mistakes and consider how things could be better (e.g., Byrne, 2002; Roese, 1997; Roese & Olson, 1995). Research by Markman et al. (1993) was the first to demonstrate the preparative functions of counterfactual thinking. Their study involved participants playing blackjack against a computer. Participants were told they would be playing three additional hands or no additional hands of blackjack. The study revealed that participants who expected to play again generated more upward counterfactuals relative to those participants who did not expect to play again. Markman et al. inferred from this that participants who expected to play again

generated upward counterfactuals to gain preparative information that might facilitate better performance. However, participants who did not expect to play again needed no such information and were motivated to avoid feeling bad about the game. Thus, they utilized downward counterfactuals to serve an affect enhancing function. Counterfactual thinking has also been demonstrated to improve performance in other types of tasks such as college assignments and anagrams (Nasco & Marsh, 1999; Roese, 1994).

It is worth considering what exactly it is about counterfactual thinking that might potentially facilitate adaptive planning and behaviour modification. Counterfactuals may be adaptive largely because they help determine behavioural intentions (Page & Colby, 2003). Epstude and Roese (2008; 2011) have proposed two pathways by which counterfactual thoughts can influence future behaviour: a content-specific pathway and a content neutral pathway. The content-specific pathway refers to the information contained within counterfactual thoughts. As Epstude & Roese, (2008) suggest, a direct semantic connection occurs due to the specific causal insight within the counterfactual. For example, if a person were to fail an exam they might think, “If only I had studied instead of going out then I would have passed the exam”. This action step – studying – may become more likely to be adopted in future similar scenarios. Thus, behavioural intentions are formed based on information contained within the counterfactual.

The content-neutral pathway refers to a general increase in motivation resulting from a failure. The content neutral pathway describes the way in which information is handled rather than how the details of the information may be applied. Thus, factors such as negative affect experienced due to considering “what might have been” may cause people to try harder generally and influence future intentions.

Similarly, the content-neutral pathway may influence intentions due to mind set changes. This refers to how the style of information processing a person uses may be influenced by previous cognitive strategy in an unrelated domain. For example, thinking counterfactually about a task may increase the likelihood that counterfactuals will be generated more liberally in subsequent unrelated tasks (e.g., Galinsky & Moskowitz, 2000). Generating counterfactuals about how a negative situation may have been avoided may also make people aware that they are active agents of change. The resulting self-inferences may influence behavioural intentions independently of any learned lessons that stem from considering counterfactuals.

It is somewhat unclear whether future intention ratings are influenced by counterfactual content or whether factors such as negative affect cause people to try harder generally, thus shaping intentions. Epstude and Roese (2008) suggest that a counterfactual thought may exert its influence by one pathway, or by both pathways. Research by Smallman and Roese (2009) attempted to show that it is the content of counterfactual thoughts, and not only fluctuations in motivation or affect, that determines behavioural intentions. In their study, participants were initially shown a negative event (e.g., “got a bad sunburn”) and then asked to imagine they had experienced it. Two seconds later, a cue and an action phrase appeared together below the negative event statement. The cue was either counterfactual or non-counterfactual. Those given a counterfactual cue were asked to determine whether this behaviour could have changed the negative event while the control group were asked whether this was something they had done in the past two weeks. The control condition was designed to draw participants’ attention to the action phrase without encouraging inferences of a counterfactual nature. Subsequently, participants were asked to make a behavioural intention judgement. Results indicated that

counterfactuals led to faster behavioural intention judgements relative to control conditions. Thus, counterfactual thinking was shown to facilitate intentions to perform specific content-related acts.

2.2 Individual differences and counterfactual thinking

Previous research on individual differences and counterfactual thinking

A great deal of research (e.g., Kahneman & Miller, 1986; Medvec et al., 1995; Meyerslevy & Maheswaran, 1992; Roese, 1997) has identified or described situational factors that influence counterfactual thinking (e.g., exceptional events, the first event in a causal sequence, controllable events, actions). Petrocelli, Percy, Sherman, and Tormala (2011) recently referred to these types of findings as ‘The List’, by which they mean that ‘...rather than a synthesis or explanation of what makes counterfactual thoughts impactful, the existing literature delineates only the types of events associated with counterfactual thoughts’ (p.2). Petrocelli et al. (2011) attempt to address this problem by focusing on the impact of the counterfactual thought itself. However, individual differences in personality may also be influential in counterfactual thought activation and focus.

To illustrate, imagine two fishermen who invest in a new boat. On their maiden voyage the ship is lost due to a freak storm; both men are lucky to be rescued and escape with their lives. Counterfactuals produced by the fishermen may indeed be influenced by factors such as normality (“If only the weather had not turned so harshly...”) and controllability (“If only I had paid more attention to weather conditions before setting out...”). However, it is possible that both men will

differ significantly in the way they mentally simulate alternative scenarios, even when they have experienced such similar outcomes. In this sense, counterfactuals may potentially be influenced as a result of individual personality differences as well as situational factors. Varying personality characteristics and individual differences have previously been shown to influence counterfactual thinking (Sanna, 2000).

Some recent research has highlighted the potential importance of considering individual difference factors in relation to counterfactual thinking. Epstude and Roese (2011) suggest that more research is needed, particularly in understanding how individual differences may influence counterfactual functionality. Similar suggestions have been made by Murphy (2005). Bacon, Walsh, and Martin (2013) also point out that relatively little is known about how personality influences counterfactual thinking and that understanding how individual differences shape counterfactual thinking may have important implications for learning.

Relatively little research has focused on the role of personality traits and individual differences in influencing counterfactual thoughts, but what research has been done demonstrates that personality traits may have an important role to play in counterfactual thinking. For instance, Sanna (1998) investigated counterfactual thinking in defensive-pessimists and optimists. Defensive pessimists and optimists represent opposing ends of a personality continuum. Essentially, defensive pessimists are people who benefit from adopting a negative outlook for tasks they are about to undertake. According to Showers (1992), defensive pessimists acknowledge a history of success in certain situations, such as in social interactions, but will enter future similar situations expecting the worst outcome. In contrast, optimists tend to use retrospective strategies, analysing performance after the event

has taken place. Sanna (1998) found that when optimists think counterfactually they tend to generate mood repairing downward counterfactuals more so than pessimists.

Another personality characteristic shown to influence counterfactual thinking is self-esteem. The construct of self-esteem refers to an individual's perception of their own self-worth (Carver & Connor-Smith, 2010). There are several reasons why self-esteem may be relevant in terms of mental simulation and counterfactual thinking. Firstly, research indicates that high self-esteem and low self-esteem individuals differ in terms of the coping styles they utilize (Sheppard & Arkin, 1991). While high-self-esteem individuals are generally quick to accept credit and deny blame, low-self-esteem individuals are more likely to accept a greater share of responsibility for failures. As Sanna and Meier (2000) suggest, those with low self-esteem are generally more even handed in accepting responsibility for both positive as well as negative outcomes. A study by Roese and Olson (1993a) was one of the first studies to link self-esteem and counterfactual thinking. Their research indicated that individuals with low self-esteem were more likely to undo their own actions following failure, while people with higher self-esteem were more likely to undo their own actions after success.

Research by Bacon et al. (2013) examined individual differences in fantasy proneness in relation to counterfactual thinking. Fantasy proneness describes a personality trait typified by excessive fantasies that are difficult to distinguish from reality. The researchers asked participants to engage in a fictional diary entry used to measure spontaneous counterfactual generation, and then complete a measure of individual differences in fantasy proneness. Results indicated that higher levels of fantasy proneness were correlated with higher levels of spontaneous counterfactual thinking. This study was one of the first to demonstrate a significant association

between a specific personality trait and individual differences in the activation of counterfactual thoughts.

Broader perspectives focusing on numerous individual difference factors have also been taken (e.g., Kasimatis & Wells, 1995; Murphy, 2005). To date, one of the most significant contributions in the area of counterfactual thinking and individual differences has been made by Kasimatis and colleagues (Kasimatis & Sterling, 1994; Kasimatis & Wells, 1995). Kasimatis and Wells (1995) asked college students to consider six hypothetical scenarios relating to course registration, then to generate counterfactuals, and complete a number of personality measures. Personality constructs examined in their study included optimism and self-esteem. After waiting for a period of a few weeks, the researchers asked the same students to consider six different but similar scenarios before completing a series of counterfactual generation tasks and additional personality measures. A fundamental finding of the study was that some people were consistently more likely to engage in counterfactual thinking and those who did engage more frequently typically utilized more upward counterfactuals. In terms of the various personality measures, there were a limited number of correlations between counterfactual generation and personality measure scores. A person's outlook or disposition seemed to be a significant factor. Optimists were more likely to engage in downward counterfactuals than pessimists, and were less likely to use upward counterfactuals. Similar results were reported for self-esteem; those low in self-esteem were more likely than those high in self-esteem to generate upward counterfactuals. Essentially, viewing events in a positive manner seems to be related to more infrequent use of upward counterfactuals (i.e., thinking about how things could have turned out better).

Kasimatis and Wells (1995) also investigated whether analytical abilities influenced counterfactual thinking. They observed that all participants were capable of engaging in counterfactual thoughts regardless of intellectual or analytical ability. In a subsequent experiment with minor methodological changes, they examined whether belief in a just world or a deity had an impact on counterfactual thought. Data indicated that people were less likely to consider how things could have turned out better if they reported having a strong belief in a just world. The same was also true for those who held a belief in god.

Another study to research a wide variety of individual differences in relation to counterfactual thinking was that of Murphy (2005). This study, like those of Kasimatis & colleagues, examined a wide range of individual difference variables while utilizing vignettes to elicit counterfactual responses. Murphy addressed the neglect of personality styles in the counterfactual literature by examining the Digman (1990) five-factor model. Several significant findings emerged from this study. Firstly, higher levels of neuroticism were correlated with the use of upward counterfactual thoughts. Secondly, openness to experience was correlated with the generation of more downward counterfactuals.

What may be concluded from this series of studies is that personality deserves consideration in counterfactual thinking research. People who score high in optimism, self-esteem, or who use emotion-focused coping strategies may use counterfactuals to serve an affective function. These studies have demonstrated that personality may have an influence over both the activation and focus of counterfactual thoughts. However, the majority of studies have examined individual difference variables relating to outlook or positive disposition. In the next section we

consider whether or not self-regulatory traits/individual differences might influence counterfactual thoughts.

Self-regulatory individual differences and counterfactual thinking

That many of the studies of individual differences in counterfactual thinking have tended to focus largely on affective traits (e.g., self-esteem, optimism, positive outlook) rather than on self-regulatory individual differences, may be partly due to the fact that self-regulatory orientations have been somewhat ignored generally in the personality literature (Hoyle, 2006). However, self-regulatory individual differences have not been entirely ignored; a handful of studies have examined self-regulatory individual differences in relation to counterfactual thinking (Haynes et al., 2007; Kasimatis & Sterling, 1994; Kasimatis & Wells, 1995; Markman, Balkin, & Baron, 2002; Murphy, 2005; Sanna, 1997). The findings from these studies have been mixed.

Successful self-regulation allows people to set important goals and alter their actions if needed in pursuit of those goals. A lack of self-regulation is synonymous with a lack of control over one's life and capacity to attain desired outcomes. Essentially, adaptive functioning in many areas of life is largely dependent on effective self-regulation. Individual differences are thought to exist in terms of how people typically self-regulate (Kuhl, 1992).

Particularly in developmental psychology, research has identified a number of important self-regulatory traits. One such construct is effortful control (Rothbart & Rueda, 2005). This capacity allows a child to inhibit dominant

responses when such responses conflict with successfully implementing a task in which they are engaged. Temporally stable individual differences in effortful control are thought to emerge by the time a child is 4 years of age (Kochanska, Murray, & Harlan, 2000). Another important self-regulatory individual difference identified by developmental theorists is that of behavioural inhibition (Fox, Henderson, Marshall, Nichols, & Ghera, 2005). This construct examines individual differences in how children react to unexpected stimuli in their environment. Those who are behaviourally inhibited typically experience significant levels of distress when they encounter unexpected stimuli. Unexpected feedback is vital in the self-regulatory process and as such, behaviourally inhibited children must manage this feedback while also tending to their aversive affective response.

In terms of self-regulatory individual differences in adults, Hoyle (2006) suggests that the broader construct of conscientiousness may be particularly important. Conscientiousness refers to the general manner in which an individual manages their behaviour. A person high in conscientiousness would typically be disciplined, orderly, reliable, and would also frequently engage in planning strategies (Costa & McCrae, 1992). As conscientiousness is a higher order personality trait, it may also be described in terms of its more narrowly focused facets. Facets associated with conscientiousness include self-efficacy, achievement striving, self-discipline, and deliberation. Individual differences in these facets are thought to be particularly important in terms of behaviour modification (Roberts, Chernyshenko, Stark, & Goldberg, 2005).

Of the studies that have examined self-regulatory individual differences in relation to counterfactual thinking, a number of constructs have been examined. The studies by Kasimatis and colleagues (1995, 1994) looked at

individual differences in gaining mastery over a negative outcome. Desire for control is a stable personality trait reflecting the degree of control a person seeks over events in their lives. A person with a high desire for control is said to prefer making their own decisions, taking action to avoid losing control, and assuming leadership roles in group settings. A low desire for control is associated with a preference to relinquish control and have other people make decisions. Individuals high in desire for control respond to challenges with more effort and persistence than participants with low desire for control. High desire for control individuals also exhibit an attribution pattern for successes and failures that suggests a high level of motivation on subsequent achievement tasks (Burger & Cooper, 1979). Kasimatis and Wells postulated that if indeed counterfactual simulations do serve preparative functions, it is likely that people who have a high desire for control over circumstances in their lives will be more likely to engage in counterfactual thinking that allows them to feel more in control of future situations, compared with people who have a low desire for control. However, the researchers found that desire for control was not related to a propensity to engage in overall or upward counterfactual thinking. For the researchers, this implied that the instances when counterfactuals serve a preparative function may well be limited in scope.

A conceptually similar construct to that of desire for control – locus of control (Rotter, 1966) – was also examined by Kasimatis and colleagues (1995, 1994). Locus of control is only slightly correlated with desire for control (Burger & Cooper, 1979). Unlike desire for control, a construct pertaining to motivation, locus of control describes a perception. Locus of control orientation is a belief about whether the consequences of an individual's actions are determined by what they themselves do (internal locus of control) or by events outside personal control

(external locus of control). It was hypothesized by the researchers that due to the control aspect of mental simulations, internal locus of control may be a relevant characteristic. Again however, no evidence was found to suggest that individual differences in locus of control influence preparative counterfactual thinking. Kasimatis and colleagues again inferred from this that instances when counterfactuals are preparative may be limited. However, the authors suggested that further research is needed to understand how counterfactuals influence preparative functions as a result of personality characteristics.

Murphy (2005) also failed to link self-regulatory individual differences to functional counterfactual thinking. Of most importance to self-regulation in this study was the trait of conscientiousness. As discussed, conscientiousness has clear implications for self-regulation. It refers to the general manner in which an individual manages their behaviour. It was predicted by Murphy (2005) that those with higher conscientiousness scores would produce a higher total number of total counterfactuals, given that counterfactuals may serve a preparative function. However, correlation analysis revealed no significant relationship between the variables.

In terms of self-regulation, self-efficacy has been shown to influence the way in which counterfactual simulations are utilized. Self-efficacy involves a belief that one can organize, act and produce desirable outcomes in a specific domain (Bandura & Locke, 2003). A study by Sanna (1997) examined self-efficacy as a moderator of the affective consequences of both upward and downward counterfactual thinking. Participants were asked to perform simple anagram tasks while self-efficacy was influenced by providing false feedback after the task was attempted. Analysis of affect scores indicated that when participants thought they

would be attempting the task again, low self-efficacy participants felt significantly worse than high self-efficacy participants when generating upward counterfactual thoughts. These affective differences were not observed for downward counterfactual thoughts. Moreover, when there was no repeat task to perform, affective reactions to counterfactual direction did not differ as a result of self-efficacy.

From these findings, it may be inferred that people with high self-efficacy interpret upward counterfactuals as being achievable goals and assimilate them for behaviour regulation, whereas individuals scoring low in self-efficacy tend to contrast counterfactuals to reality, resulting in negative affective experience. Rather than demonstrating functionality, the study by Sanna (1997) demonstrated the influence of individual difference variables on affective reactions to counterfactual thinking. From a functional perspective, it may be the case that people with high self-efficacy are more likely to make better use of the self-improvement function of upward counterfactual thoughts (Sanna, 2000).

Haynes et al. (2007) offer some compelling evidence suggesting that self-regulatory individual differences may indeed influence counterfactual functionality. Their research examined the influence of uncertainty orientation on counterfactual thinking. Uncertainty orientation is a formal theory of self-regulation that says people differ in how they handle uncertainty. Within this construct there are two main types of people: uncertainty-oriented and certainty-oriented. Uncertainty-oriented people are the need to know types who are willing to question things, including self-related beliefs, when faced with uncertainty. Certainty-oriented people are more concerned with maintaining self-representations and are less willing to question deeply held beliefs when faced with uncertainty. Haynes et al. (2007)

remind us that counterfactuals involve running hypothetical ‘what ifs’ and that they allude to past failures in dealing with the environment. If people generate upward counterfactuals after a negative event because they feel uncertain, about themselves or things that happen, then uncertainty-oriented people should be more likely than certainty-oriented people to engage in upward counterfactual thinking. The study also examined temporal order effects (e.g., Medvec et al., 1995; Walsh & Byrne, 2004). Participants generated counterfactuals about events that were framed as either psychologically recent or distant. Results indicated that individuals who are uncertainty-oriented are more likely to generate upward counterfactual thoughts to psychologically recent negative outcomes than are certainty-oriented individuals. The findings by Haynes et al. (2007) suggest that self-regulatory individual differences may be important in terms of how and when functional counterfactual thoughts are used.

It appears that there is no strong consensus about the role of self-regulatory individual differences in counterfactual thinking. However, there may be a number of reasons why previous research such as that of Kasimatis and colleagues (1994, 1995) found little evidence that self-regulatory individual difference factors, such as locus of control, facilitate preparative counterfactual thinking. Two possible reasons relate to the types of traits examined and to the methodology used and these will be discussed in turn.

Firstly, the types of self-regulatory individual difference factors studied may reflect more of a neurotic need to control events rather than a capacity to react well to negative setbacks and choose adaptive responses. For instance, while at times it may be psychologically healthy to have an internal locus of control, this may not always be the case (Rotter, 1966). Rotter, who conceptualized the construct

of locus of control, warned against the simplistic view that internal is good and external is bad; there are important subtleties to consider. According to Rotter, individuals with an internal locus of control can be psychologically unhealthy, unstable, neurotic, anxious, and depressed. Moreover, individuals with an external locus of control can lead easy-going, happy lives.

Similar points can be made about the individual difference variable 'desire for control' examined by Kasimatis and colleagues (1995, 1994). According to Burger & Cooper (1979), it is possible that high desire for control can become a liability. Although people high in desire for control may at times react to challenges with increased effort, the inability to control elements of a situation may also cause performance-inhibiting reactions. Burger (1984) also found that those with a high desire for control, who were in situations in which they did not feel in control, typically exhibited more depressive symptoms than those with a low desire for control. Rather than being universally adaptive, those with a high desire for control may also mistakenly attempt to control events over which they have little or no influence (e.g., Burger & Cooper, 1979; Burger & Smith, 1985).

Secondly, the studies by Kasimatis and colleagues (1995, 1994) and Murphy (2005) relied entirely on the use of vignettes to elicit counterfactual responses from participants. It has been suggested that this narrative method is capable of transporting recipients, generating a sort of genuine vicarious experience. This transportation, according to Green and Brock (2000), involves the absorption of the recipient into the story, or a sense of being deeply involved in the story. Absorption into the story facilitates the acceptance of the narrative world created by the story. Vignettes have been used extensively in counterfactual thinking research and have proved to be a reliable and effective way of eliciting counterfactuals

(Byrne, Segura, Culhane, Tasso, & Berrocal, 2000; Dixon & Byrne, 2011; Kahneman & Tversky, 1982; McCloy & Byrne, 2000). Vignettes allow a high number of participants to engage with a particular scenario within a relatively short time frame. They also allow participants to consider scenarios that would otherwise be impossible to experimentally induce.

However, problems with this approach have been identified recently (Giroto et al., 2007; Pighin, Byrne, Ferrante, Gonzalez, & Giroto, 2011). Giroto et al. (2007) suggest that readers (participants who read about a scenario via vignette) and actors (participants who actually attempt a task) differ in postdecisional counterfactual thinking. They claim there are two main reasons why this may be the case. One reason is that actors and readers may be directed by divergent motivational goals. Actors, unlike readers, may be motivated to avoid self-blame following a negative outcome. Research by Gilbert, Morewedge, Risen, and Wilson (2004) compared counterfactual thinking in people who had actually missed their train by 1 minute with those who imagined the same situation. Analysis of counterfactual focus determined that people who actually missed their train (actors) were more likely to produce externally focused counterfactuals (e.g., “I would not have missed the train if all the gates had been opened instead of just one”) than people who merely imagined missing a train. Readers were apparently more comfortable with generating self-blame counterfactuals (e.g., “If only I had skipped breakfast”) than were actors.

The other reason Giroto et al. (2007) suggest that readers and actors generate counterfactual thoughts differently is because they experience tasks/situations in different ways. After reading a vignette, readers tend to undo choices made by the protagonist which lead to subsequent failure. Those who actually attempt a task can however, retrieve from memory detailed elements of the

problem-solving phase. An actor's role can make available, as counterfactual alternatives, problem features in addition to the actor's choice. Girotto et al. (2007) demonstrated this over a series of experiments in which participants either read about a protagonist who participated in a task (game or lottery) or attempted the task themselves. The outcome of the task was always negative. For instance, a difficult mental multiplication task was presented to participants who were asked to solve it within 30 seconds (or read about a person attempting to solve the problem). All participants failed the task (or read about someone failing the task). A counterfactual thought listing task where participants noted ways in which the outcome may have been better was then completed. It was shown that differences in counterfactual thought for actors and readers depended on the differential availability of information about the problem-solving phase to actors and readers. The differences were diminished when problem-solving information was made less available to actors.

In a similar vein, Pighin et al. (2011) demonstrated that even individuals who merely observe a real event generate counterfactuals differently to individuals who read about the event. Observers generate counterfactuals in a similar way to actors, tending to focus more on alternative ways to solve a problem rather than simply undoing a choice that lead to a negative outcome as do readers. The researchers suggest that these role effects may be due to the fact that observers and actors' attention is engaged more than the attention of readers.

Findings by Girotto et al. (2007) and Pighin et al. (2011) suggest that the methodological approach may have implications for the types of counterfactuals generated. While the methodologies used by Kasimatis and Sterling (1994), Kasimatis and Wells (1995), and Murphy (2005) led to significant findings regarding

the association between counterfactual thinking and traits such as self-esteem, neuroticism, and dispositional outlook, it may be that the use of vignettes does not lend itself as effectively to demonstrating any potential association between self-regulatory individual differences and counterfactual thinking. For self-regulatory individual differences to influence counterfactual thinking, it may be the case that the stimulus that encourages counterfactual thinking needs to be tangible rather than hypothetical.

While Giroto et al. (2007) have shown that there are methodological concerns with vignettes used in studies such as Kasimatis and Wells (1995), their findings may also suggest that functional counterfactuals are less likely to surface when participants actually take action. Giroto et al. (2007) suggest that actors and observers are directed by divergent motivational goals; actors, unlike observers, are motivated to avoid self-blame following a negative outcome. It seems likely that, due to self-enhancement strategies, people may make harsher evaluations when they themselves have not been implicit in a negative outcome. However, if self-regulatory traits do indeed influence the functionality of counterfactual thoughts, the means with which counterfactuals are elicited should be taken into consideration.

2.3 The current research

We suggest that while previous studies of individual differences and counterfactual thinking (e.g., Kasimatis & Sterling, 1994; Kasimatis & Wells, 1995; Murphy, 2005) are particularly important in that they demonstrate how individual differences do indeed influence counterfactual thinking, the potential for self-regulatory individual difference factors to influence counterfactual functionality should not be dismissed

based solely on their findings. Further investigation, utilizing varying methodologies is necessary. Indeed, Murphy (2005) suggests that additional research is required in order to understand the role of individual differences in preparative counterfactual thinking. Therefore, the aim of this research is to investigate a number of self-regulatory individual differences in relation to counterfactual thinking. In particular, we are interested in whether certain types of individual difference factors may be important to counterfactual functionality.

Self-regulatory individual difference factors such as self-efficacy (Bandura & Locke, 2003), desire for control (Burger & Cooper, 1979), locus of control (Rotter, 1966), conscientiousness (Costa & McCrae, 1992), and uncertainty orientation (Sorrentino, Short, & Raynor, 1984) have all been studied in relation to counterfactual thinking, with mixed findings reported (Haynes et al., 2007; Kasimatis & Sterling, 1994; Kasimatis & Wells, 1995; Murphy, 2005). These traits typically describe an inclination towards controlling events or perceiving control over outcomes. We acknowledge that control needs and efficacy may be important. However, we suggest that self-regulatory individual differences that describe variation in the capacity to view the self as unthreatened during negative situations may be particularly important.

The concept of self-motives is relevant to the present research. Self-motives describe how individuals perceive or maintain a self-concept in relation to various situations (Sedikides & Strube, 1997). There are numerous ways in which self-motives may be conceptualized or delineated. Although not exhaustive, Sedikides and Strube (1997) identify the self-motives of self-repair, self-maintenance, and self-protection. Generally, the present research focuses on the self-motive of self-maintenance. That is to say, we are interested in self-regulatory

individual differences that describe how a person's sense of self is left largely unchanged during thoughts of negative past events.

Self-motives have previously been examined using an individual difference approach. For instance, when Sanna et al. (2001) investigated self-protection motives, they measured individual differences in self-esteem. Instead of experimentally controlling motives, the researchers preselected high-self-esteem and low-self-esteem persons because they differ in dispositional self-motives. High-self-esteem persons are thought to accept credit for success but deny blame for failure more so than low-self-esteem persons (Sanna, Meier, & Turley-Ames, 1998). Thus high-self-esteem persons may be motivated by mood-repair while low-self-esteem persons may be motivated by self-protection.

There are many individual difference factors which may influence self-motives that have not been examined in relation to counterfactual thinking. To address this gap in the literature, we examine a number of potentially important individual difference variables that have not been investigated before in counterfactual thinking research. Specifically, we examine individual differences in the traits of autonomy (Bekker & van Assen, 2006), action/state orientation (Diefendorff et al., 2000; Kuhl, 1994), and cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012; Steele, 1988). Essentially, the central connection shared by these constructs is that they are all thought to involve the capacity to perceive external sources of self-relevant information as unthreatening to self-representations. We propose that these individual difference factors may facilitate the use of more functional types of counterfactual thinking.

Traits examined in the present research were also selected because they were associated with various positive behavioural outcomes and because prior studies have identified them as potentially important and in need of investigation. Epstude and Roese (2011) have emphasized the importance of investigating self-regulatory personality traits in relation to counterfactual thinking. Investigation of these various personality traits will contribute to our understanding of counterfactual thinking. Knowledge of which traits are important, and how they interact with experimental manipulations will enable refinement and extension of the functional theory of counterfactual thinking. We start our investigation by examining individual differences in autonomy (Bekker & van Assen, 2006) in the next chapter.

Chapter Three

Autonomy

3.1 General introduction

An area that has thus far been overlooked in counterfactual research is that of autonomy. While research has focused on factors such as responsibility (Meyerslevy & Maheswaran, 1992) and external accountability to organizational superiors (Morris & Moore, 2000) little is known about the influence of beliefs about self-initiation, self-motivation, and autonomy. We suggest that beliefs regarding ones underlying sense of autonomy, characteristic of a freedom from self-implication from extrinsic outcomes, may be particularly important in terms of counterfactual functionality. In framing this exploration, given that the concept of autonomy holds multiple definitions in the psychological literature, it is necessary to outline the conceptualization of the construct used in the present research.

3.1.1 Autonomy

Generally, autonomy focuses on the degree to which an individual's behaviour is self-motivated and self-determined (Bekker & van Assen, 2006; Deci & Ryan, 2008). Actions which are autonomous and volitional are carried out by people who fully endorse such actions and experience an underlying sense of choice. According to developmental theorists (e.g., Bronson, 2000), autonomy is a psychological condition which can be expected to manifest in early adulthood. The term is generally perceived as being positive, as an autonomous person will typically be considered psychologically well adjusted. Deficits in autonomy have been associated

with fundamental defects in mental health (e.g., Davidson & Strauss, 1992; Laor, 1982).

Classical theories of autonomy (e.g., Erikson, 1974; Kohlberg, 1984; Mahler, Pine, & Bergman, 1975) describe it as a tendency to behave in an isolated manner, with heavy emphasis placed on individual independence. These perspectives hold that autonomy involves the development of a separate self. According to Mahler et al., autonomy is the final stage of individuation – separation. However, these theories of autonomy have been criticised more recently for placing too much emphasis on independence and isolation. Research by Hmel and Pincus (2002), in which they conducted factor analysis involving 15 distinct self-report autonomy scales, revealed multiple unique conceptualizations of autonomy. It was shown that at least one of these – “autonomy as self-governance” – was correlated positively with the personality factors of agreeableness, conscientiousness, and openness. From such findings, it appears that classical theories may undermine the possibility that healthy, autonomous functioning permits not only the awareness of personal goals and the ability to realize them, but also the ability to interact within meaningful social relationships.

Bekker (1993) suggested that the need for connectedness might be as important to healthy autonomous functioning as the need for separation and independence. It is argued by Bekker that desire to seek out meaningful relationships should not suggest that an individual is incapable of acting and thinking independently. Due to the tendency for older theories to describe autonomy only as a capacity for acting and thinking independently, Bekker (1993) developed an alternative autonomy scale. The scale moves away from the classical description of autonomy and instead reflects a capacity to feel and behave independently while

incorporating the capacity for functioning in intimate relationships. A revised shortened version of this scale was developed by Bekker and van Assen (2006). This conceptualization of autonomy was selected for use in the present research.

Essentially, one of the main reasons this construct of autonomy was selected for use in the present research is that it focuses on autonomy rather than on dependence, as with numerous other autonomy measures (e.g., Hirschfeld et al., 1977; Zuckerman, Levitt, & Lubin, 1961). For instance, these older measures include items referring to ones 'need to seek assistance', rating autonomy as low when interdependence is high. This type of characterization of autonomy is more in line with individual difference factors such as desire for control (e.g., Burger, 1984) or locus of control (Rotter, 1966) which have previously been examined in counterfactual thinking research (Kasimatis & Sterling, 1994; Kasimatis & Wells, 1995). These individual differences describe an inclination or need to control while the construct of autonomy proposed by Bekker (1993) describes a condition in which interdependence may be high while a sense of not being controlled by external sources is also emphasized. High autonomy participants are thought to place greater emphasis on self-initiation and self-motives rather than on external ego involvements or extrinsic rewards (Bekker, 1993).

3.1.2 Autonomy and counterfactual thinking

In terms of research investigating the potential association between autonomy and counterfactual thinking, to date this area has not received much attention. One recent study (Leach & Patall, 2013) indirectly examined the relationship. The main focus of the research by Leach and Patall was on the effects of decision related orientation

and counterfactual thinking on student satisfaction with their choice of college major. Specifically, they examined individual difference in maximizing (Schwartz et al., 2002). This individual difference variable categorizes people as either maximizers or satisficers. Maximizers typically seek to find the best option among alternatives when making a choice. These individuals perceive that out of a multitude of options, there is one perfect match to their wants and needs. Thus, for maximizers, an increasing number of options can be problematic because their goal of finding the perfect choice requires them to examine all the alternatives before making a choice. Satisficers on the other hand are content to select an option as long as it satisfies their minimum requirements. Rather than being perfect, decision making must only be good enough for these individuals. Research indicates that compared to satisficers, maximizers often feel less competent in their decision making (Parker, Bruine de Bruin, & Fischhoff, 2007) and feel less satisfied with their choices (Sparks, Ehrlinger, & Eibach, 2012). Leach and Patall (2013) anticipated that when options are abundant, because of the impracticality of exhaustively examining every option, maximizers would generate more upward counterfactual thoughts about how things could be better than satisficers. Results indicated that maximizing was significantly associated with upward counterfactual thinking, suggesting that maximizers engaged in more upward counterfactual thinking than satisficers.

In terms of autonomy, Leach and Patall (2013) anticipated that the upward counterfactuals generated by maximizers would reduce levels of autonomous motivation in learning practices. To assess autonomy, they used the learning self-regulation questionnaire developed by Black and Deci (2000). This questionnaire specifically concerns the regulation of learning behaviour and the extent to which it

is self-directed and initiated. Black and Deci state that the questionnaire assesses regulatory styles. While considered individual differences, these regulatory styles are not categorized as trait concepts because they are not particularly stable. However, they are also not considered state concepts because they are more stable than typical states which can fluctuate easily as a function of time and place (Black & Deci, 2000). Leach and Patall (2013) found that when maximizers generated upward counterfactuals, there was a marked decrease in autonomous motivation.

Although stable individual differences were not assessed, the study by Leach and Patall (2013) suggests that there may be an association between autonomy and counterfactual thinking. Dysfunctional decision related orientations were associated with dysfunctional types of counterfactual thinking about past events that could not be altered or improved in the future. These dysfunctional counterfactuals were in turn associated with reduced levels of autonomous motivation. The research by Leach and Patall did not investigate any potential association between counterfactual thinking and autonomy when improvement motives were salient. The researchers suggest that future research might aim to identify more directly the relationship between counterfactual thinking and autonomy.

Apart from the recent research undertaken by Leach and Patall (2013), there are a number of reasons for investigating whether individual differences in autonomy might be important in terms of counterfactual thinking, and particularly functional types of counterfactual thinking. Firstly, previous research on autonomy indicates that high autonomy may be responsible for numerous positive behavioural outcomes. Outcomes such as improved academic grades (Black & Deci, 2000), greater persistence at academic and sporting pursuits (Pelletier, Fortier, Vallerand, & Briere, 2001), and higher levels of psychological well-being (Ryan,

Rigby, & King, 1993) have previously been associated with autonomy. The functional theory of counterfactual thinking (Roese, 1994; Epstude & Roese, 2008) states that counterfactual thoughts are best understood in terms of behaviour regulation. It may be the case that high autonomy facilitates the use of functional types of counterfactual thinking, allowing adaptive behaviour regulation.

Secondly, research has shown that people are more likely to counterfactually mutate events prior to the outcome that they personally have greater control over (Miller et al., 1990). Such research is consistent with a functional perspective of counterfactual thinking. It is, after all, more likely that future performance may be altered or improved by focusing on factors that are personally, and more easily controlled. Given that autonomy concerns the degree to which an individual is driven by self-focused directives, it may be possible that this inclination toward emphasising personal control influences counterfactual thinking as is the case with situational or event-related controllability.

Thirdly, it has been shown that accountability to external sources has an influence on counterfactual functionality. Morris and Moore (2000) investigated this influence in a study focusing on how lessons may be learned through counterfactual thinking in pilots. The researchers hypothesized that accountability to superiors would inhibit learning through counterfactual thinking. Specifically, they hypothesized that individuals would be more likely to draw performance-promoting lessons from ambiguous outcomes after they have responded with a self-focused upward counterfactual comparison than after they have responded with other types of comparisons or no comparison at all, and that working for an airline who demanded reports of what went wrong would result in fewer learned lessons compared to more autonomous private pilots. Results indicated that although self-

focused counterfactuals were particularly adaptive, situational accountability (as determined by the degree of accountability to organizational superiors) inhibited the likelihood of their generation. Given that autonomy is also thought to influence whether attention is focused on self-driven motives or on external ego involvements (Bekker, 1993; Deci & Ryan, 2008) it may be the case that individual differences in autonomy also influence the likelihood of functional counterfactual generation.

In the three experiments reported below we investigate whether or not autonomy plays a role in counterfactual thinking and how it might mediate performance improvement on a task following counterfactual thinking. To the best of our knowledge, no other research has attempted to link individual differences in the construct of autonomy as outlined above, to counterfactual activation and focus.

3.2 Experiment 1: Does autonomy influence counterfactual thinking?

The primary aim of this experiment was to investigate whether individual differences in autonomy (Bekker & van Assen, 2006) influenced counterfactual activation and focus. To test this hypothesis, we examined participant's counterfactual responses after they experienced failure in a mental multiplication task. We expected that individuals high in autonomy, compared to those low in autonomy, would generate a greater number of counterfactuals overall, more functional counterfactuals overall and be more likely to generate a functional counterfactual as the first counterfactual they listed.

Regarding functional counterfactuals we were specifically interested in examining the direction, structure and focus of the counterfactuals generated. As discussed in the previous chapter, research has identified upward, additive and

controllable counterfactuals (Markman et al., 2007; Morris & Moore, 2000; Roese, 1994) as important to counterfactual functionality. We anticipated that given the nature of the task the majority of counterfactuals generated would be upward and additive so whether or not the counterfactuals generated were controllable was of primary interest.

A secondary aim of this experiment was to examine whether any potential influence of autonomy on counterfactual thinking patterns might be dependent on whether participants read about or actually attempted a task. Methodological concerns outlined by (Giroto et al., 2007) and discussed in the previous chapter were addressed by presenting a problem to participants in one of two ways; half of the participants read about and imagined themselves encountering a problem, while half actually attempted to solve a problem first hand. To induce failure, participants were asked to attempt (or read about and imagine attempting) a difficult mental multiplication problem similar to that used by (Giroto et al., 2007). We anticipated that due to the difficult nature of the task, no participants would complete it successfully, thus permitting counterfactual thought after a negative outcome. Giroto et al. (2007) may indeed be correct in asserting that actually doing a task and failing leads to more affect enhancing counterfactuals than when the task is presented as a narrative. However, we suggest that the influence of self-regulatory individual differences on counterfactual thinking may be more readily observed during instances involving actual task performance.

3.2.1 Method

Participants: Participants were 160 undergraduate students (117 women and 43 men) with an average age of 19.87 years ($SD = 2.00$). Participants were randomly assigned to either an actor ($n = 80$) or to a reader ($n = 80$) condition.

Design: The experimental design was essentially a between participants design with two independent variables: task performance (actor versus reader) and autonomy (high versus low).

Materials: Participants were randomly assigned to the actor condition or the reader condition. Participants in the actor condition were invited to participate in a problem solving task. By successfully completing the task, a small prize would be awarded (chocolates). The task involved completing a difficult maths problem similar to the method used by Giroto et al. (2007). Participants were asked to choose one of two identical sealed envelopes. One of the envelopes was said to contain an easy problem (e.g., multiply two one-digit numbers such as 5×8 in 30 seconds) and the other a difficult problem (e.g., multiply two two-digit numbers in 30 seconds). In actuality, both envelopes contained the difficult problem (multiply 69×73 in 30 seconds). As expected, no participant successfully completed the task. Participants in the reader condition read a vignette corresponding to the actor condition described above (see Appendix A).

Once participants had finished attempting the mental multiplication task, or reading the vignette about it, all participants were then asked to list as many

“if only” type ways in which the outcome could have been turned out differently. They were provided with multiple lines in which to write the responses (see Appendix B).

Finally, participants filled out a self-report measure of autonomy (Bekker & van Assen, 2006) (see Appendix C). The questionnaire contains 30 items. Answering the questionnaire involved noting how much various statements refer to oneself on a 7-point Likert response scale. Answer options ranged from 1 (doesn't fit me) to 7 (completely fits me). Examples of statements included in the autonomy measure are: “Usually it is very clear to me what I like most”, “I often go deeply into other people's feelings”, “I am a very adventurous person”, and “I easily come to grips with a new problem on my own”. Autonomy scores are calculated by adding the scores of each participant response to give an overall score with higher scores indicating higher autonomy. According to Bekker & van Assen (2006), the autonomy measure has good internal consistency, with a Cronbach alpha coefficient reported of .82. In the current experiment, the Cronbach alpha coefficient was .76

Procedure: Participants were approached to take part in the experiment immediately following college lectures. They were informed that the study was interested in how people think while problem solving. All participants were assured confidentiality and told that their responses would be completely anonymous. An information sheet (see Appendix D) was administered before proceeding with data collection. Individuals who were interested in taking part in the experiment signed a consent form (see Appendix E). They then either took part in or read about the mental multiplication task, generated counterfactual thoughts and completed the autonomy questionnaire.

All participants were debriefed and offered the prize at the end of the experiment. Ethical clearance for this experiment and all experiments reported in this thesis was granted by the Mary Immaculate Research Ethics Committee (MIREC).

Coding of counterfactual statements: After data collection, counterfactuals were coded. First, each thought was analyzed for whether it was in fact counterfactual. The working definition used by Kahneman and Tversky (1982) describes counterfactuals as mental constructions of plausible alternatives that may change the outcome of an event. Using this definition, to be considered counterfactual, thoughts must incorporate both an antecedent and a consequence. Thus, merely imagining a different outcome (e.g., “I could have solved the puzzle”) without reconstructing a changed antecedent (e.g., “Had I concentrated more”) to bring about the changed circumstance would not be considered counterfactual. The present study used a less rigid definition of counterfactual. Thoughts were considered counterfactual if they mentioned any changes in antecedents that could mentally undo the task performance (e.g., by using terms such as *at least*, *if only*, *should've*, *could've*, etc.; see Roese & Olson, 1995). Thoughts that merely involved a very basic undoing of outcomes (e.g., “Things could have been different.”) were not considered counterfactual.

Using similar categorizations to those used by Nasco and Marsh (1999), and commonly used in the counterfactual literature, the counterfactuals were coded as: upward versus downward, additive versus subtractive, and controllable versus uncontrollable. Thoughts were considered upward if they imagined outcomes that were preferable to reality (“If only I had gotten an easier number...”) and

downward if they imagined outcomes worse than reality (“I suppose I could have done worse...”). Thoughts were considered additive if they inserted events into reality (“If only I had started with the tens.”), whereas thoughts were considered subtractive if they removed events from reality (“If I hadn’t panicked...”). An example of a controllable counterfactual was: “If only I had focused on the tens first and then the units, I would have solved it in time”. Such controllable thoughts suggested mutable actions participants had full control over which could feasibly lead to performance improvement in subsequent attempts. Uncontrollable counterfactuals such as “If only I had been given more time, I would have won the prize”, typically mutated features beyond the control of the participant (e.g., experimental parameters). Additionally, as was the case in research by Markman and Weary (1998), counterfactuals that undid chronic aspects of the self (e.g., “If only I wasn’t stupid”) were categorized as uncontrollable.

Two trained coders, both unaware of the experimental hypotheses, independently coded all counterfactual thoughts. Inter-rater agreement was high (98.5%). Agreement ranged from 94% for coding additive versus subtractive counterfactuals to 98% for coding whether the thought was a counterfactual. Disagreements were resolved by the experimenter.

3.2.2 Results

Omitted data: Out of all respondents, data from 4 were discarded due to failure to follow instructions adequately. For an additional 5 participants, a small number of items (no more than 3) on the autonomy measure were left unanswered. Rather than

eliminate these respondents altogether, a mean score was recorded for these missing items.

Descriptive statistics

Individual difference measure: Scores on the autonomy scale (Bekker & van Assen, 2006) could range between 30 and 210. In this sample the mean score total for autonomy was 136.9 ($SD = 13.09$), ranging from 101 to 174. Using a median split, 78 participants were categorized as high autonomy while 82 were categorized as low autonomy. This approach of categorizing participants nominally in terms of an individual difference variable has been used in previous counterfactual thinking research (Roese & Olson, 1993a; Roese, 1994; Sanna, 1997; Sanna, Turley-Ames, & Meier, 1999; Sanna & Meier, 2000; Seta, Seta, McElroy, & Hatz, 2008). The mean score for the high autonomy group was 147.6 ($SD = 7.5$) and the mean score for the low autonomy group was 126.7 ($SD = 7.9$).

Number and type of counterfactuals generated: Overall, participants generated exactly 505 counterfactual thoughts. All participants generated at least one counterfactual statement, resulting in 160 opening/initial counterfactuals. Participants recorded a mean of 3.16 ($SD = 1.24$) counterfactual items each, ranging from 1 to 5 items. Descriptive statistics for each counterfactual categorization are shown below in Table 1. Both the initial counterfactuals generated and the total number of counterfactuals generated are displayed as both measures are commonly used in counterfactual thinking research (Davis, 1991; Haynes et al., 2007; Kasimatis

& Wells, 1995; Markman, Balkin, & Baron, 2002; Markman & Miller, 2006; Markman & Weary, 1998; Murphy, 2005; Roese & Olson, 1993a; Sanna, 1996) and will be used to analyse the data. As Table 1 shows, nearly all participants generated upward additive counterfactuals and this was the case for both initial counterfactuals (i.e., the first counterfactual listed) as well as for the number of counterfactuals overall. Participants generated more uncontrollable than controllable counterfactuals both for initial counterfactuals and overall.

Table 1
Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Experiment 1

Type of counterfactual	Initial (N=160)	Overall (N=505)
Upward versus Downward	100% vs 0%	95% vs 5%
Additive versus Subtractive	94% vs 6%	95% vs 5%
Controllable versus Uncontrollable	37% vs 63%	26% vs 74%

Counterfactual activation

Overall, there was a small, positive correlation between autonomy score and the total number of counterfactuals generated, $r = .20$, $n = 160$, $p = .009$, indicating that the higher in autonomy an individual scored, the more counterfactuals they generated. There was also a small, positive correlation between autonomy score and the total number of controllable counterfactuals generated, $r = .16$, $n = 160$, $p = .042$, indicating that the higher in autonomy an individual scored, the more controllable counterfactuals they generated.

In order to explore the impact of high vs. low autonomy and the actor vs. reader manipulation on the number of counterfactuals generated, a two-way between participants ANOVA was conducted. The interaction effect between autonomy and task presentation was not statistically significant, $F(1, 156) = .24, p = .62$, nor was the main effect of task presentation, $F(1, 156) = .06, p = .80$. However, the main effect for autonomy approached statistical significance, $F(1, 156) = 3.57, p = .06$, with slightly more counterfactuals generated in the high autonomy group than in the low autonomy group (52% versus 48%). This finding suggests that although autonomy may have a small influence on counterfactual activation, task presentation is not important in observing this effect. Actors and readers did not differ in the number of counterfactuals that they generated, nor did they differ significantly in terms of the total number of controllable counterfactuals generated, $t(158) = 1.12, p = .26$.

Focus of initial counterfactuals

We compared high and low autonomy participants for initial counterfactual controllability; counterfactual direction and structure were predominantly upward and additive as an initial response and so were not included in these statistical analyses. For the first counterfactual generated, a 2x2 Chi-square test for independence indicated that there was no significant association between autonomy and counterfactual controllability, $\chi^2(1, n = 160) = 2.41, p = .12$.

We then compared the initial counterfactual controllability of high and low autonomy participants taking into consideration task presentation; data were divided in terms of actors versus readers. We observed a statistically significant

association between autonomy and counterfactual controllability in the actor condition, $\chi^2(1, n = 160) = 10.11, p = .001$, with a medium effect size ($\phi = -.38$). No association was observed in the reader condition, $\chi^2(1, n = 160) = .78, p = .37$. Percentages of controllable and uncontrollable initial counterfactual responses are provided in Tables 2 and 3 below.

Table 2
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Autonomy Participants in the Actor Condition in Experiment 1

	Controllable	Uncontrollable
High	60%	40%
Low	23%	77%

An examination of Table 2 indicates that in the actor condition, high autonomy participants generated controllable counterfactuals as an initial response more so than low autonomy participants (60% versus 23%). Table 3 below, shows that there was little difference between high and low autonomy participants and that both generated more uncontrollable than controllable counterfactuals as an initial response. Comparing across the tables the pattern of controllable and uncontrollable counterfactuals is similar for the low autonomy participants, regardless of whether they attempted or read about the task. However, a different pattern emerges for the high autonomy participants. They generated more controllable counterfactuals as an initial response when they attempted the task rather than when they read about it (60% versus 26%).

Table 3
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Autonomy Participants in the Reader Condition in Experiment 1

	Controllable	Uncontrollable
High	26%	74%
Low	38%	62%

3.2.3 Discussion of Experiment 1

We found a small association between autonomy scores and counterfactual activation. This finding however, may not be due to any propensity toward self-driven motivation. It is possible that because Bekker and van Assen (2006) include tenets such as ‘sensitivity to others’ in their autonomy construct, failure in the experimental task may have caused high autonomy participants to feel more self-conscious after failure, leading to more counterfactual thinking. Essentially, this observed association between autonomy and the overall number of counterfactuals generated needs to be interpreted very cautiously.

We found some evidence that autonomy is associated with counterfactual controllability. High autonomy was associated with a higher overall number of controllable counterfactuals and a higher percentage of initial counterfactuals focusing on controllable antecedents.

Initially, we observed no association between high autonomy and the use of controllable counterfactuals as an initial response. Significant findings only emerged when we considered task presentation. We observed a statistically significant association between autonomy and initial counterfactual controllability in the actor condition, but not in the reader condition. This suggests that task

presentation may be particularly important when investigating any potential influence of self-regulatory individual difference variables on the focus of counterfactual thinking.

We did not observe a strong preference towards controllable counterfactuals for actors as might have been anticipated given findings from Gilbert et al. (2004). Gilbert et al. determined that people who actually missed a train (actors) were more likely to produce uncontrollable counterfactuals (e.g., “I would not have missed the train if all the gates had been opened instead of just one”) than people who merely imagined missing a train. Readers were apparently more comfortable with generating self-blame, controllable counterfactuals (e.g., “If only I had skipped breakfast”) than were actors. Thus, it may have been anticipated that participants who actually attempted a task in Experiment 1 would be less likely than participants who read vignettes to generate self-implicating counterfactuals. However, this was not the case. There was no significant difference in the number of controllable counterfactuals generated by both readers and actors. Experiment 1 suggests that actors may not always be as prone to shirking responsibility for outcomes as previous research indicates.

This experiment demonstrated that those high in autonomy, compared to those low in autonomy, tend to generate more counterfactual thoughts overall, more controllable counterfactuals and they are also more likely to initially focus on undoing controllable aspects of their behaviour when they perform a task. Previous research suggests that controllable counterfactuals are facilitative (Morris & Moore, 2000) and can improve performance. Experiment 2 investigates whether generating controllable counterfactuals may facilitate observable performance improvement in a

laboratory type task and whether any potential benefits of controllable counterfactual thinking are moderated by individual differences in autonomy.

3.3 Experiment 2: Does autonomy influence the functionality of counterfactuals?

Experiment 1 demonstrated an association between the individual difference factor of autonomy and controllable counterfactuals. In Experiment 2 we invited participants to engage with two experimental tasks, separated by a counterfactual thought listing exercise or a filler exercise. We also measured individual differences in autonomy. The aim of this experiment was to investigate whether counterfactual thinking and individual differences in autonomy might influence performance improvement. Through analysis of the counterfactuals generated by participants, it may be observed whether the personality trait of autonomy is associated with the activation and focus of counterfactual thoughts.

Experiment 2 also investigates any potential association between individual differences in autonomy and control perceptions after generating counterfactual thoughts. If individual differences do facilitate functional counterfactual thinking, considering potential mediators of this association may be important. Although it is unclear from Experiment 1, autonomy may influence control perceptions after counterfactual thinking. Nasco and Marsh (1999) suggest that individual differences may be important in determining control perceptions after counterfactual thinking. In an investigation of the relationship between individual difference variables and control perceptions after generating upward counterfactuals, we anticipated that individuals who score high in autonomy would rate their feelings

of ‘control ahead of the next trial’ more highly than individuals who score low in autonomy.

3.3.1 Method

Participants: Participants were 80 (68 women and 12 men) undergraduate students with an average age of 22.46 years ($SD = 6.06$). Participants were randomly assigned to either a counterfactual condition ($n = 40$) or a control condition ($n = 40$).

Design: The experimental design was essentially a between participants design with two independent variables: experimental group (counterfactual group versus control group) and autonomy (high versus low).

Materials: The experiment involved solving two sets of anagram problems (see Appendix F). The order in which each set appeared was randomized. Participants were asked to read the instructions on the cover page of the booklet. The instructions were as follows:

“For this experiment, you will be solving anagrams. Anagrams are scrambled word combinations – solving them means unscrambling them into an actual word. For example, “YHAPP” is an anagram, and its solution is “HAPPY”. All the anagrams in this study have only ONE solution. You will have 3 minutes to find as many answers as

possible. Following completion of the anagrams, you will receive feedback concerning your performance. The anagrams are awarded points on the basis of their difficulty. There are more points to be earned from solving a difficult anagram than from solving an easy anagram. You may choose which anagram to attempt in order to maximize your score”.

The varying difficulty level of the anagrams meant there was a certain level of strategy involved in maximizing ones score. Participants were free to decide whether they wanted to spend the 3 minutes on the easier anagrams (e.g. ACNFY – FANCY, Score of 1 point), medium difficulty anagrams (e.g. LTIGN – GLINT, Score of 3 points), or most difficult anagrams (e.g. RETIV – RIVET, Score of 5 points). This degree of participant control over the experimental task was central to the methodological design. Decisions participants could make represented obvious mutation targets; that is, antecedent elements out of which participants could construct counterfactual alternatives to their actual performance. It also allowed participants to formulate performance improving strategies for subsequent anagram trials.

All anagrams were selected from Gilhooly and Johnson (1978). The anagrams selected had no repeated letters, had only one correct solution, and were not plural words. All anagrams in each respective difficulty-category were equated on the dimensions identified by Gilhooly and Johnson as determinants of anagram solution time (bigram rank, pronounceability, anagram-word similarity, and vowel

vs. consonant starting letter). Thus, differences in solution rates across trials could not be attributed to differences in anagram difficulty.

Following completion of the anagrams, correct answers were provided to participants. Participants listened as the answers were read aloud before totalling their own correct answers to calculate a task score. However, participants were also provided with false information about the normative performance of all participants who had previously completed the anagram task. Participants were shown a number said to indicate the average score of all participants who had previously run through the task. This number was in actuality set higher than the highest score achieved by participants in an earlier pilot study. Technically, a total score of 54 was possible if all anagrams were solved in the 3 minute test period. However, from all the participants who attempted the task, the highest score achieved was 36. Participants were told that the average score achieved in the trial was 42. This number was intentionally high so the vast majority of participants would perceive their score as being improvable in subsequent trials. This feedback also meant that participants might potentially feel dissatisfied with their score. A manipulation check (see Appendix G) was included in the form of a Likert-scale type rating; participants were asked to rate the degree of satisfaction they had with regard their performance in the first set of anagrams on a scale ranging from 1 (not satisfied at all) to 7 (very satisfied).

Next, half of the participant's generated counterfactual alternatives to their actual performance. The other half – the control group – attempted a simple filler task involving grammatical correction of sentences (see Appendix H). After the counterfactual generation/filler task was completed, participants were informed for the first time that they would be attempting a second set of anagrams. It was decided

that participants not be informed earlier of this second set of anagrams so that counterfactual thoughts generated between tasks focused explicitly on past events. Before attempting the second set of anagrams, participants were asked to rate control perceptions in another Likert-scale type measure (see Appendix I). The measure assessed the degree of control the participant felt they had over their performance in the upcoming trial. Following completion of the second set of anagrams, participants were again informed of the correct answers so that they could calculate a score for the trial. No false information about normative scores was provided after the second trial.

Finally, participants filled out a self-report measure of autonomy (Bekker & van Assen, 2006) as described in Experiment 1 (see Appendix C). According to Bekker and van Assen (2006), the autonomy measure has good internal consistency, with a Cronbach alpha coefficient reported of .82. In the current experiment, the Cronbach alpha coefficient was .74.

Procedure: Participants were approached to take part in the experiment immediately following college lectures. They were informed that the study was interested in how people think while problem solving. All participants were assured confidentiality and told that their responses would be completely anonymous. An information sheet (see Appendix D) was administered before proceeding with data collection. Individuals who were interested in taking part in the experiment signed a consent form (see Appendix E). Participants were given booklets containing all experimental materials and were asked not to open or flick through it until instructed. A full debriefing was given to all participants post testing.

Coding of counterfactual statements: Counterfactuals were coded using the process and categorizations as in Experiment 1. Inter-rater agreement between the two trainer coders was high (96.9%). Agreement ranged from 89% for coding controllable versus uncontrollable counterfactuals, to 99% for coding whether the thought was a counterfactual. Disagreements were resolved by the experimenter.

3.3.2 Results

Omitted data: Out of all respondents, data from 2 were discarded due to failure to follow instructions adequately. For an additional 3 participants, a small number of items (no more than 2) on the individual difference measures were left unanswered. Rather than eliminate these respondents altogether, a mean score was recorded for these missing items.

Descriptive statistics

Individual difference measure: Scores on the autonomy scale (Bekker & van Assen, 2006) could range between 30 and 210. In this sample the mean score total for autonomy was 132.3 ($SD = 12.89$), ranging from 98 to 172. Using a median split, 47 participants were categorized as high autonomy while 33 were categorized as low autonomy. The mean score for the high autonomy group was 143.9 ($SD = 7.3$) and the mean score for the low autonomy group was 122.5 ($SD = 6.9$).

Number and type of counterfactuals generated: Overall, participants generated exactly 139 counterfactual thoughts. Participants recorded a mean of 3.48 ($SD =$

1.06) counterfactual items each, ranging from 1 to 6 items. All participants in the counterfactual group generated at least one counterfactual statement, resulting in 40 opening/initial counterfactuals. Descriptive statistics for each counterfactual categorization are shown below in Table 4. As Table 4 shows, nearly all participants generated upward additive counterfactuals and this was the case for both initial counterfactuals (i.e., the first counterfactual listed) as well as for the number of counterfactuals overall. Participants generated more controllable than uncontrollable counterfactuals both for initial counterfactuals and overall.

Table 4
Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Experiment 2

Type of counterfactual	Initial (N=40)	Overall (N=139)
Upward versus Downward	100% vs 0%	96% vs 4%
Additive versus Subtractive	79% vs 21%	84% vs 16%
Controllable versus Uncontrollable	70% vs 30%	53% vs 47%

Satisfaction ratings: As expected, participants generally felt dissatisfied with their performance in the first trial of anagram problems. On a Likert scale ranging from 1 (not satisfied at all) to 7 (very satisfied), participants recorded an average satisfaction score of 2.18 ($SD = 1.18$). This meant that the anagram task resulted in consistently low satisfaction ratings.

Counterfactual activation

There was no correlation between autonomy score and the overall number of counterfactuals generated, $r = .14$, $n = 40$, $p = .38$. We observed a small, positive correlation between autonomy score and the overall number of controllable counterfactuals generated, $r = .28$, $n = 40$, $p = .04$ (one-tailed), indicating that the higher in autonomy an individual scored, the more controllable counterfactuals they generated.

Focus of initial counterfactuals

We compared high and low autonomy participants for initial counterfactual controllability; counterfactual direction and structure were largely upward and additive as an initial response and so were not included in these statistical analyses. We sought replication of the finding of Experiment 1 that high autonomy (Bekker & van Assen, 2006) was associated with the use of controllable counterfactuals as an initial response. For the first counterfactual generated, a 2x2 Chi-square test for independence indicated that there was a significant association between autonomy and initial counterfactual controllability, $\chi^2(1, n = 40) = 4.88$, $p = .03$, with a medium effect size ($\phi = .40$). Percentages of controllable and uncontrollable initial counterfactual responses are provided in Table 5 below. High autonomy participants generated controllable counterfactuals as an initial response more so than low autonomy participants.

Table 5
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Autonomy Participants in Experiment 2

	Controllable	Uncontrollable
High	72%	28%
Low	52%	48%

Performance improvement

We computed a unitary dependent variable of score improvement (score in anagram Trial 2 – score in anagram Trial 1). Greater performance improvement was observed in the counterfactual group ($M = 5.43$, $SD = 7.77$) than in the no-counterfactual group ($M = 1.11$, $SD = 6.50$), $t(78) = 3.38$, $p = .001$. The eta squared statistic (.13) indicated a large effect size.

A between groups ANOVA was conducted to explore the impact of initial counterfactual controllability and autonomy on performance improvement. There was a marginally significant main effect on performance improvement depending on whether the initial counterfactual was controllable ($M = 7.25$, $SD = 8.23$) or uncontrollable ($M = 1.177$, $SD = 4.40$), $F(3, 36) = 2.30$, $p = .06$ (one-tailed). The main effect for autonomy did not reach statistical significance, $F(3, 36) = .74$, $p = .39$, nor did the interaction effect between initial counterfactual controllability and autonomy, $F(3, 36) = 2.60$, $p = .11$.

Control ratings: The mean score for ‘control ahead of the next trial’ was 4.12 ($SD = 1.85$). There was a medium, positive correlation between the total number of

controllable counterfactuals generated and ratings for ‘control ahead of the next trial’, $r = .40$, $n = 40$, $p = .01$, indicating that the higher the number of controllable counterfactuals generated, the higher control perceptions.

A between groups ANOVA was conducted to explore the impact of initial counterfactual controllability and individual differences in autonomy on ratings of ‘control ahead of the next trial’. Although control perceptions were slightly higher when initial counterfactuals were controllable ($M = 4.93$, $SD = 1.76$) than when uncontrollable ($M = 4.00$, $SD = 1.95$), this main effect was not statistically significant, $F(3, 36) = .48$, $p = .49$. The interaction effect between autonomy and initial counterfactual controllability was also not statistically significant, $F(1, 36) = .84$, $p = .36$, nor was the main effect of autonomy, $F(1, 156) = .06$, $p = .80$.

3.3.3 Discussion of Experiment 2

Experiment 2 partially replicated the findings of Experiment 1 and showed that autonomy plays a role in counterfactual thinking and particularly in the generation of controllable counterfactuals when people actually engage with a task. Unlike Experiment 1, we did not find a relationship between autonomy and counterfactual activation overall in this experiment but we did replicate the correlation between autonomy and the number of controllable counterfactuals generated. Similar to Experiment 1 we also found that those high in autonomy were more likely to generate a controllable initial counterfactual than those low in autonomy. Given that the association between autonomy and counterfactual activation overall was small in Experiment 1 and not replicated here it may be the case that autonomy has more of a

role to play in counterfactual focus than counterfactual activation. However, we will investigate this matter further in the next experiment.

The results of this experiment also extended the findings of Experiment 1 by demonstrating the performance improvement effects of counterfactual thinking in general and of controllable counterfactual thinking in particular. Overall the findings showed that the counterfactual group improved more than the control group and that those who generated controllable initial counterfactuals tended to improve more than those who generated uncontrollable initial counterfactuals. Interestingly autonomy did not directly affect performance improvement scores, nor did it directly interact with controllable counterfactual thinking scores to improve performance. Although autonomy has a role to play in controllable counterfactual thinking, it seems that it is the process of counterfactual thinking, and perhaps specifically controllable counterfactual thinking, that is important in performance improvement.

In terms of control perceptions ahead of the second anagram task, we found that generating controllable counterfactuals was associated with higher control perceptions. This finding is in line with Markman and Weary (1998) who demonstrated that controllable counterfactual mutations rather than uncontrollable counterfactual mutations increase control perceptions on repeated tasks. Although participants in Experiment 2 were not explicitly aware of an upcoming second anagram task during counterfactual generation, they were aware that the experiment was not over at this stage and may have anticipated future trials. The influence of event repeatability on the findings of Experiment 2 would need to be examined more closely using a more explicit experimental manipulation.

Experiment 2 demonstrated that after generating controllable counterfactuals, high and low autonomy participants did not differ in terms of control perceptions ahead of the second anagram task. This finding has implications for research by Nasco and Marsh (1999). In their month-long study of counterfactual thoughts in college students, Nasco and Marsh aimed to identify mediators of observed performance improvement in academic performance. They suggest that future research might investigate the role of individual difference factors in influencing control perceptions after counterfactual thinking. Findings from Experiment 2 suggest that while autonomy may influence counterfactual focus, it may not influence control perceptions. Rather, control perceptions seem to be more directly influenced by counterfactual controllability.

In the next experiment we examine the role of controllable counterfactual thinking in performance improvement in more depth.

3.4 Experiment 3: Does the method of counterfactual elicitation influence functionality?

In the previous two experiments high autonomy participants demonstrated a tendency to generate controllable counterfactuals. Experiment 3 has three main aims. The first is to replicate the association observed between autonomy and controllable initial counterfactual thinking found in Experiments 1 and 2 and also investigate if there is an association with counterfactual activation. The second aim is to replicate the findings of Experiment 2 regarding the performance improvement role of counterfactual thinking. The final aim is to examine whether being directed to

generate controllable counterfactuals leads to observable performance improvement for both high and low autonomy individuals.

All participants attempted an anagram task and were then assigned to one of three experimental conditions. Participants were either directly asked to generate controllable counterfactuals, asked to generate counterfactuals in a less directed way as in the previous experiments, or asked to complete a filler task. Finally, participants attempted a second anagram task and completed a self-report measure of autonomy. Instructing participants to generate controllable counterfactuals meant that we could investigate more specifically the effect of these types of counterfactuals on performance improvement. It also allowed us to examine how both high and low autonomy participants performed after generating controllable counterfactuals.

Regarding autonomy, we predicted that there would be an association between autonomy and counterfactual controllability in the undirected counterfactual generation condition. Regarding performance improvement, we predicted that participants in both of the counterfactual conditions would improve their performance significantly more than those in the control condition. However, it was difficult to predict if, or how, the two counterfactual groups might differ from each other. It could be the case that those in the directed controllable counterfactual group would see greater performance improvement than those the undirected counterfactual group because all of their counterfactuals would focus on controllable aspects of behaviour. On the other hand, the undirected counterfactual group could see greater performance improvement because all of their thoughts would focus on aspects of behaviour that spontaneously came to mind rather than being directed to only think about controllable things. Finally, it may be the case that generating any

type of counterfactual, directed or undirected, would improve performance and there would be no difference between the groups.

3.3.1 Method

Participants: Participants were 60 undergraduate students (39 women and 21 men) with an average age of 20.33 years ($SD = 4.22$). Participants were randomly assigned to one of three experimental conditions: undirected counterfactual generation ($n = 20$), directed controllable counterfactual generation ($n = 20$), or a control group ($n = 20$).

Design: The experimental design was essentially a between participants design with two independent variables: experimental task (undirected counterfactuals versus directed controllable counterfactuals versus control) and autonomy (high versus low).

Materials: Participants were presented with two anagram tasks identical to those used in Experiment 2 (see Appendix F). The order in which each set appeared was randomized. After attempting the first set of anagrams, participants were provided with the correct answers. As in Experiment 2, false performance feedback was provided to manipulate perceived outcome valence; participants were led to believe they performed below average. A manipulation check (see Appendix G) was included in the form of a Likert-scale type rating of the degree of satisfaction they had with regard their performance in the first set of anagrams.

Participants subsequently engaged in a thinking exercise. Participants in the undirected counterfactual generation group generated counterfactuals after being encouraged to consider how their score could have been different. Participants in the directed controllable counterfactual generation group generated counterfactuals after being encouraged to consider things they could have done differently and that they had full control over. Participants assigned the control group engaged with a grammatical correction task identical to the one used in Experiment 2 (see Appendix H).

After the counterfactual generation/filler task was completed, participants were informed for the first time that they would be attempting a second set of anagrams. It was decided that participants not be informed earlier of this second set of anagrams so that counterfactual thoughts generated between tasks focused explicitly on past events. Following completion of the second set of anagrams, participants were again informed of the correct answers so that they could calculate a score for the trial. No false information about normative scores was provided after the second trial.

Finally, participants filled out the self-report measure of autonomy (Bekker & van Assen, 2006) as described in Experiment 1 (see Appendix C). According to Bekker and van Assen (2006), the autonomy measure has good internal consistency, with a Cronbach alpha coefficient reported of .82. In the current experiment, the Cronbach alpha coefficient was .77.

Procedure: Participants were approached to take part in the experiment immediately following college lectures. They were informed that the study was interested in how

people think while problem solving. All participants were assured confidentiality and told that their responses would be completely anonymous. An information sheet (see Appendix D) was administered before proceeding with data collection. Individuals who were interested in taking part in the experiment signed a consent form (see Appendix E). Participants were given booklets containing all experimental materials and were asked not to open or flick through it until instructed. A full debriefing was given to all participants post testing.

Coding of counterfactual statements: Counterfactuals were coded using the process and categorizations as described previously. Inter-rater agreement between the two trained coders was high (95.6%). Agreement ranged from 94% for coding controllable versus uncontrollable counterfactuals, to 97% for coding whether the thought was a counterfactual. Disagreements were resolved by the experimenter.

3.3.2 Results

Omitted data: Data from 1 participant was discarded due to failure to follow instructions adequately.

Descriptive statistics

Individual difference measure: Scores on the autonomy scale (Bekker & van Assen, 2006) could range between 30 and 210. In this sample the mean score total for autonomy was 131.4 ($SD = 12.71$), ranging from 93 to 169. Using a median split, 32 participants were categorized as high autonomy while 28 were categorized as low

autonomy. The mean score for the high autonomy group was 142.2 ($SD = 6.8$) and the mean score for the low autonomy group was 119.3 ($SD = 7.1$).

Number and type of counterfactuals generated: Overall, participants generated exactly 96 counterfactual thoughts. Participants recorded a mean of 2.40 ($SD = .96$) counterfactual items each, ranging from 1 to 5 items. All participants in the counterfactual groups generated at least one counterfactual statement, resulting in 40 opening/initial counterfactuals. Descriptive statistics for each counterfactual categorization are shown below (Table 6). As Table 6 shows, nearly all participants generated upward additive counterfactuals and this was the case for both initial counterfactuals (i.e., the first counterfactual listed) as well as for the number of counterfactuals overall. All counterfactuals were controllable in the directed controllable counterfactual condition. In the undirected counterfactual condition, participants generated more controllable than uncontrollable counterfactuals for initial responses, but only slightly more controllable than uncontrollable counterfactuals overall.

Table 6
Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Experiment 3

Type of counterfactual	Initial (N=40)	Overall (N=96)
Upward versus Downward	95% vs 5%	94% vs 6%
Additive versus Subtractive	86% vs 14%	91% vs 9%
Controllable versus Uncontrollable ^a	70% vs 30%	53% vs 47%

a. Descriptive statistics reported here refer to the undirected counterfactual group; all counterfactuals in the directed controllable condition were controllable.

Satisfaction ratings: As expected, participants generally felt dissatisfied with their performance in the first trial of anagram problems. On a Likert scale ranging from 1 (not satisfied at all) to 7 (very satisfied), participants recorded an average satisfaction score of 1.55 ($SD = .79$). This meant that performance on the anagram task resulted in consistently low satisfaction ratings.

Counterfactual activation

In the undirected counterfactual thinking group, there was no correlation between autonomy score and the overall number of counterfactuals generated, $r = .08$, $n = 20$, $p = .50$. There was also no correlation between autonomy score and the overall number of controllable counterfactuals generated, $r = .14$, $n = 20$, $p = .54$.

Focus of initial counterfactuals

We compared high and low autonomy participants for initial counterfactual controllability; counterfactual direction and structure were largely upward and additive as an initial response and so were not included in these statistical analyses. We sought replication of the findings of Experiments 1 and 2 that high autonomy was associated with the use of controllable counterfactuals as an initial response. In the undirected counterfactual thinking group, for the first counterfactual generated, a 2x2 Chi-square test for independence indicated that there was a significant association between autonomy and initial counterfactual controllability, $\chi^2(1, n = 20) = 3.43$, $p = .03$ (one-tailed), with a medium effect size ($\phi = .41$). Percentages of controllable and uncontrollable initial counterfactual responses are provided in Table

7 below. High autonomy participants generated controllable counterfactuals as an initial response more so than low autonomy participants.

Table 7
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Autonomy Participants in the Undirected Counterfactual Group in Experiment 3

	Controllable	Uncontrollable
High	77%	23%
Low	36%	64%

Performance improvement

Overall, anagram solution scores increased significantly from Trial 1 ($M = 6.15$, $SD = 5.45$) to Trial 2 ($M = 9.82$, $SD = 6.35$), $t(59) = 5.99$, $p < .001$. The mean increase in anagram solution scores was 3.66 with a 95% confidence interval ranging from 2.42 to 4.91. The eta squared statistic (.40) indicated a large effect size.

We computed a unitary dependent variable of score improvement (score in anagram Trial 2 – score in anagram Trial 1). To investigate the effect of autonomy and controllable counterfactual thinking on performance improvement we conducted a 2 way between groups ANOVA. In order to compare the findings to the results of Experiment 2 we initially only used data from the undirected counterfactual group as all participants in the directed group generated controllable counterfactuals. There was a marginally significant main effect on performance improvement depending on whether the initial counterfactual was controllable ($M =$

6.82, $SD = 5.11$) or uncontrollable ($M = 2.22$, $SD = 1.48$), $F(3, 16) = 3.70$, $p = .07$. The main effect for autonomy did not reach statistical significance, $F(3, 16) = 1.11$, $p = .31$, nor did the interaction effect between initial counterfactual controllability and autonomy, $F(3, 16) = .31$, $p = .58$. This finding replicates the finding of Experiment 2.

We investigated if there was a difference between the three experimental groups in performance improvement. A one-way ANOVA indicated that there was a difference in improvement scores for the three experimental groups, $F(2, 57) = 7.01$, $p = .002$. Tukey post hoc comparisons indicated that participants in the directed controllable counterfactual condition ($M = 5.55$, $SD = 5.39$) and the undirected counterfactual condition ($M = 4.75$, $SD = 4.49$) improved significantly more than participants in the filler condition ($M = .70$, $SD = 2.92$). There was no significant difference between the directed controllable counterfactual condition and the undirected counterfactual condition.

Although the difference was not statistically significant, participants in the undirected counterfactual condition demonstrated score improvements slightly lower than participants in the directed controllable counterfactual condition. However, participants in the undirected counterfactual condition were free to generate both controllable and uncontrollable counterfactuals if they so wished. We compared the performance improvement scores of participants in the undirected counterfactual generation condition whose initial counterfactual mutation was controllable, with performance improvement scores of participants in the directed controllable counterfactual generation condition. An independent samples t-test was conducted to compare the performance improvement of these two groups. Although performance improvement scores were slightly higher for participants in the

undirected counterfactual generation condition ($M = 6.82$, $SD = 5.11$) than for participants in the directed controllable condition ($M = 5.55$, $SD = 5.39$), the difference was not statistically significant, $t(29) = .64$, $p = .53$.

3.3.3 Discussion of Experiment 3

Experiment 3 replicated the findings of Experiments 1 and 2 and showed that autonomy plays a role in counterfactual thinking and particularly in the generation of controllable initial counterfactuals. Similar to Experiment 2, we did not find a relationship between autonomy and overall counterfactual activation.

As predicted the findings showed that both of the counterfactual groups improved more than the control group. As in the previous experiment, autonomy did not directly affect performance improvement scores, nor did it directly interact with controllable counterfactual thinking scores to improve performance. Those who generated controllable initial counterfactuals improved more than those who generated uncontrollable initial counterfactuals, although there was no difference in performance improvement between those who spontaneously generated controllable counterfactual thoughts and those who were directed to focus on controllable counterfactual thoughts. These findings support research suggesting that counterfactual thinking may facilitate performance improvement (e.g., Nasco & Marsh, 1999) and that counterfactuals which focus on antecedents a person has control over may be particularly adaptive (e.g., Morris & Moore, 2000).

Participants in the undirected counterfactual group whose initial counterfactuals were controllable demonstrated higher mean performance improvement scores than participants in the controllable counterfactual group. Future

research might examine in more detail whether controllable counterfactuals that are self-initiated are more functional than those generated through prompting. Somewhat similar findings emerged from research by Tal-Or, Boninger, Poran, and Gleicher (2004) who found that positive attitude changes persisted over time when participants self-generated counterfactuals but not when participants were explicitly directed to consider specific counterfactuals. All counterfactuals generated in Experiment 3 were to some degree prompted in that all participants were asked to generate counterfactuals. However, given that the undirected counterfactual condition was sufficient to demonstrate functionality and it involved less artificial counterfactual generation than the directed controllable counterfactual condition, it may be that simply instructing participants to consider how things could have been different rather than what they alone could do differently, is sufficient to observe the performance improving effects of counterfactuals.

3.5 General Discussion

The findings reported in the three experiments above suggest that individual differences in autonomy may influence what individuals tend to counterfactually mutate. Like Leach and Patall (2013), our findings suggest that the association between autonomy and counterfactual thinking is important. The functional theory of counterfactual thinking (Roese, 1994; Epstude & Roese, 2008; 2011) proposes that certain types of counterfactual are more likely to facilitate behaviour regulation and subsequent performance improvement. These experiments suggest that certain individuals are more likely than others to engage in functional types of counterfactual thinking such as generating controllable mutations.

In Experiment 1, we observed a small relationship between autonomy scores and the total number of counterfactuals generated overall as well as the number of controllable counterfactuals generated. Experiments 2 and 3 however, failed to replicate the finding for the total number of counterfactuals although there was an association between autonomy and the number of controllable counterfactuals in Experiment 2. This result may have been due to the smaller sample sizes used in Experiments 2 and 3. These divergent findings mean it is unclear whether individual differences in autonomy are associated with counterfactual activation. Further research may be required to determine the precise nature of any potential association.

It may be the case that other individual difference factors influence counterfactual activation. For example, Davis (1991) found that scores on a dispositional rumination scale were moderately related to the frequency of counterfactual thinking. Research by Bacon et al. (2013) found that higher levels of fantasy proneness were correlated with higher levels of spontaneous counterfactual thinking. Also, depressed individuals have been shown to generate more counterfactuals than nondepressed individuals (Markman & Weary, 1998). Other research however, suggests that individual differences may not be strongly related to counterfactual activation. Kasimatis and Wells (1995) anticipated that individuals with a greater desire for control would be more likely to engage in counterfactual thinking, but this was not the case. Their studies also showed no relationship between counterfactual thinking and the need for cognition, rumination, or other coping strategies. Our findings suggest that further research is needed.

In Experiment 1, significant findings regarding individual differences in autonomy only emerged when participants engaged with a real task as opposed to

considering hypothetical scenarios. This finding informed Experiments 2 and 3 which used real tasks as opposed to hypothetical scenarios. While it may not always be feasible to use ‘real world’ experimental methodology, results of Experiments 1, 2 and 3 indicate that when individual differences are the focus of research, tangible problems may be preferable to vignette methodologies. A key difference between the experiments reported here which found evidence that self-regulatory individual differences may influence counterfactual focus, and past studies that found no association between self-regulatory individual differences and counterfactual thinking (e.g., Kasimatis & Sterling, 1994; Kasimatis & Wells, 1995; Murphy, 2005) is that these experiments utilized an actual problem that participants engaged with. While some previous studies have found consistency among hypothetical and real-appearing decision paradigms (e.g., McElroy & Dowd, 2007), our findings are more in line with Giroto et al. (2007) who found that post decisional counterfactual thinking can differ significantly depending on the method of counterfactual elicitation.

The cognitive task used in Experiments 2 and 3 resulted in a higher percentage of controllable counterfactuals than with the task used in Experiment 1. This may have been due to the higher complexity and inherent strategy of the experimental task in Experiments 2 and 3. Regardless of this change in accessible controllable antecedents, Experiments 2 and 3 indicated that the influence of counterfactual controllability on functionality may be observed in a laboratory setting using a cognitive task that leads to failure. A concern we had in Experiments 2 and 3 was that the task used to prompt counterfactual thinking was not overtly personally salient to participants and thus may not activate performance improvement motives to the same extent as studies in applied settings (e.g., Morris

& Moore, 2000; Nasco & Marsh, 1999). However, the consistently low satisfaction scores recorded by participants indicated that they were at least somewhat engaged with the tasks.

Experiments 1, 2 and 3 provide evidence that individual differences in autonomy are associated with counterfactual controllability. This suggests that autonomy may potentially be important in terms of counterfactual functionality. Previous research has linked individual differences to counterfactual focus. Roeser and Olson (1993a) found that individuals with low self-esteem were more likely to undo their own actions following a failure, while those with higher self-esteem were more likely to report undoing their own actions after a success. Markman and Weary (1998) found that depressed participants generated more controllable counterfactuals than nondepressed participants. Our findings support research by Haynes et al. (2007) which suggests that self-regulatory individual differences can influence counterfactual functionality. While Haynes et al. demonstrated that uncertainty orientation may influence counterfactual direction after a temporally recent negative outcome, Experiments 1, 2 and 3 demonstrate that autonomy may influence whether counterfactuals focus on antecedents that fall within the domain of personal control.

It is important to make the distinction here between controllable and self-referent counterfactuals. The associations observed in Experiments 1, 2 and 3 relate to counterfactuals that focus not just on the self – which also includes immutable features of the self (e.g., “If only I were smarter...”) – but to antecedents that could realistically be altered in future. Thus, these findings may hold implications for the functionality of counterfactual thinking, emphasizing the importance of individual difference factors.

Both Experiments 2 and 3 demonstrated the performance improving effect of counterfactual thinking. While all participants typically improved at the anagram task from Trial 1 to Trial 2, performance improvement was largest when the trials were separated by a counterfactual thinking exercise. These findings support previous research such as Roese (1994) and Markman et al. (2008). Moreover, we found evidence in both Experiments 2 and 3 that generating controllable counterfactuals as an initial response facilitated performance improvement more so than just generating counterfactuals. This finding is in line with research by Morris and Moore (2000) which suggested that controllable counterfactuals may be particularly adaptive.

Experiment 3 suggests that controllable counterfactual thoughts are functional and lead to performance improvement regardless of whether they are directed or undirected. However, in daily life when people generate spontaneous counterfactual thoughts after failure these thoughts can be controllable or uncontrollable. While this experiment demonstrates the functionality of controllable counterfactual thoughts, subsequent experiments will not direct people to engage in controllable counterfactual thinking in order that the counterfactual thoughts generated are more natural and also that there is greater variability in the types of counterfactual thoughts generated so that they can be considered in light of various self-regulatory personality traits.

In Experiment 2, after generating controllable counterfactuals we observed no difference between high and low autonomy participants in terms of control perceptions. In Experiments 2 and 3, after generating controllable counterfactuals we observed no difference between high and low autonomy participants in terms of performance improvement. Again however, we emphasise

that this finding should not be over generalized. Other individual difference factors may influence control perceptions and performance improvement once counterfactuals have been generated. Factors such as depression may be significant in determining the degree to which control perceptions are influenced once counterfactuals have been generated (Markman & Miller, 2006). Other self-regulatory individual differences may also be important. Our findings are important in that they emphasize that individual differences in autonomy influence whether controllable counterfactuals are generated at all.

In terms of other individual differences that may be implicated by the findings of this chapter, further research might examine alternative constructs used to describe autonomy. For instance, we suggest that the construct of autonomy as outlined in self-determination theory (Deci & Ryan, 1985a) may also be important to counterfactual functionality. Indeed, a related subscale of self-determination was used in the research by Leach and Patall (2013), suggesting that self-determination may be relevant. Part of the broader theoretical framework of self-determination, general causality orientation (Deci & Ryan, 1985b) describes individual differences in people's tendencies to regulate behaviour in various ways. There are three types of causality orientations: autonomous, controlled, and impersonal. Of these, autonomous orientation is of the highest salience to the present research. A person high in autonomy orientation typically displays greater self-initiation, and takes greater responsibility for personal behaviour. The general causality orientation autonomy subscale (Deci & Ryan, 1985b) may be used to assess individual differences in autonomous orientation. This orientation is understood to be a relatively enduring aspect of personality. Investigating this individual difference in relation to counterfactual functionality would be one of assessing the degree to

which findings from this chapter could be generalized to other constructs of autonomy.

One possible mechanism by which autonomy may influence counterfactual thinking relates to self-motives. Counterfactual thinking is widely reported to occur most often following negative outcomes (e.g., Sanna & Turley-Ames, 1996). Particularly when a negative outcome is self-implicating, there may be a resulting need to protect the self from criticism. However, a high level of autonomy may make people cognizant of the fact that their sense of self-worth is not exclusively determined by the evaluative implications of an immediate task or problem. As a result, people may become more open-minded and willing to engage in self-implicating adaptive behavioural plans. Essentially, autonomy describes the degree to which an individual is self-motivated, carries a sense of free-will and self-initiation in their behaviour, and is unconcerned by external ego-involvements (e.g., Bekker & van Assen, 2006; Bekker, 1993; Deci & Ryan, 1985a). Given these characteristics, for individuals with high autonomy, it may be that the implications of negative feedback from external sources do not result in attempts to re-evaluate the self. When counterfactuals may be considered without self-implication, functional types may be more likely. However, whether this mechanism is responsible for counterfactual functionality in high autonomy individuals or some other mechanism is operating needs to be investigated empirically.

Conclusion: The experiments in this chapter have provided the first direct investigation of the role of autonomy in counterfactual thinking and particularly in the generation of controllable counterfactual thoughts. The findings from all three experiments indicated that individuals high in autonomy have a tendency to generate more controllable initial counterfactual thoughts after engaging in a task compared to

those low in autonomy. As Experiments 2 and 3 demonstrated, these controllable counterfactual thoughts are particularly useful in performance improvement.

If the ability to consider counterfactuals without self-implication is particularly important in terms of functionality, investigation into other self-regulatory individual differences relevant to these self-motives may be important. One such individual difference factor is that of action/state orientation (Kuhl,1992). This individual difference factor has been highlighted by Epstude and Roese (2011) as being potentially important and in need of empirical investigation and we investigate it in the next chapter.

Chapter Four

Action/state orientation

4.1 *General introduction*

Why do some people engage in painful rumination rather than simply enjoying the activity they are currently pursuing? How do some people shrug off negative outcomes as if they never happened? These questions are central to the area of self-regulation. Action/state orientation (Kuhl, 1994) describes differences between people in terms of how they typically self-regulate after negative outcomes. Action/state orientation describes the capacity to regulate emotions, thoughts, and behaviours in order to fulfill intentions an individual may form (Kuhl, 1981). According to Kuhl (2000), individuals are predisposed to either an action-orientation or a state-orientation and this orientation is a stable personality trait over time. Action-oriented individuals are adept at regulating thoughts and feelings of inadequacy or frustration, allowing them to effectively plan and focus on a specific goal. State-oriented individuals however, are less capable of putting aside disruptions to focus on a task and are less adept at modifying states such as anxiety and dejection (Kuhl, 1994).

There are a number of reasons for focusing on action/state orientation in relation to counterfactual thinking. Firstly, because action/state orientation and autonomy are conceptually similar and closely related (Kuhl, 1994) turning attention to action/state orientation may reveal that the findings of Experiments 1, 2 and 3 are applicable to a broader range of self-regulatory individual difference factors. Another reason for focusing on action/state orientation specifically is that very little research

has been conducted on this variable in relation to counterfactual thinking, despite its potential importance to counterfactual thinking being suggested by previous researchers. Epstude and Roese (2011) as well as Markman and Weary (1998) have suggested that it may be a particularly important individual difference factor and one in need of empirical research.

4.1.1 Action/state orientation

Action/state orientation describes an individual difference in terms of how people typically self-regulate in response to demanding situations or negative events. Kuhl and colleagues (e.g., Kuhl, 2000; Kuhl & Kazén, 1994) have catalogued typical features associated with both action-orientation and state-orientation. An action-orientation predisposes individuals to actively solve problems and spend relatively more cognitive resources on tasks. Action-oriented individuals are also more adept than state-oriented individuals at focusing attention when a desired goal has been identified. For these reasons, action-oriented persons are generally better equipped to outperform state-oriented persons on goal centered tasks. State-oriented persons often fixate on negative aspects of an event and may find it relatively more difficult to regulate negative affect after some perceived failure. In terms of adaptive functioning, this negative affect serves to diminish cognitive resources and impedes sound decision making and task completion. One of the main differences then between the two orientations lies in how they determine affective reactions to negative situations. Action-oriented persons are relatively better at overcoming negative experiences and regulating affective reactions. However, it is important to

note that this does not necessarily mean action-oriented individuals feel less negatively about unpleasant events.

The effects of action/state orientation have been demonstrated empirically in applied settings. One study that examined action/state orientation in a real world setting was that of Heckhausen and Strang (1988) which examined individual differences in semiprofessional basketball players. Their research found that state-orientated individuals reacted more negatively to stressful playing conditions than action-orientated individuals. The negative reaction was marked by an increase in physiological stress and a decrease in athletic performance. Action-oriented players experienced neither physiological stress nor deterioration in performance when playing under similar levels of stress.

Other research by Kuhl (1981) has shown that state-oriented individuals show decreased performance on some cognitive tasks when they experience failure. In one experiment, participants attempted a series of cognitive problems. The problems involved pattern recognition (see Hiroto & Seligman, 1975, p. 318), logical reasoning, and object discrimination. During the first trial, some participants were assigned to a failure condition in which they engaged with a problem and were told they had failed, regardless of the responses they provided. A control condition was used in which participants engaged with a problem but were given no negative feedback. Results revealed that participants exposed to failure feedback showed increased or decreased performance compared to the control condition. These performance effects could be explained on the basis of individual differences in action/state orientation. Action-oriented individuals tended to increase performance after receiving failure feedback while state-oriented individuals tended to decrease performance after receiving failure feedback.

More recent research has examined the role of action/state orientation in terms of how it influences the consistency of adaptive behaviour over longer time frames. Research by Wanberg, Zhu, and Hooft (2010) examined action/state orientation in relation to job searching behaviour. According to the researchers, when individuals seek jobs they frequently feel their progress has been stifled. Typically, their confidence and mood can deteriorate as the process plays out. In one study, participants who were currently seeking jobs completed a survey every week day across three weeks. They were asked to rate their progress, effort, affect and confidence at the end of each day. Results indicated that for state-oriented individuals a decline in positive affect on one day tended to curb effort devoted to job searching the following day. However, for action-oriented individuals, a decline in affect one day tended to enhance job searching efforts the following day. According to Wanberg et al. (2010), action-oriented individuals are particularly likely to mobilize effort and determination after their mood has been dented.

In terms of measuring individual differences in action/state orientation, scales have been developed by Kuhl (1994) and Diefendorff et al. (2000). The scale developed by Kuhl measures two subscales of action/state orientation: disengagement and initiative. Disengagement describes the capacity to effortlessly and immediately disengage from a perceived sense of threat. Initiative describes the capacity to easily foster the emotional and cognitive responses needed to execute intentions despite challenging demands. These two subscale scores are combined to form an overall score of action/state orientation (e.g., Jostmann, Koole, van der Wulp, & Fockenberg, 2005). Action/state orientation describes an individual difference that has action-orientation and state-orientation on opposing ends of a continuum. A study by Kuhl (1994) which used self-report measures of action/state

orientation suggests that up to 50% of the normal non-clinical population in Western societies may be predisposed towards a state-orientation. The measure developed by Diefendorff et al. (2000), which was developed from the Kuhl (1994) scale, also includes subscales of disengagement and initiative. However, Diefendorff et al. emphasize the importance of persistence in goal striving and thus include an additional subscale: volatility. Volatility describes the tendency to focus on an additional goal while pursuing an original goal.

In the Diefendorff et al. (2000) measure, as in the Kuhl (1994) measure, both the disengagement and initiative subscales are treated as single constructs. The volatility subscale is treated as a second construct, theoretically related to action/state orientation. Reasons for this approach include the fact that correlations between the disengagement and initiative subscales are typically high, while their correlations with volatility are often close to zero. Theoretically, this approach is congruent with the concept that the ability to demonstrate an action-orientation during self-regulation (e.g., the ability to disengage for setbacks or to initiate behavioural plans) may be independent of the ability to maintain such an action-orientation for prolonged periods of time (e.g., persistence in goal striving).

In the present research, individual differences in action/state orientation are assessed using the measure of action/state orientation developed by Diefendorff et al. (2000). Thus, action/state orientation is considered a composite of both the disengagement and initiative subscales. Volatility is treated as a separate construct, albeit theoretically related to action/state orientation.

4.1.2 Action/state orientation and counterfactual thinking

The findings from a number of studies suggest that action/state orientation may have a role to play in counterfactual thinking. In a study examining action/state orientation and regret, McElroy and Dowd (2007) asked participants to recall a negative life event about a situation in which the person had engaged in either action or inaction. State-oriented individuals reported consistent levels of regret regardless of whether the event was action or inaction related. In contrast, action-oriented individuals experienced more regret for situations that recalled inaction than situations involving action. The findings of this study indicate that regret is influenced by innate action/state orientation. Some research suggests that state-oriented individuals are more likely than action-oriented individuals to focus on self-related attributions when experiencing negative affect (Baumann & Kuhl, 2003). McElroy and Dowd (2007) state that their findings suggest state-oriented individuals are unable to regulate the tendency to place blame on their self.

Further, the cognitive process of rumination has been associated with action/state orientation. Rumination is conceptually similar to counterfactual thinking. Although cognitive undoing may not necessarily take place during rumination, both processes involve reflecting on past events. Kuhl (1994) conceptualizes rumination as a mode of thought that reflects a state-orientation. In this sense rumination is viewed as dysfunctional; focus on the causes and consequences of internal and external states becomes an end in itself rather than facilitating positive behavioural action plans. Given that two studies by Davis (1991) reported that scores on a dispositional rumination scale were moderately related to the frequency of counterfactual thinking, it is possible that state-orientation may also be important in counterfactual thinking. It may be the case that state-oriented

individuals may be more likely than action-oriented individuals to engage in counterfactual thinking, particularly about negative outcomes.

State-orientation has also previously been characterized as a preoccupation with the simulation of alternative plans and by persistent analysis of how and why past endeavours resulted in either success or failure (Watkins & Baracaia, 2002). This persistent analysis may work against the formulation of behavioural plans. Action-orientation however, is characterized by more functional action planning. An action-orientation has been associated with self-monitoring – the ability to regulate and alter one’s own behaviour in order to adapt to a given situation (Watkins & Baracaia, 2002).

It may also be the case that the extent to which an individual continues to generate counterfactual thoughts after a negative outcome is associated with Kuhl’s action/state orientation. There is evidence which suggests that this trait may be particularly important in relation to cognitive coping strategies. A study by El Leithy et al. (2006), which examined temporal changes in counterfactual generation, found that active reappraisal and reality testing in response to negative thoughts (a feature of Kuhl’s action-orientation) was associated with greater ease in generating counterfactual thoughts in the aftermath of a traumatic event but fewer counterfactual thoughts over longer time intervals. Conversely, the researchers noted that cognitive coping strategies such as interrupting unpleasant emotional states by focusing on other negative thoughts or “thought stopping” (characteristics consistent with Kuhl’s state-orientation) did not facilitate recovery and may be associated with continued, persistent counterfactual thinking (El Leithy et al., 2006). Thus, any potential association between action/state orientation and counterfactual thinking may be mediated by time or perhaps the degree of negative affect experienced.

In terms of the precise nature of any potential association between counterfactual thinking and action/state orientation, research suggests that counterfactual controllability may be important. Markman and Weary (1998) investigated the control concerns typically found in depressed individuals, thought to typically utilize a state-orientation, and potential associations to counterfactual content. Their research was one of the first to document individual differences in counterfactual thinking as a function of depression. Over the course of two studies, they examined the role of depressives chronic control beliefs on counterfactual thinking. They hypothesized that depressed individuals would be more likely than non-depressed individuals to generate controllable counterfactuals about a negative life event because of a desire to minimize control losses and to possibly expand control perceptions over future action. Analysis revealed that depressed participants generated more controllable counterfactuals than nondepressed participants. The research by Markman and Weary (1998) suggests that the chronic control concerns of depressives are an important determinant of counterfactual focus.

What the research described above indicates is that while there has been very little direct study of the relationship between counterfactual thinking and action/state orientation, the indirect findings warrant further investigation. It seems likely from previous research that action/state orientation may be an important individual difference in counterfactual thinking and, more specifically, may influence counterfactual functionality.

In terms of observing the potential adaptiveness of an action-orientation, another interesting line of research has focused on experimentally inducing either action-orientation or state-orientation in participants and observing the effects on performance and cognition (Kuhl, 1981; Van Putten, Zeelenberg, &

Van Dijk, 2009; Watkins & Baracaia, 2002). State-orientation has previously been associated with depression (Watkins & Baracaia, 2002). However, an action-orientation may seemingly be cultivated in persons who have been shown to typically generate less functional depressive thoughts about past events. Watkins and Baracaia (2002) successfully managed to temporarily induce an action-orientation and improved problem solving in a sample of depressed and recovering depressive patients. These patients had originally displayed a propensity toward a state-orientation. The study involved three experimental groups (currently depressed, recovered depressed, and never depressed) in three conditions (no questions, state-oriented questions, and action-focused questions). State-oriented questions included: "What am I doing wrong?"; "What caused this problem?"; "Why can't I do better?" and "What is the reason behind all this?" These questions represented questions that might typically occur naturally in the minds of people who tend to ruminate. Action-focused questions included: "How am I deciding on a way to solve this problem?" and "How am I deciding what do to next?" These represented questions that might typically occur naturally in the minds of people with innate action-orientation. Results indicated that manipulation of action/state orientation influenced success in problem solving.

Similarly, to manipulate action/state orientation, Van Putten et al. (2009) had participants read and imagine a scenario in which a travel agency had offered a trip to Rome for only \$100 – half the usual price. However, when the protagonist eventually decided to purchase a ticket, the offer had expired. Some participants were instructed to describe how they might act to improve the situation. This instruction was intended to induce an action-orientation. Other participants were asked to list the thoughts and feelings this situation might elicit. This

instruction was designed to promote a state-orientation. Subsequently, all participants completed a measure of action/state orientation. Results indicated that after an action-orientation rather than state-orientation was induced, participants did indeed report an elevated level of action-orientation. The effects of these experimental inductions are likely short lived however, given that action/state orientation is an enduring personality trait thought to be consistent over time (Kuhl, 2000).

Given that previous research has shown it is possible to experimentally induce an action-orientation or a state-orientation, this type of approach might be useful in observing more directly the influence of these regulatory orientations on counterfactual thinking. In the next section we present the findings of two experiments looking at the role of action/state orientation in counterfactual thinking. Experiment 4 investigates whether or not action/state orientation influences counterfactual thinking. Experiment 5 experimentally induces an action-orientation or a state-orientation and considers the effects for counterfactual thinking.

4.2 Experiment 4: Does action/state orientation play a role in counterfactual thinking?

Building on the previous chapter, which demonstrated that individual differences in autonomy may be important in terms of counterfactual controlability, Experiment 4 sought to extend these findings. Our primary aim was to investigate whether another self regulatory individual difference – action/state orientation – might influence counterfactual thinking after a negative outcome.

Similar to the previous experiments, participants twice attempted a series of difficult cognitive tasks (e.g., Anagrams). Counterfactual thoughts were generated after attempting each cognitive task. Individual differences in action/state orientation were measured. Based on the findings in the previous experiments we expected that performance on the task would improve across trials and more so for individuals that generated controllable than uncontrollable initial counterfactuals.

Our first hypothesis was that an action-orientation would lend itself to similar patterns of counterfactual thinking to those observed in the high autonomy participants. We anticipated that action-oriented individuals would generate more controllable counterfactuals than state-oriented individuals after failure in the initial cognitive task. We also hypothesized that this association would become more readily observed in the second counterfactual generation task given that participants will have experienced a second undesirable outcome. Thus, we investigated whether persistent failure influences any findings for individual differences in action/state orientation and counterfactual thinking.

Consideration was given to the role of volatility – an aspect of action/state orientation describing the tendency to focus on an additional goal while pursuing an original goal (Diefendorff et al., 2000). We expected that individuals high in volatility would disengage from goals more quickly once difficulties arose, and thus may be less likely to generate counterfactual thoughts than those low in volatility. Thus, we anticipated that participants high in volatility would generate fewer overall numbers of counterfactual thoughts. Given some research indicates that individuals low in volatility are better at finding a way around obstacles than people high in volatility (Marguc, Forster, & Van Kleef, 2011) it may be the case that individuals low in volatility may generate more functional types of

counterfactual thought (controllable) that facilitate performance improvement and learning. We also examined this hypothesis.

4.2.1 Method

Participants: Participants were 116 undergraduate students (80 women and 36 men) with an average age of 24.94 years ($SD = 11.76$).

Design: The experimental design was essentially a between participants design with one independent variable: action-orientation versus state-orientation.

Materials: Participants were familiarized with four different types of cognitive puzzles (see Appendix J). Using multiple puzzles meant there was greater strategy involved in the experimental task and thus potentially more antecedents that could be counterfactually undone. The puzzles included: alphabetical anagrams (anagrams whose solutions are in consecutive alphabetical order), anagrams (typically shorter than the alphabetical anagrams but without a first letter clue), word circles (participants had to figure out the missing letter to complete an eight-letter word reading either clockwise or anticlockwise), and word wheels (participants had to find the 9 letter word that was scrambled in various segments of a wheel diagram. The word starts with the letter located at the centre of the wheel).

After familiarizing themselves with the different types of puzzles, participants were informed that they would be attempting similar tasks throughout the experiment (see Appendix K). The order in which these tasks were presented to

participants was randomized. Participants were not told how many times they would be attempting the tasks throughout the experiment. They were told that the object of the task was to get the highest possible score by solving as many puzzles as they could. They were free to try any puzzle they wished. They could stick at one type of puzzle or they could attempt multiple puzzles. Before attempting the puzzles, participants were given approximately 1 minute to decide on a strategy that would give them the best chance of maximizing their score. Participants were then given approximately 6 minutes to attempt an initial set of puzzles. A manipulation check (see Appendix L) was included in the form of a Likert-scale type rating; participants were asked to rate the degree of satisfaction they had with regard their performance in the first set of puzzles on a scale ranging from 1 (not satisfied at all) to 7 (very satisfied). Subsequently, participants generated counterfactual thoughts regarding how the puzzle task could have been different.

Next, participants were informed for the first time that they would be attempting another set of puzzles similar to those they had already tried (they were unaware of the upcoming trial during counterfactual generation). As in Trial 1, participants were given 6 minutes to engage with the puzzles. Again, they rated their satisfaction with their performance. A second counterfactual generation task was then initiated.

Finally, participants filled out the self-report measure of action\state orientation and volatility developed by Diefendorff et al. (2000) (see Appendix M). The measure has three subscales. The preoccupation and hesitation subscales are combined to give a score for action\state orientation. The volatility subscale is analyzed separately to give a volatility score. In total, the measure includes 36 forced choice items. Items in the preoccupation subscale include: “When several things go

wrong on the same day” (“I usually don’t know how to deal with it” versus “I just keep on going as though nothing has happened”); “When I am in competition and have lost every time” (“I can soon put losing out of my mind” versus “The thought that I lost keeps running through my mind”). Items in the hesitation subscale include: “When I have work to do at home” (“It is often hard for me to get the work done” versus “I usually get it done right away”); “When I know I must finish something soon” (“I have to push myself to get started” versus “I find it easy to get it done and over with”). Items in the volatility subscale include: “When I read something I find interesting” (“I sometimes want to put the article down and do something else” versus “I will sit and read the article for a long time”); “When I’m on vacation and having a good time” (“After a while, I really feel like doing something different” versus “I don’t even think about doing anything else until the end of the vacation”). According to Diefendorff et al. (2000) the action\state orientation measure has good internal consistency, with a Cronbach alpha coefficient reported of .74. In the current experiment, the Cronbach alpha coefficient was .71. According to Diefendorff et al. (2000) the volatility measure also has good internal consistency, with a Cronbach alpha coefficient reported of .78. In the current experiment, the Cronbach alpha coefficient was .72.

Procedure: Participants were approached to take part in the experiment immediately following college lectures. They were informed that the study was interested in how people think while problem solving. All participants were assured confidentiality and told that their responses would be completely anonymous. An information sheet (see Appendix D) was administered before proceeding with data collection. Individuals who were interested in taking part in the experiment signed a consent form (see

Appendix E) and completed the booklet containing the experimental materials. All participants were debriefed at the end of the experiment.

Coding of counterfactual statements: Counterfactuals were coded using the process and categorizations as in previous experiments. Inter-rater agreement between the two trained coders was high (91.3%). Agreement ranged from 89% for coding controllable versus uncontrollable counterfactuals, to 95% for coding whether the thought was a counterfactual. Disagreements were resolved by the experimenter.

4.2.2 Results

Omitted data: In general, participants had little difficulty understanding instructions. Participants seemed to understand the concepts involved in the various word puzzles; only 4 participants asked for clarification about the objective of a specific puzzle. No one puzzle seemed to cause confusion however. Data from 3 participants were discarded due to failure to follow instructions adequately.

Descriptive statistics

Individual difference measure: Scores for action/state orientation (Diefendorff et al., 2000) could range between 0 and 24. In this sample the mean score total for action/state orientation was 11.37 ($SD = 4.09$), ranging from 1 to 23. Participants were categorized as action-oriented or state-oriented using a median split as has been done in previous research (e.g., Hiroto & Seligman, 1975; Wanberg, Zhu, & Hooft, 2010). Using this categorization, 57 participants were categorized as action-oriented

and 59 were categorized as state-oriented. The mean score for action-orientation was 14.61 ($SD = 2.05$) and the mean score for state-orientation was 8.24 ($SD = 2.96$).

Scores for volatility (Diefendorff et al., 2000) could range between 0 and 12. In this sample the mean score total for volatility was 8.65 ($SD = 1.93$), ranging from 4 to 12. Participants were categorized as volatile or non-volatile using a median split. Using this categorization, 66 participants were categorized as volatile and 50 were categorized as non-volatile. The mean score for volatile participants was 7.46 ($SD = 1.50$) and the mean score for non-volatile participants was 10.51 ($SD = 1.96$).

Number and types of counterfactuals generated: Overall, participants generated exactly 241 counterfactual thoughts in Trial 1 and 258 in Trial 2. Participants recorded a mean of 2.08 ($SD = .77$) counterfactual items each in Trial 1, ranging from 1 to 4 items. Participants recorded a mean of 2.22 ($SD = .90$) counterfactual items in Trial 2, ranging from 1 to 5 items. This difference was not statistically significant, $t(116) = -.92, p = .35$. In both trials, all participants generated at least one counterfactual statement, resulting in 116 opening/initial counterfactuals. Descriptive statistics for each counterfactual categorization in both Trial 1 and Trial 2 are shown below in Tables 8 and 9.

Table 8

Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Trial 1 of Experiment 4

Type of counterfactual	Initial (N=116)	Overall (N=241)
Upward versus Downward	100% vs 0%	94% vs 6%
Additive versus Subtractive	93% vs 7%	89% vs 11%
Controllable versus Uncontrollable	40% vs 60%	66% vs 34%

Table 9

Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Trial 2 of Experiment 4

Type of counterfactual	Initial (N=116)	Overall (N=258)
Upward versus Downward	99% vs 1%	96% vs 4%
Additive versus Subtractive	91% vs 9%	90% vs 10%
Controllable versus Uncontrollable	35% vs 65%	53% vs 47%

Satisfaction ratings: As expected, participants generally felt dissatisfied with their performance in Trial 1. It was anticipated that due to the difficult nature of the tasks (as observed in a small pilot study), participants satisfaction scores would remain consistently low throughout the experiment. A paired-samples t-test was conducted to evaluate whether participants satisfaction scores varied across trials. There was only a marginally significant increase in satisfaction scores from Trial 1 ($M = 1.14$, $SD = .37$) to Trial 2 ($M = 1.23$, $SD = .53$), $t(116) = -1.73$, $p = .09$. This meant that throughout the experimental procedure, participants' satisfaction scores remained relatively low and constant.

Counterfactual activation

We checked for statistically significant correlations between the individual difference factors and counterfactual frequency in both trials. There was no correlation between action/state orientation score and counterfactual frequency in Trial 1, $r = .09$, $n = 116$, $p = .35$, or Trial 2, $r = .02$, $n = 116$, $p = .82$. There was also no correlation between volatility and counterfactual frequency in Trial 1, $r = .05$, $n = 116$, $p = .54$, or Trial 2, $r = -.14$, $n = 116$, $p = .13$.

Similarly there was no correlations between action/state orientation score and the overall number of controllable counterfactuals generated in Trial 1, $r = .03$, $n = 116$, $p = .73$, or Trial 2, $r = .15$, $n = 116$, $p = .11$. There was also no correlation between volatility and the overall number of controllable counterfactuals generated in Trial 1, $r = .05$, $n = 116$, $p = .60$, or Trial 2, $r = -.14$, $n = 116$, $p = .13$.

Focus of initial counterfactuals

For both trials, we compared action-oriented and state-oriented individuals for initial counterfactual controllability; counterfactual direction and structure were largely upward and additive as an initial response and so were not included in these statistical analyses. Firstly, we investigated whether an action-orientation was associated with the use of controllable counterfactuals as an initial response. For the first counterfactual generated in Trial 1, a 2x2 Chi-square test for independence indicated that there was no association between action/state orientation and initial counterfactual controllability, $\chi^2(1, n = 116) = .116$, $p = .73$. Descriptive statistics are provided in Table 10.

Table 10

Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by Action-oriented and State-oriented Participants in Trial 1 of Experiment 4

	Controllable	Uncontrollable
Action-orientation	42%	58%
State-orientation	37%	63%

However, for the first counterfactual generated in Trial 2, a 2x2 Chi-square test for independence indicated that there was an association between action/state orientation and initial counterfactual controllability, $\chi^2(1, n = 116) = 5.21, p = .02$, with a small effect size ($\phi = .23$). Descriptive statistics are provided in Table 11. For action-oriented individuals, initial counterfactual controllability increased slightly across trials: 42% to 46%. For state-oriented individuals, initial counterfactual controllability decreased across trials: 37% to 24%. This finding suggests that action-oriented individuals seem more likely to generate controllable counterfactuals than state-oriented individuals when faced with persistent negative outcomes.

Table 11

Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by Action-oriented and State-oriented Participants in Trial 2 of Experiment 4

	Controllable	Uncontrollable
Action-orientation	46%	54%
State-orientation	24%	76%

Finally, we examined volatility. There was no association between volatility and initial counterfactual controllability in Trial 1, $\chi^2(1, n = 116) = 1.07, p = .30$, or in Trial 2, $\chi^2(1, n = 116) = 1.43, p = .23$.

Performance improvement

As expected, performance scores increased significantly from Trial 1 ($M = 5.55, SD = 3.80$) to Trial 2 ($M = 6.64, SD = 3.60$), $t(115) = 4.51, p < .001$. The eta squared statistic (.15) indicated a large effect size.

We computed a unitary dependent variable of score improvement (score in puzzle Trial 2 – score in puzzle Trial 1). A between groups ANOVA was conducted to explore the impact of initial counterfactual controllability and action/state orientation on performance improvement. There was a significant main effect on performance improvement depending on whether the initial counterfactual was controllable ($M = 2.09, SD = 2.67$) or uncontrollable ($M = .43, SD = 2.33$), $F(3, 112) = 12.20, p < .001$, replicating the findings of Experiments 2 and 3. The effect size was small (partial eta squared = .01). Similar to the findings reported for autonomy, the main effect for action/state orientation was not statistically significant, $F(3, 112) = .04, p = .84$, nor was the interaction effect between initial counterfactual controllability and action/state orientation, $F(3, 112) = .11, p = .74$.

4.2.3 Discussion of Experiment 4

Experiment 4 examined individual differences in action/state orientation (Diefendorff et al., 2000). Action-oriented individuals are hypothesized to perceive

failure as less threatening to self-representations than are state-oriented individuals. Participants attempted cognitive tasks (e.g., anagrams) and subsequently generated counterfactual thoughts in two consecutive trials. Action/state orientation was not associated with counterfactual activation. It was anticipated that volatility, the tendency to focus on an additional goal while pursuing an original goal, would have implications for counterfactual activation. Specifically, we hypothesized that volatility would be associated with the generation of fewer counterfactual thoughts but this hypothesis was not supported. Experiment 4 suggests that action/state orientation and volatility are not associated with counterfactual activation.

We found no significant association between action/state orientation and controllable counterfactual focus in Trial 1. However, in Trial 2, we did observe a significant association between action/state orientation and initial counterfactual controllability. Compared to state-oriented participants, action-oriented participants generated more controllable counterfactuals as an initial response in Trial 2. Participants' satisfaction with their performance was uniformly low throughout the experiment. This suggests that in order to observe individual differences in the functionality of counterfactual thinking, the degree of 'failure' participants engage with may be an important factor.

We also examined whether there would be a significant difference between high and low volatility participants in terms of counterfactual controllability. Previous research indicates that people low in volatility are better at finding solutions to obstacles than people who are high in volatility (Marguc, Förster, & Van Kleef, 2011). However, volatility was not associated with controllable counterfactual thinking.

One possible explanation for why action/state orientation did not influence counterfactual controllability in Trial 1 may have been that the outcome of the cognitive puzzle task used was initially perceived as unthreatening. However, affect scores were consistently low throughout the experiment. Another explanation might be that having participants engage with a strategy formation task, as they did before Trial 1, may have bolstered control perceptions for all participants. This may have eradicated the variance in counterfactual thinking patterns attributable to individual difference factors. Regardless of this fact, the study found some evidence that action/state orientation influences counterfactual focus after a negative outcome. Findings from Experiment 4 suggest that persistent negative outcomes influence action-oriented and state-oriented individuals differently. Our findings are in line with research by McElroy and Dowd (2007) who observed a dysfunctional capacity to regulate negative emotion in state-oriented individuals.

Experiment 4 indicates that action/state orientation may be important in terms of the generation of functional types of counterfactual thinking. To that end, Experiment 5 experimentally induces an action-orientation or state-orientation and observes potential effects on counterfactual thinking and interactions with individual differences in action/state orientation.

4.3 Experiment 5: Does inducing an action or state orientation influence counterfactual functionality?

Following from Experiment 4, which indicated that individual differences in action/state orientation may be important in terms of counterfactual controllability, Experiment 5 sought to examine the matter further. As in Experiment 4, we

investigated whether action/state orientation might influence counterfactual controllability after a negative outcome. Experiment 5 builds on Experiment 4 in that it provides an additional test of the hypothesis that action/state orientation influences counterfactual thinking. Experiment 5 also permits investigation into the effects of experimentally manipulating action/state orientation and any potential interaction that may exist with innate individual differences in action/state orientation.

We anticipated that experimentally inducing an action-orientation would lead to more controllable counterfactual thinking than would inducing a state-orientation. We were unsure as to whether or not individual differences in action/state orientation would directly influence counterfactual thinking, given that two task failures were required to observe variance attributable to this individual difference in Experiment 4. We did however anticipate that the experimental manipulation of action/state orientation would not influence naturally action-oriented and naturally state-oriented individuals in the same way. We anticipated that participants with a natural action-orientation would uniformly generate relatively high numbers of controllable counterfactual thoughts. Conversely, we anticipated that naturally state-oriented participants would generate comparable numbers of controllable counterfactuals only in the action-orientation inducing condition.

4.3.1 Method

Participants: Participants were 80 undergraduate students (62 women and 18 men) with an average age of 20.96 years ($SD = 3.72$). Participants were randomly

assigned to an action-orientation (n = 40) or a state-orientation (n = 40) induced condition.

Design: The experimental design was essentially a between participants design with two independent variables: Induced action/state orientation (action-orientation versus state-orientation) and innate action/state orientation (action-orientation versus state-orientation).

Materials: To experimentally manipulate an action/state orientation, a procedure similar to that used by Van Putten et al. (2009) was used. All participants read the following vignette:

“You adore Rome! Shortly you will have a whole week without lectures and you would very much like to visit Rome. A friend tells you that a local travel agency offers a completely organized three-day trip to Rome. You can book the trip this week for €100 instead of the usual €199. This includes flights and two nights with breakfast at a four star hotel in the centre of Rome. He also tells you that you have to hurry before it is too late and the trip is sold out. During the week after you have spoken to your friend, you pass by the travel agency several times and think about booking the trip. However, you do not do so. When you finally want to book the trip it is sold out. You are too late.”

The vignette was changed slightly from that used by Van Putten et al. (2009); the offer included air flights instead of travel on a high speed train. Participants read the vignette about a missed opportunity and either ruminated about how they might feel (state-orientation) or considered what they could do to improve the situation (action-orientation). This constituted the experimental manipulation of action/state orientation.

Next, participants were familiarized with four different types of cognitive puzzles identical to those used in Experiment 4 (see Appendix J). As they familiarized themselves with the different types of puzzles, participants were informed that they would be attempting a similar set of tasks in a few moments. These tasks were identical to those used in Experiment 4 (see Appendix K). Unlike Experiment 4 however, participants only attempted one trial of puzzles. Also, participants did not engage in developing a strategy before attempting the puzzles as they did in Experiment 4. Participants were given 6 minutes to attempt the set of puzzles. After this task, participants indicated their level of satisfaction with their performance in the puzzles on a Likert scale ranging from 1 (not satisfied at all) to 7 (very satisfied) (see Appendix L). Participants next generated counterfactual thoughts regarding how the puzzle task could have been different. They were free to generate as many as they wished.

Finally, participants filled out the self-report measure of action-state orientation developed by Diefendorff et al. (2000) (see Appendix M). According to Diefendorff et al. (2000) the measure has good internal consistency, with a Cronbach's alpha coefficient reported of .74. In the current experiment, the Cronbach's alpha coefficient was .70.

Procedure: Participants were approached to take part in the experiment immediately following college lectures. They were informed that the experiment was interested in how people think while problem solving. All participants were assured confidentiality and told that their responses would be completely anonymous. An information sheet (see Appendix D) was administered before proceeding with data collection. Individuals who were interested in taking part in the experiment signed a consent form (see Appendix E) and given the booklet containing the experimental materials. Participants were debriefed about the nature of the experiment after completing the action/state orientation manipulation, the puzzles and the counterfactual generation exercise. This debriefing lasted approximately 3 minutes so that a significant period of time could separate the induction of an action-orientation or state-orientation from the individual difference measure. The aim of this was to reduce any potential effects of the experimental manipulation on the measure of innate action\state orientation. Participants were also made aware that their responses in the individual difference measure should reflect their typical feelings and behaviour and not how they were currently feeling.

Coding of counterfactual statements: Counterfactuals were coded using the process and categorizations as in previous experiments. Inter-rater agreement between the two trained coders was high (94.9%). Agreement ranged from 92% for coding controllable versus uncontrollable counterfactuals, to 96% for coding whether the thought was a counterfactual. Disagreements were resolved by the experimenter.

4.3.2 Results

Omitted data: In general, participants had little difficulty understanding instructions. Participants seemed to understand the concepts involved in the various word puzzles; only 1 participant asked for clarification about the objective of a specific puzzle. Data from 2 participants were discarded due to failure to follow instructions adequately.

Descriptive statistics

Individual difference measure: Scores for action/state orientation (Diefendorff et al., 2000) could range between 0 and 24. In this sample the mean score total for action/state orientation was 13.85 ($SD = 4.01$), ranging from 3 to 20. Participants were categorized as action-oriented or state-oriented using a median split as has been done in previous research (e.g., Hiroto & Seligman, 1975; Wanberg et al., 2010). Using this categorization, 40 participants were categorized as action-oriented and 40 were categorized as state-oriented. The mean score for action-orientation was 17.22 ($SD = 1.23$) and the mean score for state-orientation was 10.48 ($SD = 2.78$).

Number and types of counterfactuals generated: Overall, participants generated exactly 197 counterfactual thoughts. Participants recorded a mean of 2.46 ($SD = .88$) counterfactual items each. All participants generated at least one counterfactual statement, resulting in 80 opening/initial counterfactuals. Descriptive statistics for each counterfactual categorization are shown below (Table 12).

Table 12

Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Experiment 5

Type of counterfactual	Initial (N=80)	Overall (N=197)
Upward versus Downward	100% vs 0%	96% vs 4%
Additive versus Subtractive	91% vs 9%	92% vs 8%
Controllable versus Uncontrollable	39% vs 61%	50% vs 50%

Satisfaction ratings: Participants satisfaction ratings with their performance in the puzzle task was low ($M = 1.60$, $SD = .61$).

Potential impact of inducing an action-orientation or state-orientation on completion of the questionnaire measuring individual differences in action/state orientation: We were conscious that inducing an action-orientation or a state-orientation in participants could impact scores on the action/state orientation questionnaire. We attempted to minimise the possibility of this by leaving as much time as possible between the induction and the questionnaire and we also checked the distribution of naturally action-oriented and state-oriented individuals in each of the conditions. We anticipated that if the experimental manipulation of action/state orientation had an influence on the individual difference measure, then there would be more naturally action-oriented individuals in the action-oriented induced condition and more naturally state-oriented individuals in the state-oriented induced condition. This was not the case, $\chi^2(1, n = 80) = .05$, $p = .82$. Participants in both experimental conditions were equally action-oriented and state-oriented. In the action-oriented induced condition, 48% of participants were naturally state-oriented

and 52% were naturally action-oriented. In the state-oriented induced condition, 53% of participants were naturally state-oriented and 47% were naturally action-oriented.

Counterfactual activation

There was no correlation between action/state orientation score and counterfactual frequency, $r = .09$, $n = 80$, $p = .38$. There was a marginally significant association between action/state orientation score and the overall number of controllable counterfactuals generated, $r = .19$, $n = 80$, $p = .08$, with action-orientation associated with higher numbers of controllable counterfactuals.

Focus of initial counterfactuals

We compared naturally action-oriented and state-oriented participants for initial counterfactual controllability; counterfactual direction and structure were predominantly upward and additive as an initial response and so were not included in these statistical analyses. For the first counterfactual generated, a 2x2 Chi-square test for independence indicated that there was a significant association between action/state orientation and counterfactual controllability, $\chi^2(1, n = 80) = 7.58$, $p = .006$, with a medium effect size ($\phi = .33$). Descriptive statistics are provided in Table 13. Action-oriented participants generated controllable counterfactuals as an initial response more readily than state-oriented individuals.

Table 13

Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by Naturally Action-oriented and Naturally State-oriented Participants in Experiment 5

	Controllable	Uncontrollable
Action-orientation	55%	45%
State-orientation	23%	77%

We compared the induced action-oriented and state-oriented conditions for initial counterfactual controllability. Although action-oriented induced participants generated controllable counterfactuals as an initial response more readily than state-oriented induced participants, the association did not reach statistical significance, $\chi^2(1, n = 80) = .84, p = .36$. Descriptive statistics are provided in Table 14.

Table 14

Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by Induced Action-oriented and Induced State-oriented Participants in Experiment 5

	Controllable	Uncontrollable
Induced Action-orientation	45%	55%
Induced State-orientation	32%	68%

We then compared the initial counterfactual controllability of naturally action and state-oriented participants taking into consideration the experimental manipulation; data were divided in terms of innate orientation (action-orientation vs. state-orientation). For innately action-oriented participants, we

observed a significant association between induced action/state orientation and counterfactual controllability, $\chi^2(1, n = 40) = 2.63, p = .05$, with a small effect size ($\phi = .25$). Individuals induced into an action-orientation generated controllable counterfactuals as an initial response more readily than individuals induced into a state-orientation. Descriptive statistics are provided in Table 15.

Table 15
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by Naturally Action-oriented Individuals in the Induced Action-orientation Condition and the Induced State-orientation Condition in Experiment 5

	Controllable	Uncontrollable
Induced action-orientation	67%	33%
Induced state-orientation	42%	58%

No association was observed for innately state-oriented participants, $\chi^2(1, n = 40) = .43, p = .84$. Percentages of controllable initial counterfactual responses are provided in table 16 below.

Table 16
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by Naturally State-oriented Individuals in the Induced Action-orientation Condition and the Induced State-orientation Condition in Experiment 5

	Controllable	Uncontrollable
Induced action-orientation	21%	79%
Induced state-orientation	24%	76%

We had anticipated that participants with a natural action-orientation would uniformly generate relatively high numbers of controllable counterfactual thoughts and that naturally state-oriented participants would generate comparable numbers of controllable counterfactuals only in the action-orientation inducing condition. However, we found that for naturally action-oriented participants, more controllable counterfactuals were generated in the action-oriented induced condition than in the state-oriented induced condition. For naturally state-oriented participants; inducing an action-orientation did not significantly increase initial counterfactual controllability.

4.3.3 Discussion of Experiment 5

Participants read a vignette about a missed opportunity and either ruminated about how they might feel (state-orientation) or considered what they could do to improve the situation (action-orientation). Participants attempted a series of puzzles (identical to Experiment 4). They then generated counterfactuals. Subsequently, participants filled out an individual difference measure of action/state orientation. Results suggested that individual differences in action/state orientation may be important in terms of counterfactual controllability. Action-oriented participants generated controllable counterfactuals as an initial response more readily than state-oriented individuals. In addition, Experiment 5 demonstrates that the results of experimental manipulations of action/state orientation on counterfactual controllability are best interpreted when individual difference factors are considered; experimentally inducing an action-orientation influenced naturally action-oriented and state-oriented participants differently in terms of initial counterfactual controllability.

One concern of Experiment 5 was the potential influence of the action/state inducing manipulation on the self-report measure of individual differences in action/state orientation. There may be no ideal way of positioning individual difference measures in an experiment of this type. However, both the experimental manipulation of action/state orientation and the measures of individual difference were separated by a considerable length of time during which the puzzles were attempted, counterfactual thoughts were generated, and a debriefing was given. Thus, the influence of the manipulation was more likely to influence counterfactual generation rather than the individual difference measure. Also, participants were made aware that the answers they gave in the individual difference measure were to reflect ways in which they *typically* think, and not how they were currently feeling.

Overall the findings from this experiment support those of Experiment 4, suggesting that individual differences in action/state orientation may be important in terms of counterfactual controllability. In observing the influence of action/state orientation on counterfactual thinking, utilizing an individual difference perspective may be particularly useful.

4.4 General Discussion

Building on results from Chapter 3 which indicated that individual differences in autonomy (Bekker & van Assen, 2006) may be important in terms of counterfactual controllability, Chapter 4 examined individual differences in action/state orientation (Diefendorff et al., 2000). We anticipated that individuals with an action-orientation would demonstrate a tendency to generate controllable counterfactuals. Some evidence for this hypothesis was found in both Experiments 4 and 5. In Experiment

4, we found a significant association between counterfactual controllability and action-orientation in a second counterfactual listing exercise. In Experiment 5, we also found a significant association between counterfactual controllability and action-orientation. This suggests that action/state orientation (Diefendorff et al., 2000) may influence counterfactual focus.

Results from Experiments 4 and 5 add to existing research on action/state orientation and thoughts about the past. McElroy and Dowd (2007) found evidence that regret may be influenced by innate action/state orientation. They found that action-oriented individuals experienced more regret for situations that recalled inaction than situations involving action. In contrast, state-oriented individuals reported consistent levels of regret regardless of whether the event was action or inaction related. Given that additive counterfactuals typically focus on things a person could have done (action), this might suggest that action-oriented individuals would be more likely to generate additive counterfactuals than subtractive counterfactuals. The experimental tasks used in Experiments 4 and 5 resulted in a high percentage of additive counterfactuals. Thus, it was difficult to investigate any association between action-orientation and additive counterfactual thinking. Future research might investigate this possible association using alternative counterfactual elicitation tasks. Experiments 4 and 5 add to research by McElroy and Dowd (2007) by demonstrating that the influence of action/state orientation on past-related cognitions applies to counterfactual thinking as well as regret.

In Experiment 4, neither action/state orientation nor volatility was associated with counterfactual activation. In Experiment 5, we again found no association between action/state orientation and counterfactual activation. Davis (1991) found that scores on a dispositional rumination scale were moderately related

to counterfactual activation. Given that Kuhl (1994) conceptualizes rumination as a mode of thought that reflects a state-orientation we might have anticipated an association between state-orientation and the overall number of counterfactuals participants generated. It is possible however that significant findings might emerge when utilizing an experimental task that is more self-salient, as the research by Davis (1991) involved participants considering their most significant life events.

Given that we observed an association between innate action-orientation and initial counterfactual controllability, and that controllable counterfactuals are thought to be particularly adaptive (e.g., Morris & Moore, 2000), it seems plausible that an action-orientation may facilitate functional action planning. Our findings are in line with research by Watkins and Baracaia (2002) who found that individuals with an action-orientation were characterized by more functional action planning than individuals with a state-orientation. Our findings build on those of Watkins and Baracaia (2002) by suggesting that one way action-oriented individuals may formulate functional action plans is by focusing on controllable antecedents of past events. Experiment 4 replicated the findings of Experiment 2 and 3 that focusing on controllable rather than uncontrollable counterfactuals leads to greater performance improvement.

In Experiment 4, we included a temporal factor in that participants experienced failure on more than one occasion. We found no change in counterfactual frequency across experimental trials for action/state orientation or volatility. Research by El Leithy et al. (2006) found that action-orientated individuals were less likely than state-oriented individuals to generate counterfactual mutations long after a negative event had transpired. Thus, any potential association between action/state orientation and counterfactual thinking may be mediated by

time or perhaps the degree of negative affect experienced. Our findings should not be interpreted as a refutation of the findings of El Leithy et al. given that the time between counterfactual generation exercises in both studies is not comparable. What is of significance is that we found that the association between action-orientation and controllable counterfactuals was stronger in the second counterfactual listing exercise. This suggests that any potential association between action/state orientation and counterfactual thinking may indeed be mediated by time or the degree of negative affect experienced.

However, another explanation may also serve to identify why significant findings emerged in the second counterfactual listing exercise. Experiment 5 was different to Experiment 4 in that it only utilized one counterfactual listing exercise. While we observed a significant association between counterfactual controllability and action-orientation using only one counterfactual listing exercise in Experiment 5, a second counterfactual listing exercise was needed in Experiment 4 to observe this association. This difference might be attributable to the strategy formation task utilized in Experiment 4. This task may have subtly influenced controllability given that it involved focusing on the puzzles participants were about to engage with.

Results from the experiments reported in this chapter also hold implications for studies on counterfactual thinking and depression, given that state-orientation is typically associated with depression (Kuhl, 1981). Our findings suggest that state-oriented individuals are less likely than action-oriented individuals to generate controllable counterfactuals after failure. This is in line with previous research which suggests that depressed individuals tend to focus on uncontrollable aspects of events and typically lay blame for negative outcomes on external sources

(e.g., Alloy & Abramson, 1982). However, Markman and Weary (1998) found that depressed individuals generated more controllable counterfactuals than nondepressed participants. A possible reason for these divergent findings was offered by Markman and Weary (1998) who point to the distinction between causal attributions and counterfactual mutations. Although they recognize that counterfactuals play a role in determining causal ascriptions (Wells & Gavanski, 1989), they point out that both processes are not identical. During causal ascription, depressed individuals may rely on negative self-representations to come to the conclusion that an unchangeable feature of the self was the cause. Undoing on the other hand, may involve a somewhat less self-implicating analysis of problem-solving strategies. Thus, the problem-solving nature of the undoing process may give depressed individuals a greater chance to increase control perceptions ahead of future challenges than might causal attribution processes. This might explain why depressed individuals tend to favour controllability during counterfactual undoing and not during instances of causal ascription.

Like Markman and Weary (1998), Experiments 4 and 5 focused on counterfactual undoing rather than causal ascription. However, our findings suggest that state-oriented individuals are less likely than action-oriented individuals to generate controllable counterfactuals after failure. There may however be no contradiction in these findings. The sample used in the present research was not screened for depression as was the case in the Markman and Weary studies. This may well be an important distinction. While individuals with depression are thought to typically demonstrate state-orientation, having a consistent regulatory orientation towards state-orientation does not necessarily go hand in hand with depression.

Markman and Weary (1998) suggest that counterfactual thinking offers a less self-implicating way of focusing on controllable antecedents than causal attribution. Our research suggests that individual difference factors may be important in determining perceptions of self-implication during counterfactual thinking. In other words, counterfactual thinking may indeed provide a way of determining causality with reduced self-implication, but individual difference factors mitigate this effect. The importance of considering individual difference factors was demonstrated in Experiment 5. Inducing action-orientation increased initial controllable counterfactuals only for naturally action-oriented participant. While we did not directly measure participants' perceptions of self-implication, we suggest that the divergent motivational goals typically held by action-oriented and state-oriented individuals indicate that self-implication may be important in terms of counterfactual controllability. Action-oriented individuals have been identified as being highly capable of perceiving failure as unthreatening to self-representations (Kuhl, 1992). Thus, when self-implication is low, more controllable counterfactuals may be utilized.

Alternatively, action-oriented and state-oriented individuals may differ in terms of controllable counterfactual thinking due to divergent control needs. Markman and Weary (1998) suggest the operation of a compensatory mechanism whereby depressed individuals attempt to compensate for their general perception of control loss by increasing their control perceptions about specific instances via counterfactual thinking. It may be that because action-orientation is a volitional style characterized by self-determined, autonomous goal-striving, particularly under stressful circumstances (Kuhl, 1994), these individuals may have a reduced need to control outcomes. Thus, somewhat counter intuitively, these individuals may

demonstrate a propensity towards counterfactual controllability precisely because they have little need to seek or maintain control. While the need for control in depressed individuals may lead to controllable counterfactuals designed to strengthen control perceptions, an underlying absence of chronic control needs may facilitate the use controllable counterfactuals in individuals who score high in action-orientation.

Conclusion: The two experiments in this chapter provide an initial investigation into the role of individual differences in action/state orientation in counterfactual thinking. The findings from both experiments indicated that action-oriented individuals have a tendency to generate more controllable initial counterfactual thoughts after experiencing a less than ideal outcome compared to state-oriented individuals. The degree of failure encountered may be important in observing this association. We also found evidence that action-oriented and state-oriented individuals reacted differently to experimental manipulations to temporarily induce an action or state-orientation.

Experiments 4 and 5 add some additional support to the argument that self-regulatory individual differences influence the functionality of counterfactual thoughts. Further research is required to determine precisely why action-oriented individuals may utilize controllable counterfactuals more readily than state-oriented individuals after failure. If self-implication is a major factor, this invites the study of another self-regulatory individual difference: cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012). This individual difference factor distinguishes individuals in terms of how they cope with self-threats and is the main focus of Chapter 5.

Chapter Five

Self-affirmation

5.1 General introduction

Like autonomy and action/state orientation, cognitive self-affirmation inclination describes an individual difference in self-motives. It distinguishes individuals in terms of how they cope with self-threats. Self-affirmation theory (Sherman, Nelson, & Steele, 2000; Steele, 1988; Steele, Spencer, & Aronson, 2002) proposes that people are motivated to reduce the psychological discomfort of self-threats and may do so by utilizing self-restoring methods that affirm some important aspect of the self that is unrelated to the threatened domain. The tendency to engage in this type of internal self-restoring image generation is thought to manifest differently from person to person. Chapter 5 examines individual differences in cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012) and counterfactual thinking. If reducing self-implication facilitates the use of controllable counterfactuals, we would anticipate that individuals who typically self-affirm might demonstrate an inclination towards controllable counterfactuals.

Epstude and Roese (2011) have suggested that self-affirmation may be particularly important in terms of counterfactual thinking. They suggest that because self-affirmation may help to terminate rumination after failure, counterfactual thoughts may also change or decrease as a result of self-affirmation. They state that the mechanisms for the effect of self-affirmation on counterfactual thinking might include changes in positive affect or changes in goal-related cognitions. Further, Epstude and Roese suggest that the extent to which a goal is

self-defining and how strongly individuals are committed to a goal may moderate the effect of self-affirmation on counterfactual thinking. We address some of these questions in the present chapter.

5.1.1 Cognitive self-affirmation inclination

In modern society, people experience innumerable challenges and self-threats. On a daily basis, people may encounter difficulties such as negative feedback in the work environment, frustrated goals, illness, challenges to deeply held beliefs, romantic rejection, social slights, and so on. According to Sherman and Cohen (2006) in adapting to the inevitable challenges of everyday life, it is important for people to sustain a healthy self-image.

According to self-affirmation theory (Sherman et al. 2000; Steele, 1988; Steele et al., 2002), people are motivated to maintain a positive global self-image. When the self is threatened, an individual will typically experience an accompanying degree of psychological discomfort. Self-affirming may help to reduce this sense of self-threat. For example, after failing a mathematics exam, a student may tell themselves they are “really more of an artistic person”. Thus, by reminding themselves that they do something else well, they provide themselves with a positive self-image. Self-affirmation theory addresses global self-perception. According to the theory, people do not need to feel competent or positive in every life domain. Rather, all that is generally required is for a person to foster an overall sense of proficiency or worthiness (Steele, 1988).

What it means to feel worthy or appropriate can vary across culture (Heine, 2005). Aspects such as being intelligent, logical, independent, capable of

relating to others, and being sociable may all be important. Self-threats may take many forms, but according to Leary and Baumeister (2000) they will always involve real or perceived failures to meet socially significant standards. Thus, people are typically very vigilant to events and signals that question their self-worth, in both their own eyes and in other peoples. In response to self-threats, people may become defensive. Sherman and Cohen (2002) identify a number of defensive biases to self-threat which include dismissing, denying, or avoiding the threat. Although these defensive biases may preserve self-worth, the rejection of the perceived threatening information can make it less likely that the person will learn from what may potentially be useful and adaptive information.

A number of studies have demonstrated that self-affirmation reduces the incidence of defensive reactions (e.g., Cohen, Aronson, & Steele, 2000; Correll, Spencer, & Zanna, 2004). In one study by Koole, Smeets, van Knippenberg, and Dijksterhuis (1999) participants prioritized various life domains such as religion, economics, and social life, in terms of importance. They then engaged with an apparent ability test and were given false feedback regarding their performance. Some participants completed a self-affirmation exercise in which they answered a questionnaire assessing the extent to which their highest rated life domain was important to them. Analysis revealed that self-affirming led to less negative and less defensive reactions to the negative feedback regarding performance in the ability test.

Sherman et al. (2000) examined defensive biases to potentially threatening health information in relation to breast-cancer prevention. All participants were females who were coffee drinkers or non-coffee drinkers. A self-affirmation manipulation was utilized; half of the participants completed a scale that

enabled them to assert the personal importance of a central value (e.g., their religious or political values), while half completed a filler task. Participants reviewed a fabricated scientific article which suggested that coffee consumption may be linked to breast cancer. A recommendation of the article was to reduce coffee consumption in order to lower the risk of breast cancer. In the no-affirmation control condition, coffee drinkers were more critical of the article and more resistant to the recommendation than were non-coffee drinkers. However, in the affirmation condition, coffee drinkers were more open to the message of the article than any other group. According to the researchers, because the motivation to self-protect was satisfied with the self-affirmation activity, people who would otherwise have felt threatened by the health message became more willing to consider adaptive behaviour change.

Other research has also demonstrated that self-affirmation may facilitate de-biasing (e.g., Blanton, Pelham, DeHart, & Carvallo, 2001; Reed & Aspinwall, 1998). Research has also demonstrated that this de-biasing effect of self-affirmation has implications for actual behaviour and not only behavioural intentions. In a study by Sherman et al. (2000), sexually active undergraduate students watched an AIDS educational video which highlighted the risks associated with unprotected sex. Half of the participants engaged in self-affirmation prior to watching the video while the others did not. Non-affirmed participants maintained their perceived risk from pre-test levels. Affirmed participants however, increased their perceived risk from pre-test levels. Not only did the affirmation manipulation influence perceptions of risk, but participants' behaviour was influenced. While 25% of non-affirmed participants purchased condoms after viewing the video, 50% of affirmed participants did so. Affirmed participants were also more likely to take an

AIDS educational brochure (78% did so) than were non-affirmed participants (54% did so). Taken together, these lines of research suggest that self-affirming may enable people to deal with threatening events, situations or information without resorting to defensive biases. Self-affirmation may permit people to react to potentially negative information in a more open-minded way.

Research has also demonstrated the adaptiveness of self-affirmation in applied settings. Self-affirmation has been shown to enhance performance. In a study by Cohen, Garcia, Apfel, & Master (2006), participants, all of whom were African American students, were asked to write about either an important or unimportant value they held. This affirmation manipulation was conducted at the beginning of the school term. The academic performance of all participants was assessed at the end of term. Results indicated that participants who described an important value they held (e.g., honesty, self-discipline etc.), representing the self-affirmation condition, went on to achieve higher grades than those who did not self-affirm. According to the researchers, the stereotype that African American students perform poorly in academic pursuits causes feelings of anxiety in these learners. Particularly after these students perform poorly in an initial assessment, heightened anxiety was thought to be particularly dysfunctional. According to Cohen et al. (2006) the benefit of self-affirming then is to reduce levels of anxiety experienced after failure. This in turn may facilitate performance improvement. Relatively recent work by Dutcher (2010) also provided evidence suggesting that self-affirmation may facilitate performance improvement. Participants either engaged in a self-affirmation writing task or a filler task before attempting an intelligence test. Results indicated that self-affirming improved performance on the intelligence test.

Other than experimentally manipulating self-restoring information, people may also spontaneously self-generate positive self-images that may be used when the self is threatened. The tendency to engage in this type of internal self-restoring image generation is thought to manifest differently from person to person. Pietersma and Dijkstra (2012) developed a scale measuring cognitive self-affirmation inclination. They define this as an individual difference in the way of coping with self-threats. Cognitive self-affirmation inclination varies between individuals and is thought to be relatively stable over time. People categorized as high in cognitive self-affirmation inclination are thought to habitually use positive self-images as a largely automatic response to restore and maintain a positive self-image. Within the personality trait hierarchy, cognitive self-affirmation inclination is considered to be a lower level trait (Carver & Connor-Smith, 2010).

The scale developed by Pietersma and Dijkstra (2012) measures people's tendency to utilize or think of positive self-images. In capturing the maintenance of a person's self-integrity (Tesser & Cornell, 1991), the scale includes items such as, 'I realize that besides all the "stupid" things I do, I also do some things very well.' More general items are also included in the scale, referring to a person's capacity to think of positive self-images perhaps even in the absence of threatening information. An example of such an item would be, 'I notice that I do some things very well.' Despite the inclusion of more general items, Pietersma and Dijkstra emphasize that responses to the scale items capture thought processes that are typically triggered when people encounter self-threats.

While the scale has only recently been developed, findings from Pietersma and Dijkstra (2012) indicate that the scale is both stable and reliable. In an initial experiment which examined smoking behaviour, the researchers anticipated

that because self-affirmed people tend to be more open minded regarding threatening information (Sherman & Cohen, 2002) individuals high in cognitive self-affirmation inclination should also demonstrate less defensiveness and more open mindedness regarding threatening information. In terms of their own smoking behaviour, individuals high in cognitive self-affirmation inclination reported more negative emotions than individuals low in cognitive self-affirmation inclination, suggesting less defensiveness. The test-retest reliability of cognitive self-affirmation inclination was also investigated in an experiment which involved measuring participants for the variable on two occasions, typically separated by about one to two weeks. The test-retest analysis indicated that there was a strong correlation between the first and second measurement. Another important experiment in the research by Pietersma and Dijkstra (2012) found that for participants low in cognitive self-affirmation inclination, an external self-affirmation manipulation resulted in similar levels of open mindedness to those observed in participants high in cognitive self-affirmation inclination. For participants high in cognitive self-affirmation inclination, they found no effects from the self-affirmation inclination in terms of open mindedness. Pietersma and Dijkstra suggest that this was due to the high level of spontaneous self-affirmation these individuals engage in.

Cognitive self-affirmation inclination and self-esteem are conceptually similar constructs. According to Pietersma and Dijkstra (2012) both cognitive self-affirmation inclination and self-esteem originate from the same source; both stem from memories containing information about actual self-representations. However, given that previous counterfactual thinking research has focused on self-esteem (Roese 1993a, Sanna et al. 1998) it is important to point out the distinction between cognitive self-affirmation inclination and self-esteem. While

they may share the same source, the way in which they manifest during cognition is different. Self-esteem can be thought of as a general self-evaluation based on the cumulative value of all self-images that are stored in people's memory (Carver & Connor-Smith, 2010). Thus, self-esteem may be thought of as a general conclusion about the self. Cognitive self-affirmation inclination is somewhat different in that it refers to the actual use of these specific self-images. Unlike self-esteem which may be important to cognition in a wide range of situations, cognitive self-affirmation inclination is thought to be particularly important when the use of positive self-images is required such as when self-integrity is threatened (Pietersma & Dijkstra, 2012).

5.1.2 Cognitive self-affirmation inclination and counterfactual thinking

To the best of our knowledge, there is currently no empirical research examining the influence of cognitive self-affirmation inclination on counterfactual thinking. One possibility is that individuals who score high in cognitive self-affirmation inclination may facilitate more functional types of counterfactual thought due to a reduction in perceived self-threat after negative outcomes. These individuals may feel less threatened by a negative outcome and thus be less likely to utilize the defensive strategies such as blame, dismissal, or denial outlined by Sherman and Cohen (2002). Cognitive self-affirmation inclination may make people cognizant of the fact that their sense of self-worth is not exclusively determined by the evaluative implications of an immediate task/problem. As a result, people may become more

open-minded and willing to engage in adaptive behavioural plans (Sherman et al. 2000).

On first inspection, the idea that cognitive self-affirmation inclination may be related to functional types of counterfactual thought, may seem contradictory to existing research. Self-esteem – an individuals' perception of their own self-worth (Sanna, 2000) – is a conceptually similar construct to cognitive self-affirmation inclination, and has not previously been associated with adaptive or functional types of counterfactual thought. On the contrary, Roese and Olson (1993) examined the relationship between self-esteem and counterfactual thinking and found that individuals with low self-esteem were more likely to undo their own actions following a failure, while those with higher self-esteem were more likely to report undoing their own actions after a success. Thus, it may be argued that high self-esteem, rather than being adaptive in terms of counterfactual thought, may facilitate a defensive bias. However, Self-affirmation theory (Steele, 1988) proposes a self-restoring activity that actually reduces or eliminates the need for such defensive reactions. Thus, the idea that individual differences in cognitive self-affirmation may facilitate the use of more functional types of counterfactual thinking seems plausible.

Although no research has directly examined cognitive self-affirmation inclination and counterfactual thinking, indirect evidence suggests there may be an association. It is important to emphasize that this line of research examined experimental manipulations of self-affirmation and not cognitive self-affirmation inclination. Tesser (2000) demonstrated that both self-affirmation and downward social comparison – the cognitive process of comparing ones own standing in life against another who is less fortunate – serve similar affect-repairing functions and that engaging in one strategy reduced the use of another. The parallels between

downward counterfactual thinking and downward social comparison have previously been highlighted by researchers (see Markman et al., 1993) and it seems likely that both may serve self-enhancement motives. Given that self-affirmation may serve self-enhancement strategies, when people self-affirm after a negative event there may be less need for mood repairing counterfactuals (e.g., Sanna, Turley-Ames, & Meier, 1999) and thus potentially the possibility that more functional types may be generated.

We hypothesize that cognitive self-affirmation inclination may facilitate more functional types of counterfactual thinking. Given that past research (Cohen et al., 2006; Dutcher, 2010) found a performance improving influence for self-affirmation, it is plausible that cognitive self-affirmation inclination may facilitate the use of controllable or upward counterfactual thinking. Of course, this may not be the case. Any potential controllable or upward counterfactuals attributable to cognitive self-affirmation inclination may not facilitate performance improvement. After all, self-affirming sends resources away from the threatened domain, and thus, may not ultimately be facilitative.

If the capacity to generate potentially adaptive counterfactual thoughts after a negative event is dependent on the degree to which counterfactuals are perceived as self-defining, we would anticipate that individuals who score high for cognitive self-affirmation inclination might demonstrate an inclination towards more functional types of counterfactual thinking. Experiment 6 aims to investigate whether there is any association between cognitive self-affirmation inclination and counterfactual controllability. Experiment 6 also utilizes a self-affirmation manipulation to directly investigate whether the influence of self-affirming on counterfactual thinking facilitates performance improvement.

5.2 Experiment 6: Does cognitive self-affirmation inclination influence counterfactual functionality?

Because so little is currently known about the potential influence of cognitive self-affirmation inclination on counterfactual thinking, Experiment 6 investigates any potential association. This experiment had three main aims. The first aim was to establish if cognitive self-affirmation inclination would influence the number and types of counterfactual thoughts generated. The second aim was to investigate if encouraging participants to self-affirm would influence the number and types of counterfactual thoughts generated. The final aim was to investigate any performance improvement effects as a result of self-affirmation and counterfactual thinking.

All participants performed an anagram task similar to that used in previous experiments. They were then randomly assigned to one of four experimental conditions in which they were prompted to think in a counterfactual or self-affirming manner, or to engage with both or neither types of thought. Finally, they performed a second anagram task and completed the cognitive self-affirmation inclination scale.

Given that individuals may stop ruminating about a goal via self-affirmation (Steele, 1988), it may be the case that participants who score high in cognitive self-affirmation inclination may generate fewer counterfactual thoughts than those who score low in cognitive self-affirmation inclination. We predicted that those high in cognitive self-affirmation inclination would more readily generate functional counterfactuals than those low in cognitive self-affirmation inclination. Similarly we predicted that those encouraged to self-affirm would also more readily generate functional counterfactuals than those who were not. We expected that

performance improvement would be influenced by both cognitive self-affirmation inclination and by encouraging self-affirmation.

5.2.1 Method

Participants: Participants were 160 undergraduate students (134 women and 26 men) with an average age of 22.29 years ($SD = 9.69$). Participants were randomly assigned to a self-affirmation/counterfactual thinking condition ($n = 40$), a self-affirmation/no counterfactual thinking condition ($n = 40$), a no-affirmation/counterfactual thinking condition ($n = 40$), or a no-affirmation/no counterfactual thinking condition ($n = 40$).

Design: The experimental design was essentially a between participants design with two independent variables: experimental group (4 levels) and cognitive self-affirmation inclination (high versus low).

Materials: The anagram tasks used in Experiments 2 and 3 were utilized as the experimental task (see Appendix F). Participants were told they would be attempting anagrams. They were not explicitly told how many trials there would be. To start the experiment, participants attempted the initial set of anagrams. Following completion of the anagrams, correct answers were provided to participants. Participants listened as the answers were read aloud before totalling their own correct answers to calculate a task score. As in earlier experiments, participants were provided with false information about the normative performance of all participants who had

previously completed the anagram task. This feedback also meant that participants might potentially feel dissatisfied with their score. A manipulation check was included in the form of a Likert-scale type rating; participants were asked to rate the degree of satisfaction they had regarding their performance in the first set of anagrams on a scale ranging from 1-7 (see Appendix G).

Next, participants engaged with two types of thinking task. The thinking tasks each participant engaged with were determined by the experimental group in which they were allocated. Participants in the self-affirmation/counterfactual thinking group engaged in a self-affirming exercise before generating counterfactuals about their performance in the first set of anagrams. To self-affirm, these participants were shown a list of 11 characteristics/values (e.g., social skills, creativity, relationships), were asked to rank them in order of personal importance, and write about a time in their lives when their top ranked value had proved meaningful (see Appendix N). The counterfactual generation task came directly after the self-affirmation task. Participants were asked to consider ways in which their performance in the anagram task could have turned out differently. Participants could list as many counterfactuals as they wished.

Participants in the self-affirmation/no counterfactual thinking group engaged in an identical self-affirming exercise to that described above (see Appendix N) before completing a filler task (grammatical correction task) (see Appendix H). Participants in the no-affirmation/counterfactual thinking group initially completed the filler task before engaging with the counterfactual generation task. Participants in the no-affirmation/no counterfactual thinking group completed two consecutive filler tasks, one identical to the grammatical correction task mentioned above (see Appendix H) and another similar grammatical correction task (see Appendix O).

Subsequently, participants attempted the second set of anagrams. Following completion of the second set of anagrams, participants were again informed of the correct answers so that they could calculate a score for the trial. No false information about normative scores was provided after the second trial.

Finally, participants completed self-report measures of cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012) (see Appendix P). The measure used is a six item Likert scale (with 1 indicating *never* and 5 indicating *very often*). Examples of statements included in the scale are: ‘When I feel bad about myself, I think about all the things that I can be proud of’; ‘When I have done something wrong that makes me feel dissatisfied with myself, I tell myself that I do not do everything wrong’. According to Pietersma and Dijkstra (2012), the measure has good internal consistency, with a Cronbach alpha coefficient reported of .83. In the current experiment, the Cronbach alpha coefficient was .71.

Procedure: Participants were approached to take part in the experiment immediately following college lectures. They were informed that the experiment was interested in how people think while problem solving. All participants were assured confidentiality and told that their responses would be completely anonymous. An information sheet (see Appendix D) was administered before proceeding with data collection. Individuals who were interested in taking part in the experiment signed a consent form (see Appendix E). Participants were given booklets containing all experimental materials and were asked not to open or flick through it until instructed. A full debriefing was given to all participants post testing.

Coding of counterfactual statements: Counterfactuals were coded using the process and categorizations as described in previous experiments. Inter-rater agreement between the two trained coders was high (96.3%). Agreement ranged from 92% for coding controllable versus uncontrollable counterfactuals, to 99% for coding whether the thought was a counterfactual. Disagreements were resolved by the experimenter.

5.2.2 Results

Omitted data: In general, participants had little difficulty understanding instructions. Data from 4 participants were discarded due to failure to follow instructions adequately.

Descriptive statistics

Individual difference measure: Scores for cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012) could range between 5 and 30. In this sample the mean score was 17.58 ($SD = 3.22$), ranging from 7 to 25. Participants were categorized as high or low in cognitive self-affirmation inclination using a median split. Using this categorization, 80 participants were categorized as low and 80 were categorized as high. The mean score for individuals low in cognitive self-affirmation inclination was 14.48 ($SD = 1.75$) and the mean score for individuals high in cognitive self-affirmation inclination was 20.27 ($SD = 1.79$).

Number and types of counterfactuals generated: Overall, participants generated exactly 190 counterfactual thoughts. Participants recorded a mean of 2.38 ($SD =$

1.26) counterfactual items each, ranging from 1 to 5 items. All participants who generated counterfactuals listed at least one counterfactual statement, resulting in 80 opening/initial counterfactuals. As anticipated, due to the design of the experimental task, the majority of counterfactuals generated were upward in nature. Descriptive statistics for each counterfactual categorization are shown below (Table 17). Participants generated slightly more controllable than uncontrollable counterfactuals for initial responses, but slightly more uncontrollable than controllable counterfactuals overall.

Table 17
Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Experiment 6

Type of counterfactual	Initial (N=80)	Overall (N=190)
Upward/Downward	100% vs 0%	97% vs 3%
Additive/Subtractive	94% vs 6%	93% vs 7%
Controllable/Uncontrollable	53% vs 47%	45% vs 55%

Satisfaction ratings: Participants satisfaction ratings with their performance in the first anagram task were low ($M = 1.85$, $SD = 1.18$).

Counterfactual activation

There was no correlation between cognitive self-affirmation inclination score and counterfactual frequency, $r = .07$, $n = 80$, $p = .51$. There was also no significant correlation between cognitive self-affirmation inclination score and the overall number of controllable counterfactuals generated, $r = .04$, $n = 80$, $p = .74$.

Focus of initial counterfactuals

A primary aim of this experiment was to examine if cognitive self-affirmation inclination would influence the types of counterfactual thoughts generated. In order to investigate any association between the two variables only the group that generated counterfactual thoughts (without also being encouraged to self-affirm) were included in this analysis. We compared participants that were high and low in cognitive self-affirmation inclination for initial counterfactual controllability; direction and structure were predominantly upward and additive as an initial response.

For the first counterfactual generated, a 2x2 Chi-square test for independence indicated that there was an association between cognitive self-affirmation inclination and counterfactual controllability, $\chi^2(1, n = 40) = 2.78, p = .04$ (one-tailed), with a small effect size ($\phi = -.32$). As Table 18 below shows, individuals high in cognitive self-affirmation inclination, compared to those low in cognitive self-affirmation inclination, more readily generated an initial counterfactual thought that was controllable (52% versus 20%). Next we investigate if encouraging self-affirmation affects the rate of controllable initial counterfactual thoughts generated.

Table 18
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Cognitive Self-affirmation Inclination Participants in the no-affirmation Condition in Experiment 6

	Controllable	Uncontrollable
High	52%	48%
Low	20%	80%

We compared the initial counterfactual controllability of individuals high and low in cognitive self-affirmation inclination that generated counterfactuals after completing the self-affirmation exercise. Unlike the findings reported above, in this condition no association was observed between cognitive self-affirmation inclination and initial counterfactual controllability, $\chi^2(1, n = 40) = .28, p = .59$. As Table 19 below shows, participants tended to generate controllable rather than uncontrollable initial counterfactual thoughts regardless of whether they were high or low in cognitive self-affirmation inclination.

Table 19
Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Cognitive Self-affirmation Inclination Participants in the Self-affirming Condition in Experiment 6

	Controllable	Uncontrollable
High	72%	28%
Low	59%	41%

This finding suggests that the effect of the experimental manipulation of self-affirmation may be stronger than the effect of cognitive self-affirmation inclination. However, comparing the figures in Tables 17 and 18 it seems that being encouraged to self-affirm produced a greater increase in the number of controllable initial counterfactuals for individuals low in cognitive self-affirmation inclination (from 20% to 59%) than in individuals high in cognitive self-affirmation inclination (from 52% to 72%).

Performance improvement

To investigate the role of cognitive self-affirmation inclination, the self-affirmation manipulation, and counterfactual thinking on performance improvement, all four experimental groups were included in this analysis. Overall, anagram solution scores increased significantly from Trial 1 ($M = 8.20$, $SD = 6.98$) to Trial 2 ($M = 11.24$, $SD = 7.68$), $t(160) = 5.89$, $p < .001$. The mean increase in anagram solution scores was 3.08 with a 95% confidence interval ranging from 2.02 to 4.05. The eta squared statistic (.20) indicated a large effect size.

We computed a unitary dependent variable of score improvement (score in Trial 2 – score in Trial 1). We conducted a three-way ANOVA to examine the main effects and interactions of counterfactual thinking (completed or not), self-affirmation (completed or not) and cognitive self-affirmation inclination (high versus low) as they relate to performance improvement. The three-way interaction was not significant, $F(3, 152) = .53$, $p = .46$. There was a main effect for counterfactual thinking, $F(3, 152) = 7.57$, $p = .01$. The effect size was small (eta squared = .05). Performance improvement was higher for participants who generated counterfactuals ($M = 4.58$, $SD = 6.23$) than for participants who generated no counterfactuals ($M = 1.50$, $SD = 6.48$), as Table 20 below shows.

There was no main effect of cognitive self-affirmation inclination (high versus low) on performance improvement score, $F(3, 152) = .95$, $p = .33$, and it did not interact with either counterfactual thinking (completed or not), $F(3, 152) = .70$, $p = .40$, or self-affirmation (completed or not), $F(3, 152) = .38$, $p = .55$. Similarly, there was no main effect of encouraging self-affirmation (completed or

not), $F(3, 152) = .20, p = .66$, and it did not interact with counterfactual thinking (completed or not), $F(3, 152) = .53, p = .46$.

Table 20
Mean Performance Improvement Score for Each of the Experimental Conditions in Experiment 6

	Counterfactual only	Counterfactual & Self-affirmation	Self-affirmation only	Control	Mean
High CSAI	5.48	5.17	1.57	1.61	3.61
Low CSAI	2.20	4.68	1.31	1.59	2.46
Mean	4.25	4.90	1.40	1.60	

Note. CSAI = Cognitive self-affirmation inclination.

5.2.3 Discussion of Experiment 6

The findings of Experiment 6 suggest that cognitive self-affirmation inclination is not associated with the number of counterfactual thoughts generated overall, nor with the number of controllable counterfactuals generated. However, the results indicate that there is an association between cognitive self-affirmation inclination and counterfactual focus. Individuals high in cognitive self-affirmation inclination more readily generated a controllable initial counterfactual than individuals low in cognitive self-affirmation inclination. However, when individuals were encouraged to self-affirm there was no difference between individuals high and low in cognitive self-affirmation inclination in the tendency to generate a controllable initial counterfactual. This finding suggests that the association between individual differences in cognitive self-affirmation inclination and counterfactual controllability

may be important but that natural inclinations to self-affirm can be overridden with specific instructions to self-affirm.

We found that counterfactual thinking facilitated performance improvement from Trial 1 to Trial 2. This result also argues in favour of the functionality of counterfactual thoughts (e.g., Markman & McMullen, 2003; Roesse, 1994). We found no main effect for self-affirmation manipulations or cognitive self-affirmation inclination on performance improvement. This finding seemingly contradicts those of Dutcher (2010) who observed that self-affirmation facilitated performance. However, mean improvement scores across the experimental conditions indicated that a combination of experimental self-affirmation and counterfactual thinking proved particularly adaptive in terms of performance improvement for those that do not have a natural inclination to self-affirm. This suggests that while self-affirmation does not directly influence performance improvement, it increases the likelihood that counterfactual thinking may be adaptive.

Overall this experiment demonstrated that cognitive self-affirmation inclination may be important in terms of counterfactual controllability and that counterfactuals that stem from self-affirming may be particularly adaptive. In the next experiment we investigate the potential effect of cognitive self-affirmation inclination and experimental manipulations of self-affirmation on counterfactual thinking about a real world meaningful event in participants' lives.

5.3 Experiment 7: Does cognitive self-affirmation inclination influence counterfactual thinking about a personally salient life event?

The previous experiment established that both cognitive self-affirmation inclination and encouraging self-affirming thoughts play a role in the generation of functional counterfactual thoughts. However, Experiment 6 and the other experiments in this thesis have all focused on counterfactual thinking after a negative outcome in a cognitive task. The aim of Experiment 7 was to examine counterfactual thinking about a real life event and to investigate the role played in counterfactual thinking by cognitive self-affirmation inclination and experimental manipulations of self-affirmation.

Previous research indicates that stressful life events are threatening to ones sense of self (e.g., Janoff-Bulman, 1989; Taylor, 1983). Moreover, recalling stressful life events from ones past has also been found to influence perceptions of self-threat (McFarland & Alvaro, 2000). In the experiment reported below, participants were asked to think about a real life event that they were unhappy with and write down the details of it. Half of the participants self-affirmed about something that was important to them, while the other half did not engage in self-affirmation. All participants then generated counterfactual thoughts and completed the cognitive self-affirmation inclination scale.

We expected that people who score high for cognitive self-affirmation inclination may be less likely to exhibit self-enhancement biases. Instead of generating affect-driven counterfactuals (e.g., uncontrollable) in response to the negative event recall, those who score high in cognitive self-affirmation inclination may demonstrate more adaptive, functional types of counterfactual thought (e.g.,

controllable). We anticipated that this effect might be moderated by the experimental self-affirmation manipulation.

5.3.1 Method

Participants: Participants were 80 undergraduate students (67 women and 13 men) with an average age of 20.39 years ($SD = 2.16$). Participants were randomly assigned to a self-affirmation ($n = 40$) or a no-affirmation ($n = 40$) condition.

Design: The experimental design was essentially a between participants design with two independent variables: experimental task (self-affirmation versus no-affirmation) and cognitive self-affirmation inclination (high versus low).

Materials: Participants were asked to recall something personally important from their past (e.g., an important goal) that they had attempted unsuccessfully, resulting in feelings of disappointment or dissatisfaction. They were asked to write a brief paragraph about the experience, and rate the degree to which the domain of the experience (e.g., relationships, college) defined who they were as a person on a Likert scale ranging from 1 to 5, with 1 indicating ‘not at all’ and 5 indicating ‘very much’. Participants also rated their current level of commitment to being successful in that domain on a Likert scale ranging from 1 to 5, with 1 indicating ‘not at all’ and 5 indicating ‘very much’ (see Appendix Q).

Participants were randomly assigned to either a self-affirmation or a no-affirmation condition. As in Experiment 6, participants were shown a list of 11

characteristics/values (e.g., social skills, creativity, relationships) and asked to rank them in order of personal importance (see Appendix N). Subsequently, participants were asked to write about one of the values they had ranked. In the self-affirmation condition, participants wrote about why their first-ranked value or characteristic was important to them and described a time in their lives when it had proved meaningful. In the no-affirmation condition, participants wrote about why their seventh most important value or characteristic might be important to the typical college student. Participants were instructed to write as much or as little as they liked. This task constituted the experimental manipulation of self-affirmation. In Experiment 6 we felt it was important that the difference between the self-affirmation condition and the no-affirmation condition was more pronounced due to the use of numerous cognitive tasks. The methodology used in Experiment 6 assured that participants in the no-affirmation group did not even rank values in term of importance, making the distinction between the self-affirmation and no-affirmation groups more robust. The reason for using the self-affirmation manipulation chosen for Experiment 7 was that similar experimental manipulations of self-affirmation have been used in past research (e.g., Fein & Spencer, 1997; Steele, 1988). Thus, using this manipulation meant that any potential finding could be discussed and compared more readily in relation to existing research.

Participants were then asked to think back to the negative events from their past that they wrote about earlier. Participants were instructed to generate counterfactuals regarding how the negative event could have been different. Participants were asked to list as many thoughts as they wished.

Finally, participants filled out a measure of cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012) as described in Experiment 6 (see Appendix

P). According to Pietersma and Dijkstra (2012), the measure has good internal consistency, with a Cronbach alpha coefficient reported of .83. In the current experiment, the Cronbach alpha coefficient was .73.

Procedure: Participants were approached to take part in the experiment immediately following college lectures. They were informed that the experiment was interested in how people think while problem solving. All participants were assured confidentiality and told that their responses would be completely anonymous. An information sheet (see Appendix D) was administered before proceeding with data collection. Individuals who were interested in taking part in the experiment signed a consent form (see Appendix E) and were given a booklet containing the experimental materials. A full debriefing was given to all participants post testing.

Coding of counterfactual statements: Counterfactuals were coded using the process and categorizations as described in previous experiments. Inter-rater agreement between the two trained coders was high (97.8%). Agreement ranged from 91% for coding controllable versus uncontrollable counterfactuals, to 98% for coding whether the thought was a counterfactual. Disagreements were resolved by the experimenter.

5.3.2 Results

Omitted data: In general, participants had little difficulty understanding instructions. Data from 2 participants were discarded due to failure to follow instructions adequately.

Descriptive statistics

Individual difference measure: Scores for cognitive self-affirmation inclination (Pietersma & Dijkstra, 2010) could range between 5 and 30. In this sample the mean score was 18.09 ($SD = 1.26$), ranging from 9 to 30. Participants were categorized as high or low in cognitive self-affirmation inclination using a median split. Using this categorization, 40 participants were categorized as low and 40 were categorized as high. The mean score for low cognitive self-affirmation inclination was 15.15 ($SD = 2.31$) and the mean score for high cognitive self-affirmation inclination was 21.03 ($SD = 2.51$).

Number and types of counterfactuals generated: Overall, participants generated exactly 164 counterfactual thoughts. Participants recorded a mean of 2.05 ($SD = 1.26$) counterfactual items each, ranging from 1 to 5 items. All participants generated at least one counterfactual statement, resulting in 80 opening/initial counterfactuals. As anticipated, due to the design of the experimental task, the majority of counterfactuals generated were upward in nature. However, unlike in previous experiments where the generation of downward counterfactuals was uniformly very low, a relatively higher number of downward counterfactuals were generated.

Descriptive statistics for each counterfactual categorization are shown below (Table 21). Participants generated slightly more controllable than uncontrollable counterfactuals for both initial responses and overall.

Table 21
Percentages of Initial and Overall Counterfactuals Coded for Direction, Structure, and Controllability in Experiment 7

Type of counterfactual	Initial (N=80)	Overall (N=164)
Upward/Downward	84% vs 16%	79% vs 21%
Additive/Subtractive	93% vs 7%	86% vs 14%
Controllable/Uncontrollable	59% vs 41%	58% vs 42%

Negative event description: All participants wrote about an incident from their past that resulted in feelings of disappointment or dissatisfaction. Given that the sample used in the experiment constituted undergraduate college students, many of the incidents referred to academic pursuits (53.8%). Other areas referred to were: sports (13.8%), relationships (12.5%), personal finances (11.3%), and miscellaneous (8.8%).

Participants rated the extent to which the area involving the disappointment defined who they are as a person on a Likert scale ranging from 1-5 (end-points 1 indicating *not at all* and 5 indicating *very much*). Participants recorded a mean score of 3.77 ($SD = 1.20$) for this variable. Participants also rated the extent to which they were currently committed to achieving success in this area on a Likert scale ranging from 1-5, as above. Participants recorded a mean score of 4.30 ($SD = 1.01$) for this variable. This indicates that participants followed instruction well and

reported on negative events that were personally important and that they were still committed to achieving success in.

Counterfactual activation

There was no significant correlation between cognitive self-affirmation inclination score and counterfactual frequency, $r = .13$, $n = 80$, $p = .42$. There was also no significant correlation between cognitive self-affirmation inclination score and the overall number of controllable counterfactuals generated, $r = .05$, $n = 80$, $p = .64$.

Focus of initial counterfactuals

In order to investigate the association between cognitive self-affirmation inclination and controllable initial counterfactual thinking we first analysed the data from the group that generated counterfactual thoughts without self-affirming. For the first counterfactual generated, a 2x2 Chi-square test for independence indicated that there was an association between cognitive self-affirmation inclination and counterfactual controllability, $\chi^2(1, n = 40) = 4.94$, $p = .03$, with a medium effect size ($\phi = -.40$). Descriptive statistics are provided in Table 22. Participants who were high in cognitive self-affirmation inclination had a tendency to more readily generate a controllable initial counterfactual than participants low in cognitive self-affirmation inclination (72% versus 32%).

Table 22

Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Cognitive Self-affirmation Inclination Participants in the No-affirmation Condition in Experiment 7

	Controllable	Uncontrollable
High	72%	28%
Low	32%	68%

However, when participants were encouraged to self-affirm there was no association between cognitive self-affirmation inclination and controllable counterfactual thinking, $\chi^2(1, n = 40) = 2.54, p = .12$. This finding replicates the result of Experiment 6. As Table 23 indicates, the self-affirmation inducement worked in that the majority of participants, regardless of cognitive self-affirmation inclination, generated controllable counterfactuals. Comparing across Tables 22 and 23 it seems that participants who scored high in cognitive self-affirmation inclination consistently generated relatively high percentages of initial controllable counterfactuals in both the self-affirming and no-affirming conditions (72% and 65%). Participants who scored low in cognitive self-affirmation inclination however, only generated comparatively high percentages of initial controllable counterfactuals in the self-affirming condition but not in the no-affirming condition (83% and 32%).

Table 23

Percentages of Initial Controllable and Uncontrollable Counterfactuals Generated by High and Low Cognitive Self-affirmation Inclination Participants in the Self-affirming Condition in Experiment 7

	Controllable	Uncontrollable
High	65%	35%
Low	83%	17%

For the first counterfactual generated, a 2x2 Chi-square test for independence indicated that the association between cognitive self-affirmation inclination and counterfactual direction was not statistically significant, $\chi^2(1, n = 80) = .001, p = .98$. We compared the self-affirmation and no-affirmation conditions for initial counterfactual direction. The association was marginally significant, $\chi^2(1, n = 80) = 3.30, p = .07$, with upward counterfactuals being generated more readily as an initial response by self-affirming participants (92%) than by no-affirming participants (75%).

We then compared the initial counterfactual direction of participants high and low in cognitive self-affirmation inclination taking into consideration the experimental manipulation; data were divided in terms of experimental manipulation (self-affirmation vs. no-affirmation). No association was observed in the self-affirming condition, $\chi^2(1, n = 40) = .17, p = .67$, or the no-affirming condition, $\chi^2(1, n = 40) = .13, p = .71$. This suggests that individual differences in cognitive self-affirmation inclination do not seem to be associated with counterfactual direction.

5.3.3 Discussion of Experiment 7

We found no evidence to suggest that cognitive self-affirmation inclination is associated with counterfactual activation overall or with controllable counterfactual activation. We found some evidence of an association between cognitive self-affirmation inclination and counterfactual controllability. In the condition where participants did not self-affirm, individuals high in cognitive self-affirmation inclination generated more controllable initial counterfactuals than individuals low in cognitive self-affirmation inclination. This suggests that cognitive self-affirmation

inclination may be important in terms of counterfactual controllability particularly in the absence of other factors than may encourage self-affirming. Participants who scored high for cognitive self-affirmation inclination consistently generated controllable counterfactuals in both experimental conditions, while participants who scored low for cognitive self-affirmation inclination only generated comparable percentages of initial controllable counterfactuals in the self-affirming condition.

Some differences emerged between the findings in this experiment and in Experiment 6 which may have been due to slight differences in the tasks. For example, this experiment asked participants to generate counterfactuals after recalling a personally meaningful event in the past whereas Experiment 6 asked participants to generate counterfactuals immediately following failure in a cognitive task. Also, in Experiment 6 participants in the no-affirming group completed a grammatical correction exercise whereas in this experiment they completed an exercise similar to the self-affirming group but about a non-important value for another individual. While the no-affirming group task used in this experiment was similar to that used in previous self-affirmation research (e.g., Fein & Spencer, 1997; Steele, 1988) it could be the case that some self-affirmation took place, even in the no-affirmation group.

The different tasks used may account for the different rates of controllable initial counterfactuals in the no-affirming and self-affirming groups in both experiments. For example, in this experiment individuals high in cognitive self-affirmation inclination did not generate more controllable initial counterfactuals in the self-affirming than no-affirming group as they did in Experiment 6. This seems to be due to a higher base rate of controllable initial counterfactuals in the no-

affirming group perhaps rather than the self-affirmation manipulation having no effect.

The focus on real life failure versus failure in a laboratory task may account for the different rates of upward counterfactuals in the two experiments. According to White and Lehman (2005) improvement motives are more salient than self-enhancement motives in goal related tasks. Because this experiment involved less emphasis on improvement motives than in some of the previous experiments, downward counterfactuals may have been more likely. This was indeed the case; more downward counterfactuals were generated in Experiment 7 than in any of the earlier experiments. Because of the higher generation of downward counterfactuals in Experiment 7, we were able to examine whether findings from previous experiments of the present research regarding counterfactual controllability and individual difference factors also extended to counterfactual direction. However, we found little evidence for this.

5.4 General Discussion

Overall, results from Experiments 6 and 7 suggest that drawing from positive self-images unrelated to a threatened domain facilitates the use of controllable counterfactuals. To observe this effect, considering individual differences in the tendency to self-affirm as well as experimental manipulations of self-affirmation may be useful.

In both experiments, we observed that individual differences in cognitive self-affirmation inclination had no association with the overall number of counterfactuals or the overall number of controllable counterfactuals generated. This

suggests that cognitive self-affirmation inclination is not associated with the tendency to generate counterfactuals about recent negative events or more temporally distant events. A study by Koole et al. (1999) in which participants received negative feedback after self-affirming indicated that a self-affirmation manipulation reduced levels of rumination. However, this rumination reducing effect of self-affirmation was not found in research by Dutcher (2010). Our findings are perhaps more in line with the findings of Dutcher (2010). However, it is difficult to make clear comparisons between these three studies given that all three utilized varying measures of rumination. Koole et al. (1999) used an implicit measure of rumination while the measure used by Dutcher (2010) was relatively explicit in that it asked participants directly about the degree to which a recent failure was still replaying in their mind. Our findings are worthy of comparison to these studies given that both counterfactual thinking and rumination involve considering past events. However, it should be noted that while counterfactual thoughts always involve comparing a past outcome to some alternative, rumination does not necessarily involve consideration of an alternative outcome. Rumination refers to a tendency to have persistent, recyclic, depressive thoughts, and is a relatively common response to negative moods (Rippere, 1977). Rumination may involve no undoing of past events.

Epstude & Roese (2011) suggested that self-affirmation may reduce counterfactual thinking. They point out that because self-affirmation has been shown to terminate rumination after failure (Koole et al., 1999), counterfactual thoughts may also decrease due to self-affirming. Our findings go against their suggestion. However, further research utilizing alternative methodologies would be needed to

establish firmly the precise relationship between counterfactual activation and self-affirmation.

In Experiment 6, individuals high in cognitive self-affirmation inclination more readily generated a controllable initial counterfactual than individuals low in self-affirmation inclination. However, when individuals were encouraged to self-affirm there was no difference between individuals high and low in cognitive self-affirmation inclination in the tendency to generate a controllable initial counterfactual. Similarly, in Experiment 7 we found that in the condition where participants did not self-affirm, individuals high in cognitive self-affirmation inclination generated more controllable initial counterfactuals than individuals low in cognitive self-affirmation inclination. Considered together, these findings suggest that cognitive self-affirmation inclination may be associated with counterfactual controllability and that natural inclinations to self-affirm can be overridden with experimental manipulations of self-affirmation.

Even when not encouraged to self-affirm, participants high in self-affirmation inclination demonstrated relatively high levels of controllable counterfactual thought. One potential reason for this may be that cognitive self-affirmation is a largely automatic response to negative outcomes for these individuals. When participants high in cognitive self-affirmation inclination were not encouraged to self-affirm, they may still have engaged in some degree of self-affirmation. As expected, participants low in cognitive self-affirmation inclination did not show any inclination toward more controllable – and potentially self-threatening – counterfactuals when not encouraged to self-affirm. When encouraged to self-affirm however, these participants displayed counterfactual thinking patterns comparable to participants high in self-affirmation inclination. Thus, it could be

argued that the important difference between high and low individuals in cognitive self-affirmation inclination in terms of counterfactual thinking is not the degree or type of self-affirmation engaged with, but rather whether self-affirmation is initiated at all.

While Experiment 7 found no strong evidence that cognitive self-affirmation inclination influences counterfactual direction, this finding should not be over-generalized. It may be that other self-regulatory individual differences are related to counterfactual direction. It may also be important to consider whether counterfactuals are generated when goal-related motives are salient or affect-driven motives are salient.

These findings for cognitive self-affirmation inclination and counterfactual thinking are interesting when considered in relation to a conceptually similar construct: self-esteem. Roese and Olson (1993a) examined the relationship between self-esteem and counterfactual thinking and found that individuals with low self-esteem were more likely than individuals with high self-esteem to undo their own actions following a failure. This suggests that rather than being adaptive in terms of counterfactual thought, high self-esteem may facilitate a defensive bias. Our findings suggest that individuals high in cognitive self-affirmation inclination may typically engage in a self-restoring activity that actually reduces or eliminates the need for such defensive reactions. Thus, individual differences in cognitive self-affirmation inclination may facilitate the use of more functional types of counterfactual thinking.

Our findings are in line with research by Tesser (2000) who demonstrated that engaging with self-affirmation reduced the use of downward

social comparison. According to Tesser, engaging with self-affirmation meant that downward social comparisons became less necessary to enhance affect. Likewise, we found that engaging with self-affirmation facilitated the use of more potentially threatening controllable counterfactuals. Unlike the research by Tesser (2000), our findings implicate individual differences in the tendency to self-affirm and not only experimental manipulations of self-affirmation.

Epstude and Roese (2011) proposed that the extent to which a goal is self-defining and how strongly individuals are committed to a goal may moderate the effect of self-affirmation on counterfactual thinking. While Experiment 7 involved participants recalling personally salient negative experiences from their own lives, Experiment 6 involved failure in a cognitive task that was unlikely perceived as self-defining by participants. Given some significant findings emerged from both experiments, it may be that it is the degree of dissatisfaction experienced after a failure, rather than how overtly personally salient an experience is, which moderates the effect of self-affirmation on counterfactual thinking. Also, the fact that participants in Experiment 6 knew they would be attempting a cognitive task meant that goal related cognitions may have been more prominent than they were in Experiment 7. Thus, even without the personal attachment to the negative outcomes recalled in Experiment 7, participants in Experiment 6 may still have been highly engaged with the problem.

Experiment 6 addressed whether the counterfactuals generated after self-affirming were adaptive in terms of performance improvement. We found that self-affirming alone seemed to have no benefit in terms of performance improvement. Previous research by Cohen et al. (2006) and Dutcher (2010) suggests that self-affirmation may facilitate performance. Perhaps one explanation for this

incongruity is that in the Dutcher study, after participants self-affirmed, they engaged with the experimental task almost immediately. In Experiment 6 however, the time between the self-affirmation manipulation and the experimental task was separated by a filler task. It may be that to observe the performance improving effects of self-affirmation in isolation, the time between the self-affirmation manipulation and the experimental task must be given consideration. While we found that self-affirmation did not influence performance improvement, analysis of mean scores of each experimental condition suggested that a combination of self-affirmation and counterfactual thinking actually resulted in higher performance improvement scores than when counterfactuals were generated alone. Our findings suggest that while self-affirming may not directly influence performance improvement, when it is coupled with counterfactual thinking, performance improvement may be enhanced.

While individual differences in cognitive self-affirmation inclination were associated with counterfactual controllability, individual differences in cognitive self-affirmation inclination did not mediate the association between counterfactual thinking and performance improvement. This suggests that individual differences in cognitive self-affirmation inclination are more important in determining whether functional types of counterfactual thinking are engaged with rather than the degree to which such thoughts are adaptive once generated.

Conclusion: Epstude and Roese (2011) suggested that self-affirmation might be important in terms of counterfactual thinking. The experiments in this chapter offer an initial attempt to understand any potential association. We utilized both an individual difference perspective as well as experimental manipulations of self-affirmation. Experiments 6 and 7 suggest that individual differences in cognitive

self-affirmation inclination as well as experimental manipulations of self-affirmation may be important in terms of counterfactual controllability. Given that self-affirmation may be used to bolster self-representations after a negative outcome, these experiments suggest that self-motives may be important in terms of counterfactual functionality.

Chapter Six

General Discussion

This research investigated whether self-regulatory individual differences that describe variation in the capacity to view the self as unthreatened during negative situations may be particularly important in terms of counterfactual functionality. We examined a number of potentially important individual difference variables which have not been investigated before in counterfactual thinking research. Namely, we examined the constructs of autonomy (Bekker & van Assen, 2006), action/state orientation (Diefendorff et al., 2000; Kuhl, 1994), and cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012; Steele, 1988). Over the course of seven experiments, we found evidence that these individual differences may have a role to play in counterfactual thinking. In this chapter, we summarise these findings, discuss their implications for counterfactual thinking research, theories and in applied settings, and suggest possible avenues for future research.

6.1 Summary of main findings

The association between self-regulatory individual difference factors and counterfactual frequency was investigated in all experiments. In Experiment 1, we tested the hypothesis that high autonomy participants would generate a significantly higher number of counterfactual thoughts than low autonomy participants following failure in a mental multiplication task. In Experiments 2 and 3, we tested the hypothesis that high autonomy participants would generate significantly higher numbers of overall counterfactual thoughts than low autonomy participants after

failure in an anagram task. In Experiment 4, we examined the individual differences of action/state orientation and volatility in terms of the overall number of counterfactual thoughts generated after attempting a difficult series of cognitive puzzles. Experiment 5 also examined action/state orientation in terms of counterfactual activation effects. Finally, in Experiments 6 and 7 we examined whether individual differences in cognitive self-affirmation inclination might influence the overall number of counterfactual thoughts generated. In all these experiments, we found little or no evidence to indicate that self-regulatory individual differences are important in the number of counterfactual thoughts generated. Rather, these individual differences seem to be important in the types of counterfactuals that people generate rather than the number of counterfactuals generated.

The degree and type of counterfactuals participants generated in these experiments were consistent with patterns observed in other research (Giroto et al., 2007; Morris & Moore, 2000; Nasco & Marsh, 1999; Summerville & Roese, 2008). The degree of counterfactual thinking participants engaged in was relatively consistent throughout all seven experiments. Due to the failure inducing element of the experiments, we anticipated that the majority of counterfactuals would be upward in nature. Upward counterfactuals consistently constituted the majority of responses, with downward counterfactuals only occurring to any significant degree when participants recalled negative events from their own personal lives. Even then, upward counterfactuals constituted the majority of responses. Other research also suggests that downward counterfactuals are generated spontaneously only rarely. For example, Roese and Olson (1997) found that when participants recalled recent life events and freely generated counterfactuals, more than 90% of responses were upward rather than downward.

Similarly high levels of upward counterfactual thinking have been observed in studies by Nasco and Marsh (1999) and Summerville and Roese (2008). The Nasco and Marsh study involved an outcome where the definition of success/failure (academic grade on a continuous scale) was somewhat more subjective than many of the tasks used in the current research, where negative outcomes were typically more explicit. Thus, even when people have ample opportunity to engage in downward counterfactual thinking, they often tend to focus on outcomes that could potentially facilitate improvement. For this reason, we suggest that the high percentage of upward counterfactuals generated in these experiments is not problematic. Although participants were generally induced to fail, they could still have generated downward counterfactuals.

Additive counterfactuals were consistently generated in higher quantities than subtractive counterfactuals. Generally, the amount of additive counterfactuals generated was comparable to that observed in the study by Nasco and Marsh (1999); additive counterfactuals were far more likely than subtractive counterfactuals. This finding was not unexpected given that the experimental tasks used in the present research uniformly involved the consideration of failure. This failure may have encouraged participants to seek solutions. According to Roese and Olson (1993b) when undoing failure, a new antecedent action is frequently introduced. This suggests that additive counterfactuals may be useful in identifying adaptive strategies that facilitate problem solving attempts. This was demonstrated in research by Roese (1994) who found that inducing participants to focus on regrets of inaction rather than regrets of action facilitated greater performance improvement. Because improvement motives were salient in the present experiments, the high percentage of additive counterfactuals generated was unsurprising.

In terms of counterfactual controllability, we generally observed similar levels to those of Morris and Moore (2000). In their overall sample, about a third of counterfactuals were self-referent. We recognize however, that self-referent counterfactuals are not always controllable. The various experimental tasks used undoubtedly influenced counterfactual controllability. In Experiment 1, which of all the experimental tasks offered participants the fewest controllable antecedents, we observed relatively low percentages of controllable counterfactuals. Controllable counterfactuals increased in subsequent experiments which utilized tasks involving higher levels of strategy and participant decision making. Counterfactual controllability was also relatively high when participants considered negative events from their own life.

Perhaps the most important finding to emerge from the present research is that regarding counterfactual controllability. Controllable counterfactuals may be perceived as more threatening than uncontrollable counterfactuals due to the fact that they potentially imply negligence (Morris & Moore, 2000). Thus, we hypothesized that self-regulatory individual differences important to self-motives may be important. Specifically, we investigated self-regulatory individual differences that describe variation in the capacity to view the self as unthreatened during negative situations. In Chapter 3, we examined whether individual differences in autonomy (Bekker & van Assen, 2006) might be related to functional types of counterfactual thinking.

In Experiment 1, we hypothesized that the means of eliciting counterfactual responses from participants might be important in observing any potential association. Thus, participants generated counterfactuals after actually attempting a task or after reading about attempting the task. Results of Experiment 1

indicated that individual differences in autonomy (Bekker & van Assen, 2006), the capacity to be driven by self-directed motives while placing less emphasis on external ego involvements, was associated with the generation of higher percentages of initial controllable counterfactuals after failure in a mental multiplication task. This association was observed only when counterfactuals were generated after the experimental task was actually attempted as opposed to imagined. This result extends the findings of Girotto et al (2007). In Experiments 2 and 3, we also found that autonomy (Bekker & van Assen, 2006) was associated with more controllable initial counterfactuals after perceived failure in an anagram task. These findings provided replication of the finding in Experiment 1. They also suggested that the association between autonomy and initial counterfactual controllability could be observed utilizing different experimental tasks. Results from Experiments 1, 2 and 3 are in line with research from Haynes et al. (2007) which demonstrated that self-regulatory individual differences were important in terms of the kinds of counterfactual thinking people generate.

In Chapter 4, we examined whether action/state orientation might also influence counterfactual controllability after a negative outcome. We anticipated that action-orientation would lend itself to similar patterns of counterfactual thinking to those observed in the high autonomy participants of Experiments 1, 2 and 3. This was because action-oriented individuals have been identified as being highly capable of perceiving failure as unthreatening to self-representations (Kuhl, 1992). Because the individual difference of action/state orientation is thought to be particularly important in terms of how people deal with persistent setbacks, we included two failure inducing cognitive task trials rather than one in Experiment 4. We found no significant association between action/state orientation and initial controllable

counterfactual generation in Trial 1. However, in Trial 2, we did observe a significant association between action-orientation and initial counterfactual controllability. Compared to state-oriented participants, action-oriented participants generated more controllable counterfactuals as an initial response in Trial 2.

This finding suggests that action-oriented individuals seem more likely to generate controllable counterfactuals than state-oriented individuals when faced with persistent negative outcomes. As well as providing support to the research of McElroy & Dowd (2007) who found evidence that regret may be influenced by innate action/state orientation, this finding is in line with research by El Leithy et al. (2006) who found that temporal factors influence both action-oriented and state-oriented individuals differently.

While the effect of this self-regulatory individual difference was not as immediately apparent as that of autonomy in that it was not observable after failure in an initial cognitive task, Experiment 4 also provided some evidence suggesting that self-regulatory individual differences may be important in terms of counterfactual controllability. We thought that the presence of a strategy formation task in Experiment 4 may have reduced the potential effects of action/state orientation on counterfactual thinking in Trial 1. Thus, in Experiment 5 we again compared action-oriented and state-oriented individuals in terms of initial counterfactual controllability, this time using only one failure inducing task and no strategy formation task. Results suggested that individual differences in action/state orientation were important in terms of counterfactual controllability. Action-oriented participants generated controllable counterfactuals as an initial response more readily than state-oriented individuals. This association between individual differences in action/state orientation and initial counterfactual controllability was observed when

participants were experimentally induced with an action-orientation but not when participants were experimentally induced with a state-orientation. This shows the importance of interactions between individual difference measures and experimental manipulations and is consistent with the findings of Haynes et al. (2007).

In Chapter 5, we examined the influence of cognitive self-affirmation inclination on counterfactual controllability. The main reason for investigating this individual difference was that self-affirmation is thought to make people cognizant of the fact that their sense of self-worth is not exclusively determined by the evaluative implications of a negative outcome. Because self-affirmation theory (Steele, 1988) proposes a self-restoring activity that reduces or eliminates the need for defensive reactions, we anticipated that individual differences in cognitive self-affirmation may facilitate the use of more functional types of counterfactual thinking. We found that the association between cognitive self-affirmation inclination and counterfactual controllability was statistically significant in the absence of experimentally inducing self-affirmation. This finding is in line with previous research which demonstrated that self-affirmation may be important in terms of the consideration of past events (Koole et al., 1999).

Experiment 7 also examined the influence of cognitive self-affirmation inclination on counterfactual controllability. Again we utilized an experimental manipulation of self-affirmation. Examining the no-affirmation condition in isolation, the association between cognitive self-affirmation inclination and counterfactual controllability was significant. Participants who scored high for cognitive self-affirmation inclination consistently generated controllable counterfactuals across both experimental conditions. Participants who scored low for

cognitive self-affirmation inclination only generated similar percentages of initial controllable counterfactuals after engaging in experimental self-affirmation.

When considered together, results from Experiments 1 to 7 indicate that self-regulatory individual difference factors have implications for counterfactual controllability. Associations were observed between counterfactual controllability and the individual difference factors of autonomy (Bekker & van Assen, 2006), action/state orientation (Diefendorff et al., 2000; Kuhl, 1994), and cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012; Steele, 1988) after considering failure in a variety of different cognitive tasks and self-salient scenarios.

Experiments 2, 3, 4, and 6 also investigated the potential performance improving effects of counterfactual thinking and whether or not individual difference factors mediated these effects. In general, these experiments indicated that counterfactual thinking was adaptive in terms of performance improvement, a finding in line with previous research (Markman et al., 1993; Nasco & Marsh, 1999; Roese, 1994). These experiments also demonstrated that controllable counterfactuals were particularly adaptive (Morris & Moore, 2000). In terms of individual differences mediating the functionality of counterfactual thinking, these experiments all indicated that self-regulatory individual differences may be more important in terms of whether functional types of counterfactual thoughts are generated in the first place rather than whether they are functional once generated.

In observing the importance of self-regulatory individual difference factors in relation to counterfactual thinking, incorporating experimental manipulations related to the individual difference variable being examined proved informative. Such experimental manipulations were utilized in Experiments 5, 6, and

7. In Experiment 5, we experimentally manipulated whether participants adopted an action-orientation or a state-orientation regarding a missed opportunity they considered. In Experiments 6 and 7, we experimentally manipulated whether participants self-affirmed or not. It may have been expected that in observing the effects of action/state orientation and self-affirmation on counterfactual thinking, these experimental manipulations would prove to be more effective than comparing participants in terms of the related individual difference factors. However, this was not universally the case.

In Experiment 5, there was a significant association between individual differences in action/state orientation and counterfactual controllability. Naturally action-oriented participants generated controllable counterfactuals as an initial response more readily than state-oriented individuals. For induced action/state orientation, although action-oriented induced participants generated controllable counterfactuals as an initial response more readily than state-oriented induced participants, the association did not reach statistical significance.

For self-affirmation, while individual differences in cognitive self-affirmation inclination significantly influenced counterfactual controllability, we found some evidence to suggest that experimentally inducing self-affirmation negated the effects of cognitive self-affirmation inclination. In Experiment 6, although participants high in cognitive self-affirmation inclination generated controllable counterfactuals as an initial response more readily than participants low in cognitive self-affirmation inclination, the association was only statistically significant in the absence of experimentally induced self-affirmation. Similar findings emerged in Experiment 7. Considered together, these results suggest that utilizing both an individual difference approach as well as related experimental

manipulations may be useful in studies of counterfactual thinking. It has been argued for some time that the relationship between individual difference factors and behaviour or cognition may be moderated by aspects of context or environment (e.g., Chatman, 1991; Stagner, 1977; Weiss & Adler, 1984). In other words, the degree with which personality characteristics may be used to predict behaviour or cognition is dependent on external environmental factors. The importance of such interaction effects was apparent in our findings.

The seeming importance of interaction effects between experimental manipulations and individual difference factors found in the present research is similar to findings from Haynes et al. (2007). Haynes et al. also demonstrated an association between a self-regulatory individual difference factor and functional counterfactual thinking by considering interaction effects between the trait and experimental manipulations. In an investigation of the effects of temporal framing on counterfactual thinking, their research demonstrated that individuals who are uncertainty-oriented are more likely than individuals who are certainty-oriented to generate upward counterfactual thoughts after an experimental manipulation of psychological recency. Temporal framing influenced counterfactual direction, but an individual differences perspective was necessary to observe this effect. Thus, a stable dispositional variable was shown to affect the dynamics of people's counterfactual thoughts. Haynes et al. suggest that their findings document the fruitfulness of an individual differences perspective in studies on comparative thought. Our findings lend support to this claim.

In the next section we consider the implications of our findings for counterfactual thinking research, for theories of counterfactual thinking and in applied settings.

6.2 *Implications*

Counterfactual thinking research

Experiment 1 demonstrated that the method of eliciting counterfactual responses from participants was important. We observed that the influence of self-regulatory individual differences on counterfactual thinking was only significant when participants actually experienced failure first hand as opposed to vicariously imagining failure. This finding shaped the methodological approach used in all subsequent experiments. Cognitive tasks that lead to perceived negative outcomes were utilized rather than hypothetical vignettes. Even in Experiment 7, when we examined counterfactuals of high personal salience, we utilized a methodology that involved recalling real negative events from participants past experiences as opposed to imagined hypothetical situations involving the self.

The reasons for the divergent findings that resulted from the two methods of eliciting counterfactuals remain to be precisely determined by future research. The present research simply indicates that this methodological factor is important when self-regulatory individual difference factors are being studied. However, there are a number of possible explanations. Girotto et al. (2007) found that actors and readers differ in their post decisional counterfactual thinking due to differing availability of problem-related information. Thus, it may have been that a demand characteristic associated with the use of vignettes caused participants to focus predominantly on more uncontrollable choice factors rather than on more controllable problem-specific antecedents.

Giroto et al. also suggest that actors and readers may differ in post decisional counterfactual thinking because they are directed by different motivational goals. According to Giroto et al. (2007), actors may be more prone to avoid self-blame than readers. We did not find that actors and readers differed significantly in terms of counterfactual controllability. However, we found that methodology was important in observing the influence of autonomy on counterfactual controllability. High and low autonomy participants only differed in terms of counterfactual controllability in the actor condition. We suggest that this may have been due to another demand characteristic associated with the use of vignettes: vignettes may emphasize more imaginative mental simulation rather than information processing mental simulation.

We suggest that in discerning the precise reasons for the divergent findings regarding methodology, examining the distinction between imaginative mental simulation and information processing mental simulation may be important. Whether a person experiences counterfactual alternatives in a visceral sense or on a more cognitive level has been highlighted in previous research. Markman and McMullen's (2003) reflection and evaluation model (REM) of comparative thinking highlights this distinction. Two types of counterfactual processing are proposed in this model: reflection and evaluation. Reflection allows the person to experience the counterfactual as if it were real; they are effectively transported into a counterfactual world. Reflective counterfactuals focus only on the alternatives to reality. They typically involve visualizing or fantasizing about an alternative outcome (e.g., "I can see it clearly..."). Evaluative counterfactual thinking involves switching attention between a real outcome (not being hit by a car) and a counterfactual outcome (I could have been hit by a car), leading to evaluative processing (I was really lucky

there). Evaluative counterfactuals focus on alternatives in addition to reality. The REM theory emphasizes that evaluative counterfactual thinking – as opposed to reflective counterfactual thinking – involves switching attention between a real outcome and a counterfactual outcome, leading to evaluative processing. Although both reflective and evaluative counterfactuals may be functional, evaluative counterfactual thinking is thought to be particularly important for planning and implementing behavioural change.

Research examining self-regulatory individual differences may be well served in examining the influence of experimentally manipulating reflective and evaluative counterfactual thinking. This has been done in previous research. In a study that examined counterfactual thinking and anagram performance, Markman et al. (2008) manipulated simulation mode. To foster evaluative counterfactual thinking, participants were asked to close their eyes and think about their actual performance on the anagrams compared to how they might have performed. To foster reflective counterfactual processing, participants were simply asked to close their eyes and imagine what might have been. Counterfactuals were subsequently categorized as being either evaluative or reflective along a 5-point rating scale ranging from -2 (mostly reflective) to +2 (mostly evaluative). An example of an evaluative counterfactual was, “I could have performed better than I did if I tried more and different combinations of letters.” An example of a reflective counterfactual was “I imagined that the letters were forming words right in front of my eyes.”

The REM theory emphasises the ‘cognitive switching’ usually associated with information processing styles of self-regulation. In studies where fictional vignettes are utilized to elicit counterfactual responses, reflective types of

counterfactual thinking may become more prominent as they allow participants a way of experiencing the hypothetical scenario on a more visceral level. In actual tasks that participants engage with, there may be a reduced need for reflective types of counterfactual thinking, allowing for more evaluative and potentially functional types of counterfactual thinking to be observed. Our thesis regarding the influence of individual differences in the capacity to perceive potentially threatening counterfactual alternatives as unthreatening to self-representations is based on the concept of evaluative information processing. Thus, utilizing a methodology that potentially reduces evaluative information-processing (hypothetical vignettes) may make it difficult to observe differences that exist in the domain of information-processing.

More generally, our research suggests that utilizing experimental tasks that allow participants to experience failure first hand may be useful. A large amount of counterfactual thinking research has utilized vignettes in eliciting counterfactual responses (Byrne et al., 2000; Dixon & Byrne, 2011; Kahneman & Tversky, 1982; McCloy & Byrne, 2000). One benefit of hypothetical vignettes is that they allow participants to consider highly important (e.g., Meyerslevy & Maheswaran, 1992) and realistic scenarios that are likely to elicit counterfactual responses. The cognitive tasks used in the present research were likely not perceived as overtly significant by participants. The tasks may also not resemble the kinds of failure that individuals encounter in daily life which might elicit counterfactual thinking. However, the tasks resulted in consistently low participant satisfaction ratings, suggesting that these less than ideal outcomes were adequate to engage participants. Our research suggests that counterfactual thinking studies may benefit from utilizing cognitive tasks such as those reported in this thesis.

Our findings also suggest that when examining the influence of individual difference factors on counterfactual thinking, analysis that focuses on the initial counterfactual response may be particularly important. The advantage of focusing on the initial counterfactual generated is that it likely represents the counterfactual that typically comes to mind most easily for the individual. The importance of initial counterfactual focus has previously been addressed by Wells and Gavanski (1989). According to Wells and Gavanski, when assessing the cause of some prior event, certain alternatives come to mind more easily than others. They refer to these salient alternatives as default events which are highly available counterfactual mutations to the real event. Our research suggests that when investigating the potential association between individual difference factors and counterfactual focus, it may be particularly important to examine the initial or default counterfactual generated. This is in line with research by Wells, Taylor, and Turtle (1987) who found that when analyzing participants' counterfactual responses to unusual events, counterfactuals that mutated an antecedent framed as unusual were more likely to be recorded first in response to a thought listing exercise. While the importance of considering the overall number of counterfactuals generated has been shown to be particularly important by past research (Bacon et al., 2013; Davis et al., 1995), we suggest that when investigating counterfactual focus, consideration of initial counterfactual responses may also be important.

Theoretical implications

The present research holds implications for norm theory (Kahneman & Miller, 1986). The concept of norm theory states that counterfactual thinking is the

activation from memory of positive examples of how present similar situations should be handled. Thus, the primary purpose of counterfactual thinking is to facilitate homeostasis; atypical or unexpected outcomes elicit representations that are counterfactual and more in line with expectations. According to Kahneman and Miller, judgmental standards (norms) are constructed from both a priori beliefs and actual outcomes. Our findings hold implications for the role of a priori beliefs in counterfactual thinking, given that we examined self-motives using an individual difference approach. We found that individual difference factors describing self-related beliefs regarding freedom from implication following negative outcomes influenced counterfactual controllability. This suggests that the information-processing that takes place during counterfactual thinking when outcomes and norms are compared, considering variation between individuals in terms of a priori beliefs is important. Previous counterfactual research has indicated that beliefs regarding the self in domains such as self-esteem (Roese & Olson, 1993a) and efficacy (Sanna, 1997) are important. These individual differences may influence judgmental norms directly due the self-inferences they hold. However, we propose that individual difference factors may also influence judgmental standards (norms) through wider judgements regarding self-implication following counterfactual comparison. It may be that while specific self-representations influence norms, wider metacognitive beliefs regarding what it means to succeed/fail or to consider alternatives may also be important.

However, our findings are perhaps more in line with contemporary theories on counterfactual thinking. Byrne (2005) outlined the cognitive principles that determine what people consider when thinking counterfactually. For Byrne, counterfactuals are constructed in a similar way to rational thoughts and may often

be very reasonable. Similarly, Markman and McMullen (2003) developed a reflection and evaluation model of comparative thought which emphasised the potential benefits that may be drawn from counterfactual thinking. Unlike earlier work which emphasized that counterfactual thinking may frequently be a hindrance to sound judgement (Gleicher et al., 1990; Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Wells & Gavanski, 1989), our research argues in favour of the general adaptiveness of counterfactual thinking, at least for certain individuals.

Results from the present research have specific implications for the functional theory of counterfactual thinking (Epstude & Roese, 2008, 2011; Markman & McMullen, 2003; Roese & Olson, 1997; Roese, 1994, 1997). Much like the implications this research holds for norm theory, we suggest that placing greater emphasis on individual difference factors may serve to refine the functional theory of counterfactual thinking.

Empirical support for the functionality of counterfactual thinking was found in the present research. Specifically, the performance improving influence of counterfactual thinking was observed in all four experiments in which a performance improvement element was included. In Experiments 2 and 3, participants who generated counterfactuals improved performance in an anagram task more than participants in control groups. This suggests that counterfactual thinking facilitates adaptive strategizing and performance improvement (e.g., Markman et al., 1993; Roese, 1994). In both experiments we found that those who generated controllable initial counterfactuals tended to improve more than those who generated uncontrollable initial counterfactuals. Similar findings were found in Experiment 4. These findings demonstrated that functionality could be observed in a laboratory type task and lends support to previous research suggesting controllable

counterfactuals may be particularly adaptive (e.g., Morris & Moore, 2000). In Experiment 6, we found that participants who generated counterfactuals improved performance on an anagram task and observed some evidence that counterfactuals stemming from self-affirmation may be functional.

Individual difference variables involved in these studies were autonomy (Bekker & van Assen, 2006), action/state orientation (Diefendorff et al., 2000) and cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012). None of these individual difference factors mediated the performance improving influence of counterfactual thinking. Rather than suggesting that self-regulatory individual differences influence whether counterfactuals are functional, our findings suggest that self-regulatory individual differences may be important in terms of whether functional types of counterfactual thinking are generated in the first place. While there may be an association between certain individual differences and counterfactual controllability, the controllable counterfactuals generated by participants high in self-regulatory individual difference factors may be no more adaptive than the controllable counterfactuals generated by participants low in self-regulatory individual difference factors.

These findings suggest that to fully understand the functionality of counterfactual thinking, individual difference factors should be considered. In extending the functional theory of counterfactual thinking, we suggest that recommendations from Hoyle (2006) be considered. Generally, research on self-regulation (e.g., Bronson, 2000; Duval & Wicklund, 1972; Snyder, 1974) has examined how it occurs in response to external sources of feedback from the environment and the processing of information about the self that comes from external sources. This line of research has been classified by Hoyle (2006) as

information processing approaches to self-regulation. For example, in objective self-awareness theory (Duval & Wicklund, 1972) self-relevant information is processed and compared to existing self-representations/standards, with the resulting evaluation having several implications for affective and behavioural responses. This type of information-processing model of self-regulation is not dissimilar to that proposed by Kahneman and Miller (1986) in their norm theory or in functional accounts of counterfactual thinking (Epstude & Roese, 2008, 2011; Markman & McMullen, 2003; Roese & Olson, 1997; Roese, 1994, 1997), even if the information processing involved in counterfactual thinking also involves the comparison of internalized norms and imagined alternatives. Hoyle compares these information processing models of self-regulation to trait based accounts. For trait based theories, stable tendencies to self-regulate in specific ways are reflected in a person's personality.

Like Hoyle (2006), who suggests that information-processing accounts and trait based theories should be integrated in order to better understand the processes that underlie self-regulation, we suggest that the functional theory should integrate individual difference factors in order to outline more accurately when and for whom counterfactual thinking may be adaptive. Although the functional theory of counterfactual thinking addresses important aspects of counterfactual thinking such as what an actual instance of counterfactual thinking entails, the stimuli that initiate the process, and how the process is resolved, it offers little in the way of explaining the origins of this process and variation across people in the characteristic ways the process unfolds. Understanding the role of self-regulatory individual differences, as this research makes an initial attempt to do, may address some gaps in the theory.

Epstude and Roese (2008; 2011) propose both a content-specific and a content-neutral pathway as mechanisms by which counterfactual thoughts operate. The content-specific pathway refers to the information contained within counterfactual thoughts while the content-neutral pathway typically refers to changes in motivation or affect resulting from counterfactual thinking. In integrating the functional theory of counterfactual thinking with self-regulatory individual difference factors, a deeper understanding of how these two pathways relate to personality is necessary.

Although further research is needed to separate the nature of any association between self-regulatory individual differences and both pathways, our findings hold some implications. In terms of the content-specific pathway, we found evidence that individual difference factors influenced the informational makeup of counterfactual thoughts. Individuals who scored high in the self-regulatory individual differences measured more readily focused on antecedents that they had control over and that could potentially serve to inform future adaptation. It seems likely that these counterfactuals facilitated functionality given that we found that controllable counterfactuals were associated with increased performance improvement in Experiments 2, 3, 4 and 6.

In terms of the content-neutral pathway, Epstude and Roese (2008) suggest that self-inference may be particularly important. Higher order causal inference effects refer to the general self-concepts individuals come to hold following counterfactual thinking. For instance, if counterfactuals point out specific aspects of an outcome that could have averted a problem, broader self-inferences regarding efficacy, mastery, or overconfidence may be influenced. Epstude and Roese provide the example of a manager who might decide that she should have

fired a troublesome employee. The manager might consider counterfactuals about how things could have been better if she had fired that person. A counterfactual of this kind serves to remind the manager that the act of firing someone is a powerful option and of the power her potential actions hold. This may allow the manager to feel that she is in control of events, is aware of what is happening, and is capable of adapting to unforeseen events going forward.

Other research has postulated that individual difference factors may be important to content-neutral self-inferences of this type. In their month-long study of counterfactual thoughts in college students, Nasco and Marsh (1999) aimed to identify mediators of observed performance improvement in academic performance. They found that participants who generated more upward counterfactuals engaged in more action on their environment and perceived enhanced control over their environment. These heightened control perceptions were related to performance improvement. Nasco and March suggest that factors unexamined in their study such as individual differences may influence control perceptions after counterfactual thinking. We examined this hypothesis in Experiment 2. After generating counterfactuals and before attempting a second set of anagrams, participants reported their perceptions of 'control ahead of the next trial'. We examined whether participants' ratings of 'control ahead of the next trial' were influenced by engaging in counterfactual thinking and self-regulatory individual differences in autonomy. We found that after generating counterfactuals, high autonomy participants (Bekker & van Assen, 2006) did not report higher control perceptions than low autonomy participants. While we found that individual differences did not directly influence control perceptions after generating counterfactuals, we found they were indirectly related; individual differences were associated with counterfactual controllability

which was marginally associated with heightened control perceptions. It may be the case that the content-neutral pathway plays a part due to the fact that self-regulatory individual differences such as autonomy may facilitate a heightened pre-existing sense of control.

It may also be worth investigating whether self-regulatory individual differences have an impact in determining whether either the content-specific or the content-neutral pathway may be functional. For example, for the high autonomy participants in Experiment 2, given that they may already foster innately high control perceptions, might this mean that in order to benefit from counterfactual thinking, the pathway must be content-specific rather than content-neutral. Someone low in autonomy on the other hand, who doesn't have a heightened pre-existing sense of control, may benefit from generating counterfactuals because it increases sense of control via the content-neutral pathway and/or because it informs behavioural intentions via the content-specific pathway.

It is also possible that other forms of self-inference effects, besides control perceptions, are important. Future studies could examine more directly whether individual differences might be important for self-inferences regarding aspects such as efficacy, openness, invulnerability, or positivity embracement.

Counterfactual thinking in applied settings

Some findings from the present research hold implications for how counterfactual thinking might be applied beneficially in real world settings. In this section we

discuss some previous studies on counterfactual thinking in applied settings and suggest how the findings of the present research may inform future studies.

Numerous studies in the area of counterfactual thinking and heuristics have been carried out in educational institutions and/or with research participants selected from student populations. Many of these studies have tended to focus, in some way, on academic assessment of participants (Gasper, Lozinski, & LeBeau, 2009; McMullen & Markman, 2000; Nasco & Marsh, 1999; Roese, 1994). Nasco and Marsh (1999) provided compelling evidence that the process of generating counterfactual thoughts regarding academic performance serves to inform behavioural intentions to change future preparative behaviour. This suggests that fostering this type of cognition in academic settings may prove beneficial. Our research, which also demonstrated counterfactual functionality in terms of performance improvement, supports this concept. Our research also suggests that in addition to generating counterfactuals about performance, the role of individual differences and encouraging particular cognitive styles should also be considered.

We found that individual differences in self-regulation facilitated the use of more functional types of counterfactual thinking. Assessing the performance of students has been described as one of the most important activities educators undertake (Trotter, 2006). However, the emphasis placed on letter grades has been identified as problematic in that it may serve to curb reflective cognitions aimed at addressing less than ideal performance (Boud, 2000; Craddock & Mathias, 2009; Knight, 2002). The role of self-direction in academic intervention programmes seems to be important. While earlier academic intervention programmes which focused on providing students with specific information regarding how best to prepare for examinations and study in general proved disappointing (Conway &

Ross, 1984; Gibbs, 1981), subsequent research has fared better by encouraging greater levels of student reflection (Etkina & Harper, 2002). We suggest that a possible shortcoming of traditional forms of academic feedback - widely portrayed in counterfactual thinking studies as the issuance of grades - is that they do little to increase the likelihood of self-directed future learning strategies. In academic settings, it may be useful to think of assessment as not just a reflection of what has been learned but as an opportunity to learn through reflection. We suggest that incorporating self-directed counterfactual cognitions regarding academic performance may prove beneficial. In addition, we demonstrated that inducing particular cognitive styles (e.g., to self-affirm) can encourage more functional counterfactual thinking and this could be incorporated also.

Another area which the present research may hold implications for is that of counselling, rehabilitation, and clinical depression. Counterfactual thinking research has previously examined these areas (Bingham, 2003; Davis et al., 1995; Mandel & Dhami, 2005; Markman & Miller, 2006; Markman & Weary, 1998). A general aim of applied studies is typically to foster more functional kinds of counterfactual thinking in individuals who may not otherwise be inclined to generate adaptive thoughts about past events. In the present research, while considering individual difference factors, we utilized experimental manipulations we felt might increase the likelihood that more functional types of counterfactual thinking might be generated. In Experiment 5, we examined the effects of experimentally manipulating action/state orientation and any potential interaction that may exist with innate individual differences in action/state orientation. We found that inducing an action-orientation resulted in higher percentages of initial controllable counterfactuals only for innately action-oriented individuals. Innately state-oriented

individuals did not appear to gain benefit from the experimental manipulation in terms of counterfactual functionality. Given the association with state-orientation and depression (Kuhl, 1981), our research suggests that interventions may not necessarily be best served by directly encouraging depressives to consider corrective action steps.

Instead, interventions may be better served utilizing approaches that encourage the consideration of positive self-aspects unrelated to an area currently perceived negatively. While considering individual differences in cognitive self-affirmation inclination, Experiment 6 examined whether encouraging participants to self-affirm would influence the functionality of counterfactual thoughts generated. We found that the individual difference factor significantly influenced counterfactual controllability in the absence of inducing self-affirmation. When experimentally encouraged to self-affirm however, all participants tended to increase counterfactual controllability. In terms of encouraging more functional types of counterfactual thinking, this type of approach where individuals are encouraged to self-affirm may prove more useful in applied setting than directly encouraging the consideration of corrective action steps.

Existing research on the use of counterfactual thinking in prisoner rehabilitation (Mandel & Dhimi, 2005) suggests that encouraging the use of self-focused counterfactuals can intensify attributions of self-blame and feelings of guilt. In correctional programmes, these attributions are thought to be more beneficial than attributions of shame, which were not found to be increased due to counterfactual thinking. Our findings are in line with this, suggesting that engaging with counterfactuals in a way where one's sense of self is not threatened may increase the likelihood that self-focused and adaptive counterfactuals may be generated.

6.3 *Future research*

There are a number of avenues for future research arising from the experiments presented here. Additional research will be useful both in addressing some of the limitations of the experiments and in further exploring some of the findings. These possibilities are discussed below.

The generality of the findings from these experiments are limited due to the nonspontaneous manner in which counterfactuals were elicited. Many of the counterfactuals recorded by participants may not have occurred had they not been prompted to consider how things could have turned out differently. Future research might examine self-regulatory individual differences in relation to counterfactual thinking utilizing a more spontaneous means of counterfactual elicitation. However, given the laboratory based method of data collection used in the experiments, it is encouraging to have observed similar patterns of counterfactual thinking to those seen in previous studies noted for their ecological validity (e.g., Morris & Moore, 2000; Nasco & Marsh, 1999; Summerville & Roese, 2008).

Future research on self-regulatory individual differences and counterfactual thinking might benefit from using a longitudinal approach. We found little evidence suggesting that self-regulatory individual difference factors influence counterfactual activation. However, it may be the case that to observe differences in terms of counterfactual activation, longitudinal studies that focus on highly salient negative outcomes may be more appropriate. It may be that short term laboratory experiments of the kind reported here do not offer the best means of observing the influence of self-regulatory individual difference factors on counterfactual activation. David et al. (1995) examined counterfactual frequency in parents shortly

after suffering bereavement and then again at a later stage of the grieving process. Nasco and Marsh (1999) examined academic performance improvement in students over a two month period. Longitudinal studies such as these may allow for negative outcomes to be processed more deeply and the effects of rumination to take hold more fully. On the contrary, in the laboratory type tasks utilized in the present research, counterfactual generation typically took place shortly after the negative outcome was encountered or considered. While the findings of the present research indicate that the overall number of counterfactual thoughts people engage in is not strongly influenced by self-regulatory individual difference factors, we suggest that additional research focusing on temporal factors may be useful.

Future research might also examine the association between self-regulatory individual differences and counterfactual activation using less formal and structured means of counterfactual elicitation. Although no time restraints were explicitly stated during the counterfactual generation tasks, because of the formal nature of the experiments, participants may have felt more time conscious during counterfactual generation than in a more naturalistic setting. While this concern did not appear to influence the number of counterfactual generated, other methodologies may find activational effects where the present research did not. A freer form of thought listing exercise, where participants could write about their experiences of regret, may prove useful.

Longitudinal studies may also negate any potential for experimental tasks and individual difference measures to influence each other. In the present research, although efforts were made to reduce this potential bias and results indicated that experimental manipulations did not influence individual difference measures, longitudinal studies would offer a greater degree of control. In the present

research, individual difference measures and experimental manipulations could potentially have been impacted by the fact that participants had earlier generated counterfactual thoughts. Likewise, placing the individual difference measure before the counterfactual generation task may have influenced the nature of the counterfactuals generated. There may be no ideal way of positioning individual difference measures in experiments of this type. However, in general during experiments, both experimental manipulations and individual difference measure were separated by a reasonable length of time. Thus, any potential interaction may have been reduced. Also, participants were made aware that the answers they gave in the individual difference measures were to reflect ways in which they *typically* think, and not how they were currently feeling.

In the present research, we have demonstrated that a number of self-regulatory individual difference variables influence counterfactual thinking. However, additional variables associated with varying self-motives may also be important and worthy of investigation. For instance, Hepper, Gramzow, & Sedikides (2010) outline a wide variety of individual difference factors thought to be important to self-enhancement and self-protection strategies. They identified four reliable factors associated with these strategies: defensiveness, positivity embracement, favourable construals, and self-affirming reflections. Defensiveness primarily describes individual differences in protecting the self from anticipated or actual self-threat, including a mix of behavioural and cognitive inclinations. Positivity embracement describes an individual's capacity to maximize anticipated or actual success. It describes an inclination towards self-enhancement and on obtaining and retaining positive feedback. Favourable construals describe individual differences in the capacity to construct flattering construals of the world with the goal of enhancing

self-perceptions. These strategies are oriented toward self-enhancement rather than self-protection and are associated with promotion focus and high self-esteem. Self-affirming reflections describe individual differences in the tendency to self-affirm and are conceptually similar to the cognitive self-affirmation inclination measure used in the present research. These reflections are associated with high self-esteem and may be initiated by threat.

According to Hepper et al. (2010) there has been a critical omission in the self-enhancement and self-protection literature in that most studies have focused on only one strategy rather than assessing numerous strategies simultaneously. The present research too only examined the influence of self-affirmation of counterfactual thinking. Future research might consider more of these self-enhancement strategies simultaneously to further inform their precise relationship to functional counterfactual thinking. The distinction between strategies thought to enhance as opposed to strategies thought to defend may also be considered.

Perhaps due to the high percentage of additive counterfactuals generated in the experiments of the present research, we found little evidence of a strong association between self-regulatory individual differences and counterfactual structure. Roese and Olson (1993a) found that self-esteem did not moderate people's use of different structures. They suggest that structure may be a relatively unaffected by self-enhancing motives. Thus, rather than stating that individual differences do not influence counterfactual structure, it might be useful for future research to focus more directly on individual differences in cognitive processing styles. One potentially important variable might be that of action identification (Vallacher & Wegner, 1989). Action identification refers to the ways an action can be arrayed in a cognitive hierarchy. Low-level identities might specify *how* one acts while high-

level identities might specify *why* one acts. People who consistently demonstrate a propensity for one type of action identity over another (high or low) may be characterised in terms of a broad personality dimension. High-level cognitive processing may require a more expansive mindset, while low-level cognitive processing may require a more reductive mindset. Thus, subtractive counterfactuals may be more likely for people who typically utilize low-level identities. This of course, remains to be demonstrated empirically by future research.

In terms of investigating the role of self-regulatory individual differences on counterfactual functionality, there are a number of additional factors that might be considered. For example, there is some consensus in the personality literature that the influence of personality traits on behaviour and cognition may be more easily observed when situational autonomy is high rather than low (e.g., Monson, Hesley, & Chernick, 1982; Stagner, 1977). Situational autonomy refers to how self-directed an individual's behaviour is in a given situation or environment. Idiosyncratic behaviour may be more likely to manifest in situations where individuals have greater freedom to behave in self-directed ways. This factor may be worth considering in future studies of counterfactual thinking and self-regulatory individual differences.

Some personality research has investigated the influence of situational autonomy on individual differences in organizational settings. For example, Barrick and Mount (1993) developed a scale that measured the degree of situational autonomy employees felt their jobs entailed. Items measured the degree of discretion the employee had in selecting appropriate work behaviours, deciding the pace and order in which jobs were addressed, and how activities were coordinated with others. An important finding of their research was that the degree of situational autonomy

employees had in their jobs moderated the validity of findings relating personality traits to job performance. It may be the case that any potential influence of self-regulatory individual differences on counterfactual thinking may be dependent on the degree of situational autonomy.

Previous research has examined counterfactual thinking in academic settings (e.g., Nasco & Marsh, 1999). Integrating findings from the field of educational psychology may also help enhance future counterfactual thinking studies of this kind. One way of examining the ecological validity of the findings of the present research would be to examine counterfactual generation in educational environments while assessing the degree of situational autonomy fostered by the learning environment. The dimensions on which the situational autonomy of a learning environment is determined have been well documented (e.g., Crabbe, 1993; Garcia & Pintrich, 1996; Niemiec & Ryan, 2009; Stefanou, Perencevich, DiCintio, & Turner, 2004). Classroom environments are thought to vary considerably in terms of autonomy related dimensions. Assessing variance in these factors may be important when investigating potential associations between self-regulatory individual differences and counterfactual thinking in applied settings. Methods of empirically measuring situational autonomy have already been identified by previous research (e.g., Breugh, 1985).

6.4 Conclusion

Utilizing a variety of cognitive tasks, individual difference measures, and experimental manipulations of cognitive styles, we found evidence suggesting that self-regulatory individual differences may be particularly important in terms of

counterfactual functionality. Specifically, we found evidence suggesting that individual differences in the constructs of autonomy (Bekker & van Assen, 2006), action/state orientation (Diefendorff et al., 2000; Kuhl, 1994), and cognitive self-affirmation inclination (Pietersma & Dijkstra, 2012; Steele, 1988) may be important in terms of counterfactual controllability.

The timing of our research has coincided with a call for greater emphasis to be placed on individual difference factors in counterfactual thinking research. Epstude and Roese (2011) suggested that individual differences may be important, particularly in terms of functionality. Likewise, Murphy (2005) suggested that additional research was needed to understand the role of individual difference factors in how learning and preparation take place due to counterfactual thinking. Our research suggests that certain self-regulatory individual differences may be important in terms of counterfactual functionality. However, more research is required, particularly in applied settings, to fully understand the role of these individual differences in counterfactual thinking.

To the best of our knowledge, no other research has examined the role of autonomy, action/state orientation and cognitive self-affirmation inclination in relation to counterfactual thinking. In most circumstances counterfactual thinking is functional and helps people to gain a sense of control over future and past events. The extent to which counterfactuals are functional however, may be determined by the degree to which individuals perceive themselves as being controlled by the outcome. Of course, if our research suggests anything, it is that this effect is likely only applicable to certain individuals and in certain situations.

References

- Alloy, L., & Abramson, L. (1982). Learned helplessness, depression, and the illusion of control. *Journal of Personality and Social Psychology*, 42(6), 1114–1126.
- Bacon, A. M., Walsh, C. R., & Martin, L. (2013). Fantasy proneness and counterfactual thinking. *Personality and Individual Differences*, 54(4), 469–473.
- Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *The Journal of Applied Psychology*, 88(1), 87–99.
- Barrick, M. R., & Mount, M. K. (1993). Autonomy as a moderator of the relationships between the Big Five personality dimensions and job performance. *Journal of Applied Psychology*, 78(1), 111–118.
- Baumann, N., & Kuhl, J. (2003). Self-infiltration: confusing assigned tasks as self-selected in memory. *Personality and Social Psychology Bulletin*, 29(4), 487–497.
- Bekker, M. (1993). The development of an autonomy scale based on recent insights into gender identity. *European Journal of Personality*, 7(3), 177–194.
- Bekker, M., & van Assen, M. (2006). A short form of the autonomy scale: Properties of the autonomy-connectedness scale (ACS-30). *Journal of Personality Assessment*, 86(1), 51–60.
- Bingham, C. (2003). *The content of future-directed thinking in parasuicide*. (Unpublished doctoral dissertation). Royal Holloway, University of London.
- Black, A., & Deci, E. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science Education*, 84(6), 740–756.

- Blanton, H., Pelham, B.W., DeHart, T., & Carvallo, M. (2001). Overconfidence as dissonance reduction. *Journal of Experimental Social Psychology, 37*(5), 373–385.
- Boninger, D., Gleicher, F., & Strathman, A. (1994). Counterfactual thinking - from what might have been to what may be. *Journal of Personality and Social Psychology, 67*(2), 297–307.
- Boud, D. (2000). Sustainable assessment: rethinking assessment for the learning society. *Studies in Continuing Education, 22*(2), 151–167.
- Branscombe, N. R., Wohl, M. J. A., Owen, S., Allison, J. A., & N'gbala, A. (2003). Counterfactual thinking, blame assignment, and well-being in rape victims. *Basic and Applied Social Psychology, 25*(4), 265–273.
- Breaugh, J. A. (1985). The measurement of work autonomy. *Human Relations, 38*(6), 551–570.
- Bronson, M. B. (2000). *Self-regulation in early childhood: nature and nurture*. Guilford Press.
- Buck, M. L., & Miller, D. T. (1994). Reactions to incongruous negative life events. *Social Justice Research, 7*(1), 29–46.
- Burger, J. M. (1984). Desire for control, locus of control, and proneness to depression. *Journal of Personality, 52*(1), 71–89.
- Burger, J. M., & Cooper, H. M. (1979). The desirability of control. *Motivation and Emotion, 3*(4), 381–393.
- Burger, J. M., & Smith, N. G. (1985). Desire for control and gambling behavior among problem gamblers. *Personality and Social Psychology Bulletin, 11*(2), 145–152.

- Byrne, R. M. (2002). Mental models and counterfactual thoughts about what might have been. *Trends in Cognitive Sciences*, 6(10), 426–431.
- Byrne, R. M. (2005). *The rational imagination: how people create alternatives to reality*. MIT Press.
- Byrne, R. M., & McEleney, A. (2000). Counterfactual thinking about actions and failures to act. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, 26(5), 1318–1331.
- Byrne, R. M., Segura, S., Culhane, R., Tasso, A., & Berrocal, P. (2000). The temporality effect in counterfactual thinking about what might have been. *Memory & Cognition*, 28(2), 264–281.
- Carver, C. S., & Connor-Smith, J. (2010). Personality and coping. *Annual Review of Psychology*, 61(1), 679–704.
- Chatman, J. A. (1991). Matching people and organizations: selection and socialization in public accounting firms. *Administrative Science Quarterly*, 36(3), 459.
- Cohen, G. L., Aronson, J., & Steele, C. M. (2000). When beliefs yield to evidence: reducing biased evaluation by affirming the self. *Personality and Social Psychology Bulletin*, 26(9), 1151–1164.
- Cohen, G. L., Garcia, J., Apfel, N., & Master, A. (2006). Reducing the racial achievement gap: a social-psychological intervention. *Science*, 313(5791), 1307–1310.
- Conway, M., & Ross, M. (1984). Getting what you want by revising what you had. *Journal of Personality and Social Psychology*, 47(4), 738–748.

- Coricelli, G., & Rustichini, A. (2010). Counterfactual thinking and emotions: regret and envy learning. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1538), 241–247.
- Correll, J., Spencer, S., & Zanna, M. (2004). An affirmed self and an open mind: self-affirmation and sensitivity to argument strength. *Journal of Experimental Social Psychology*, 40(3), 350–356.
- Costa, P. T., & McCrae, R. R. (1992). Normal personality assessment in clinical practice: The NEO personality inventory. *Psychological Assessment*, 4(1), 5–13.
- Crabbe, D. (1993). Fostering autonomy from within the classroom: the teacher's responsibility. *System*, 21(4), 443–52.
- Craddock, D., & Mathias, H. (2009). Assessment options in higher education. *Assessment and Evaluation in Higher Education*, 34(2), 127–140.
- Davidson, L., & Strauss, J. S. (1992). Sense of self in recovery from severe mental illness. *British Journal of Medical Psychology*, 65(2), 131–145.
- Davis, C. (1991). *The undoing experience: Antecedents, consequences, and individual differences* (Unpublished master's thesis). University of British Columbia, Vancouver, Canada.
- Davis, C., Lehman, D. R., Wortman, C. B., Silver, R. C., & Thompson, S. C. (1995). The undoing of traumatic life events. *Personality and Social Psychology Bulletin*, 21(2), 109–124.
- Deci, E., & Ryan, R. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, 49, 14–23.
- Deci, E., & Ryan, R. (1985a). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.

- Deci, E., & Ryan, R. (1985b). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*(2), 109–134.
- Diefendorff, J. M., Hall, R. J., Lord, R. G., & Streat, M. L. (2000). Action-state orientation: construct validity of a revised measure and its relationship to work-related variables. *The Journal of Applied Psychology, 85*(2), 250–263.
- Digman, J. M. (1990). Personality structure: emergence of the five-factor model. *Annual Review of Psychology, 41*(1), 417–440.
- Dixon, J., & Byrne, R. M. (2011). ‘If only’ counterfactual thoughts about exceptional actions. *Memory & Cognition, 39*(7), 1317–1331.
- Dutcher, J. (2010). *Improving performance on a creativity task via self-affirmation* (Thesis). Dietrich College, Pittsburgh, PA.
- Duval, S., & Wicklund, R. A. (1972). *A theory of objective self awareness*. New York: Academic Press.
- Egan, S. M., & Byrne, R. M. (2012). Inferences from counterfactual threats and promises. *Experimental Psychology, 59*(4), 227–235.
- Egan, S. M., Frosh, C. A., & Hancock, E. N. (2008). Thinking counterfactually – how controllability affects the ‘undoing’ of causes and enablers. In: B.C. Love, K. McRae & V.M. Sloutsky (Eds.), *Proceedings of the 30th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, 1152-1157.
- El Leithy, S., Brown, G. P., & Robbins, I. (2006). Counterfactual thinking and posttraumatic stress reactions. *Journal of Abnormal Psychology, 115*(3), 629–635.

- Epstude, K., & Roese, N. (2008). The functional theory of counterfactual thinking. *Personality and Social Psychology Review, 12*(2), 168–192.
- Epstude, K., & Roese, N. (2011). When goal pursuit fails: the functions of counterfactual thought in intention formation. *Social Psychology, 42*(1), 19–27.
- Erikson, E. (1974). *Identity: youth and crisis*. London: Faber & Faber.
- Etkina, E., & Harper, K. (2002). Weekly reports: student reflections on learning. An assessment tool based on student and teacher feedback. *Journal of College Science Teaching, 31*(7), 476–80.
- Fein, S., & Spencer, S. (1997). Prejudice as self-image maintenance: affirming the self through derogating others. *Journal of Personality and Social Psychology, 73*, 31–44.
- Ferguson, N. (2000). *Virtual history: alternatives and counterfactuals* (New edition.). New York: Basic Books.
- Ferrante, D., Giroto, V., Stragà, M., & Walsh, C. R. (2013). Improving the past and the future: a temporal asymmetry in hypothetical thinking. *Journal of Experimental Psychology. General, 142*(1), 23–27.
- Fox, N. A., Henderson, H. A., Marshall, P. J., Nichols, K. E., & Ghera, M. M. (2005). Behavioral inhibition: linking biology and behavior within a developmental framework. *Annual Review of Psychology, 56*, 235–262.
- Galinsky, A., & Moskowitz, G. (2000). Counterfactuals as behavioral primes: priming the simulation heuristic and consideration of alternatives. *Journal of Experimental Social Psychology, 36*(4), 384–409.

- Garcia, T., & Pintrich, P. R. (1996). The effects of autonomy on motivation and performance in the college classroom. *Contemporary Educational Psychology, 21*(4), 477–486.
- Gaspar, K., Lozinski, R., & LeBeau, L. (2009). If you plan, then you can: How reflection helps defensive pessimists pursue their goals. *Motivation and Emotion, 33*(2), 203–216.
- Gibbs, G. (1981). *Teaching students to learn: a student-centred approach*. Milton Keynes: Open University Press.
- Gilbert, D. T., Morewedge, C. K., Risen, J. L., & Wilson, T. D. (2004). Looking forward to looking backward. *Psychological Science, 15*(5), 346–350.
- Gilhooly, K. J., & Johnson, C. E. (1978). Effects of solution word attributes on anagram difficulty: A regression analysis. *The Quarterly Journal of Experimental Psychology, 30*(1), 57-70
- Giroto, V., Ferrante, D., Pighin, S., & Gonzalez, M. (2007). Postdecisional counterfactual thinking by actors and readers. *Psychological Science, 18*(6), 510–515.
- Giroto, V., Legrenzi, P., & Rizzo, A. (1991). Event controllability in counterfactual thinking. *Acta Psychologica, 78*(1-3), 111–133.
- Gleicher, F., Kost, K. A., Baker, S. M., Strathman, A. J., Richman, S. A., & Sherman, S. J. (1990). The role of counterfactual thinking in judgments of affect. *Personality and Social Psychology Bulletin, 16*(2), 284–295.
- Green, M., & Brock, T. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology, 79*(5), 701–721.

- Grieve, F., Houston, D., Dupuis, S., & Eddy, D. (1999). Counterfactual production and achievement orientation in competitive athletic settings. *Journal of Applied Social Psychology, 29*(10), 2177–2202.
- Haynes, G. A., Sorrentino, R. M., Olson, J. M., Szeto, A. C. H., Wirkki, J. S., & O'Connor, M. C. (2007). The effects of temporal framing on counterfactual thinking and self-appraisal: an individual differences perspective. *Social Cognition, 25*(3), 339–366.
- Heckhausen, H., & Strang, H. (1988). Efficiency under record performance demands: Exertion control--an individual difference variable? *Journal of Personality and Social Psychology, 55*(3), 489–498.
- Heine, S. J. (2005). Constructing good selves in Japan and North America. In Culture and social behavior: The tenth Ontario symposium, ed. RM Sorrentino, D. Cohen, JM Olson & MP Zanna (pp. 95-116).
- Hepper, E. G., Gramzow, R. H., & Sedikides, C. (2010). Individual differences in self-enhancement and self-protection strategies: An integrative analysis. *Journal of Personality, 78*(2), 781–814.
- Hiroto, D. S., & Seligman, M. E. (1975). Generality of learned helplessness in man. *Journal of Personality and Social Psychology, 31*(2), 311–327.
- Hirschfeld, R. M., Klerman, G. L., Gouch, H. G., Barrett, J., Korchin, S. J., & Chodoff, P. (1977). A measure of interpersonal dependency. *Journal of Personality Assessment, 41*(6), 610-618.
- Hmel, B. A., & Pincus, A. L. (2002). The meaning of autonomy: On and beyond the interpersonal circumplex. *Journal of Personality, 70*(3), 277-310.
- Hoyle, R. H. (2006). Personality and self-regulation: trait and information-processing perspectives. *Journal of Personality, 74*(6), 1507–1525.

- Janoff-Bulman, R. (1989). Assumptive worlds and the stress of traumatic events: Applications of the schema construct. *Social Cognition*, 7(2), 113–136.
- Johnson, J. T. (1986). The knowledge of what might have been. *Personality and Social Psychology Bulletin*, 12(1), 51–62.
- Johnson-Laird, P. N. & Byrne, R. M. (1991). *Deduction*. Hove, UK: Erlbaum.
- Johnson-Laird, P. N., & Byrne, R. M. (2002). Conditionals: a theory of meaning, pragmatics, and inference. *Psychological review*, 109(4), 646.
- Jostmann, N. B., Koole, S. L., van der Wulp, N. Y., & Fockenberg, D. A. (2005). Subliminal affect regulation. *European Psychologist*, 10(3), 209–217.
- Kahneman, D., & Miller, D. (1986). Norm theory - comparing reality to its alternatives. *Psychological Review*, 93(2), 136–153.
- Kahneman, D., & Tversky, A. (1982). The simulation heuristic. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgements under uncertainty: heuristics and biases* (pp. 201–208). New York: Cambridge University Press.
- Kasimatis, M., & Sterling, L. (1994, June). *Further evidence for individual differences in counterfactual thinking*. Poster presented at a meeting of the American Psychological Society, Washington, DC.
- Kasimatis, M., & Wells, G. (1995). Individual differences in counterfactual thinking. In N. Roese & J. Olsen (Eds.), *The social psychology of counterfactual thinking* (pp. 81–101). Mahwah, NJ: Lawrence Erlbaum Associates.
- Knight, P. (2002). Summative assessment in higher education: practices in disarray. *Studies in Higher Education*, 27(3), 275–286.
- Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: continuity and change, antecedents, and implications for social development. *Developmental Psychology*, 36(2), 220–232.

- Kohlberg, L. (1984). *The psychology of moral development: the nature and validity of moral stages* (1st ed.). San Francisco: Harper and Row.
- Koole, S. L., Smeets, K., van Knippenberg, A., & Dijksterhuis, A. (1999). The cessation of rumination through self-affirmation. *Journal of Personality and Social Psychology*, 77(1), 111–125.
- Kray, L., Galinsky, A.D., & Markman, K. (2009). Counterfactual structure and learning from experience in negotiations. *Journal of Experimental Social Psychology*, 45(4), 979–982.
- Kray, L., & Galinsky, A. D. (2003). The debiasing effect of counterfactual mind-sets: Increasing the search for disconfirmatory information in group decisions. *Organizational Behavior and Human Decision Processes*, 91(1), 69–81.
- Kray, L., George, L. G., Liljenquist, K. A., Galinsky, A. D., Tetlock, P. E., & Roese, N. (2010). From what might have been to what must have been: counterfactual thinking creates meaning. *Journal of Personality and Social Psychology*, 98(1), 106–118.
- Kuhl, J. (1981). Motivational and functional helplessness: the moderating effect of state versus action orientation. *Journal of Personality and Social Psychology*, 40(1), 155–170.
- Kuhl, J. (1992). A Theory of Self-regulation: Action versus State Orientation, Self-discrimination, and Some Applications. *Applied Psychology*, 41(2), 97–129.
- Kuhl, J. (1994). A theory of action and state orientations. In J Kuhl & J. Beckmann (Eds.), *Volition and personality: Action versus state orientation*. (pp. 9–46). Seattle, WA: Hogrefe & Huber.

- Kuhl, J. (2000). A functional-design approach to motivation and self-regulation. *Handbook of Self-Regulation* (pp. 111–169).
- Kuhl, J., & Kazén, M. (1994). Self-discrimination and memory: State orientation and false self-ascription of assigned activities. *Journal of Personality and Social Psychology*, *66*(6), 1103–1115.
- Landman, J., & Petty, R. (2000). ‘It could have been you’: How states exploit counterfactual thought to market lotteries. *Psychology and Marketing*, *17*(4), 299–321.
- Laor, N. (1982). Old whig psychiatry: the Szaszian variant. *The Israel Journal of Psychiatry and Related Sciences*, *19*(3), 215–227.
- Leach, J. K., & Patall, E. A. (2013). Maximizing and Counterfactual Thinking in Academic Major Decision Making. *Journal of Career Assessment*.
- Leary, M. R., & Baumeister, R. F. (2000). The nature and function of self-esteem: Sociometer theory. *Advances in experimental social psychology*, *32*, 1-62.
- Mahler, M. S., Pine, F., & Bergman, A. (1975). *The psychological birth of the human infant: symbiosis and individuation*. London: Hutchinson and Co Ltd.
- Mandel, D. (2003). Counterfactuals, emotions, and context. *Cognition & Emotion*, *17*(1), 139–159.
- Mandel, D., Hilton, D., & Catellani, P. (2005). *The psychology of counterfactual thinking*. New York: Routledge.
- Mandel, D., & Dhami, M. K. (2005). ‘What I did’ versus ‘what I might have done’: Effect of factual versus counterfactual thinking on blame, guilt, and shame in prisoners. *Journal of Experimental Social Psychology*, *41*(6), 627–635.

- Marguc, J., Förster, J., & Van Kleef, G. A. (2011). Stepping back to see the big picture: when obstacles elicit global processing. *Journal of Personality and Social Psychology, 101*(5), 883–901.
- Markman, G. D., Balkin, D. B., & Baron, R. A. (2002). Inventors and New Venture Formation: the Effects of General Self-Efficacy and Regretful Thinking. *Entrepreneurship Theory and Practice, 27*(2), 149–165.
- Markman, K., Gavanski, I., Sherman, S., & McMullen, M. (1993). The mental simulation of better and worse possible worlds. *Journal of Experimental Social Psychology, 29*(1), 87–109.
- Markman, K., Gavanski, I., Sherman, S., & McMullen, M. (1995). The impact of perceived control on the imagination of better and worse possible worlds. *Personality and Social Psychology Bulletin, 21*(6), 588–595.
- Markman, K., Klein, W., & Suhr, J. (Eds.). (2008). *Handbook of imagination and mental simulation* (1st ed.). New York: Taylor and Francis Group.
- Markman, K., Lindberg, M., Kray, L., & Galinsky, A. (2007). Implications of counterfactual structure for creative generation and analytical problem solving. *Personality & Social Psychology Bulletin, 33*(3), 312–324.
- Markman, K., & McMullen, M. (2003). A reflection and evaluation model of comparative thinking. *Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology, Inc, 7*(3), 244–267.
- Markman, K., McMullen, M., & Elizaga, R. (2008). Counterfactual thinking, persistence, and performance: A test of the Reflection and Evaluation Model. *Journal of Experimental Social Psychology, 44*(2), 421–428.

- Markman, K., & Miller, A. K. (2006). Depression, control, and counterfactual thinking: functional for whom? *Journal of Social and Clinical Psychology*, 25(2), 210–227.
- Markman, K., & Tetlock, P. (2000). ‘I couldn’t have known’: accountability, foreseeability and counterfactual denials of responsibility. *The British Journal of Social Psychology*, 39, 313–325.
- Markman, K., & Weary, G. (1998). Control motivation, depression, and counterfactual thought. In M. Kofta, G. Weary, & G. Sedek (Eds.), *Personal control in action: Cognitive and motivational mechanisms* (pp. 363–390). New York, NY, US: Plenum Press.
- McCloy, R., & Byrne, R. M. (2000). Counterfactual thinking about controllable events. *Memory & Cognition*, 28(6), 1071–1078.
- McElroy, T., & Dowd, K. (2007). Action orientation, consistency and feelings of regret. *Judgment and Decision Making*, 2, (6), 333–341
- McFarland, C., & Alvaro, C. (2000). The impact of motivation on temporal comparisons: coping with traumatic events by perceiving personal growth. *Journal of personality and social psychology*, 79(3), 327–343.
- McMullen, M., & Markman, K. (2000). Downward counterfactuals and motivation: The wake-up call and the pangloss effect. *Personality and Social Psychology Bulletin*, 26(5), 575–584.
- Medvec, V., Gilovich, T., & Madey, S. (1995). When less is more - counterfactual thinking and satisfaction among olympic medalists. *Journal of Personality and Social Psychology*, 69(4), 603–610.

- Meyerslevy, J., & Maheswaran, D. (1992). When timing matters - the influence of temporal distance on consumers affective and persuasive responses. *Journal of Consumer Research*, 19(3), 424–433.
- Miller, D., & McFarland, C. (1986). Counterfactual thinking and victim compensation - a test of norm theory. *Personality and Social Psychology Bulletin*, 12(4), 513–519.
- Miller, D., Turnbull, W. & McFarland, C. (1990). Counterfactual thinking and social perception: Thinking about what might have been. (In M. P. Zanna (Ed.), *Advances in experimental social psychology*, 23, 305-331.
- Monson, T. C., Hesley, J. W., & Chernick, L. (1982). Specifying when personality traits can and cannot predict behavior: An alternative to abandoning the attempt to predict single-act criteria. *Journal of Personality and Social Psychology*, 43(2), 385–399.
- Morris, M., & Moore, P. (2000). The lessons we (don't) learn: Counterfactual thinking and organizational accountability after a close call. *Administrative Science Quarterly*, 45(4), 737–765.
- Murphy, J. (2005). *Individual differences in counterfactual thinking: The role of personality and health* (Unpublished doctoral dissertation). Adelphi University, Long Island, New York.
- Nasco, S., & Marsh, K. (1999). Gaining control through counterfactual thinking. *Personality and Social Psychology Bulletin*, 25(5), 556–568.
- Niedenthal, P. M., Tangney, J. P., & Gavanski, I. (1994). 'If only I weren't' versus 'if only I hadn't': distinguishing shame and guilt in counterfactual thinking. *Journal of Personality and Social Psychology*, 67(4), 585–595.

- Niemiec, C. P., & Ryan, R. (2009). Autonomy, competence, and relatedness in the classroom: applying self-determination theory to educational practice. *Theory and Research in Education*, 7(2), 133–144.
- Page, C., & Colby, P. (2003). If only I hadn't smoked: The impact of counterfactual thinking on a smoking-related behavior. *Psychology & Marketing*, 20(11), 955–976.
- Parker, A. M., Bruine de Bruin, W., & Fischhoff, B. (2007). Maximizer versus satisficers: Decision-making styles, competence, and outcomes. *Judgement and Decision Making*, 2, 342–350.
- Pelletier, L., Fortier, M., Vallerand, R., & Briere, N. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion*, 25(4), 279–306.
- Petrocelli, J. V., Percy, E. J., Sherman, S. J., & Tormala, Z. L. (2011). Counterfactual potency. *Journal of Personality and Social Psychology*, 100(1), 30–46.
- Pietersma, S., & Dijkstra, A. (2012). Cognitive self-affirmation inclination: an individual difference in dealing with self-threats. *The British Journal of Social Psychology*, 51(1), 33–51.
- Pighin, S., Byrne, R. M., Ferrante, D., Gonzalez, M., & Giroto, V. (2011). Counterfactual thoughts about experienced, observed, and narrated events. *Thinking & Reasoning*, 17(2), 197–211.
- Reed M.B., & Aspinwall L.G. (1998). Self-affirmation reduces biased processing of health-risk information. *Motivation and Emotion*, 22(2), 99–132.
- Rippere, V. (1977). 'What's the thing to do when you're feeling depressed?' --a pilot study. *Behaviour Research and Therapy*, 15(2), 185–191.

- Roberts, B., Chernyshenko, O., Stark, S., & Goldberg, L. (2005). The structure of conscientiousness: an empirical investigation based on seven major personality questionnaires. *Personnel Psychology*, 58(1), 103–139.
- Roese, N. (1994). The functional basis of counterfactual thinking. *Journal of Personality and Social Psychology*, 66(5), 805–818.
- Roese, N. (1997). Counterfactual thinking. *Psychological Bulletin*, 121(1), 133–148.
- Roese, N., & Hur, T. (1997). Affective Determinants of Counterfactual Thinking. *Social Cognition*, 15(4), 274–290.
- Roese, N., & Olson, J. (1993a). Self-esteem and counterfactual thinking. *Journal of Personality and Social Psychology*, 65(1), 199–206.
- Roese, N., & Olson, J. (1993b). The structure of counterfactual thought. *Personality and Social Psychology Bulletin*, 19(3), 312–319.
- Roese, N., & Olson, J. (1995). *What Might Have Been: The Social Psychology of Counterfactual Thinking*. Mahwah, NJ: Erlbaum.
- Roese, N., & Olson, J. (1997). Counterfactual thinking: The intersection of affect and function. *Advances in Experimental Social Psychology*, 29, 1–59.
- Rothbart, M. K., & Rueda, M. R. (2005). The development of effortful control. In U. Mayr, E. Awh, & S. W. Keele (Eds.), *Developing individuality in the human brain: A tribute to Michael I. Posner*. (pp. 167–188). Washington, DC, US: American Psychological Association.
- Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs*, 80(1), 1–28.
- Ryan, R., Rigby, S., & King, K. (1993). 2 types of religious internalization and their relations to religious orientations and mental-health. *Journal of Personality and Social Psychology*, 65(3), 586–596.

- Saffrey, C., Summerville, A., & Roese, N. (2008). Praise for regret: People value regret above other negative emotions. *Motivation and Emotion, 32*(1), 46–54.
- Sanna, L. (1996). Defensive Pessimism, Optimism, and Simulating Alternatives: Some Ups and Downs of Prefactual and Counterfactual Thinking. *Journal of Personality and Social Psychology, 71*(5), 1020–1036.
- Sanna, L. (1997). Self-efficacy and counterfactual thinking: Up a creek with and without a paddle. *Personality and Social Psychology Bulletin, 23*(6), 654–666.
- Sanna, L. (1998). Defensive pessimism and optimism: The bitter-sweet influence of mood on performance and prefactual and counterfactual thinking. *Cognition & Emotion, 12*(5), 635–665.
- Sanna, L. (2000). Mental simulation, affect and personality: A conceptual framework. *Current Directions in Psychological Science, 9*(5), 168–173.
- Sanna, L, Chang, E., & Meier, S. (2001). Counterfactual thinking and self-motives. *Personality and Social Psychology Bulletin, 27*(8), 1023–1034.
- Sanna, L, Meier, S., & Turley-Ames, K. (1998). Mood, self-esteem, and counterfactuals: Externally attributed moods limit self-enhancement strategies. *Social Cognition, 16*(2), 267–286.
- Sanna, L, & Meier, S. (2000). Looking for clouds in a silver lining: self-esteem, mental simulations, and temporal confidence changes. *Journal of Research in Personality, 34*(2), 236–251.
- Sanna, L, & Turley-Ames, K. (1996). Antecedents to spontaneous counterfactual thinking: effects of expectancy violation and outcome valence. *Personality and Social Psychology Bulletin, 22*(9), 906–919.

- Sanna, L., Turley-Ames, K., & Meier, S. (1999). Mood, self-esteem, and simulated alternatives: thought-provoking affective influences on counterfactual direction. *Journal of Personality and Social Psychology*, 76(4), 543–558.
- Schwartz, B., Ward, A., Monterosso, J., Lyubomirsky, S., White, K., & Lehman, D. R. (2002). Maximizing versus satisficing: Happiness is a matter of choice. *Journal of Personality and Social Psychology*, 83(5), 1178–1197.
- Sedikides, C., & Strube, M. J. (1997). Self evaluation: To thine own self be good, to thine own self be sure, to thine own self be true, and to thine own self be better. *Advances in Experimental Social Psychology*, 29, 209–269.
- Seta, C. E., Seta, J. J., McElroy, G. T., & Hatz, J. (2008). Regret: The roles of consistency-fit and counterfactual salience. *Social Cognition*, 26(6), 700–719.
- Shepperd, J. A., & Arkin, R. M. (1991). Behavioral other-enhancement: Strategically obscuring the link between performance and evaluation. *Journal of personality and social psychology*, 60(1), 79–88
- Sherman, D., Nelson, L. D., & Steele, C. M. (2000). Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. *Personality and Social Psychology Bulletin*, 26(9), 1046–1058.
- Sherman, D., & Cohen, G. L. (2006). The psychology of self - defense: Self - affirmation theory. *Advances in experimental social psychology*, 38, 183–242.
- Sherman, D., & Cohen, G. L. (2002). Accepting threatening information: self-affirmation and the reduction of defensive biases. *Current Directions in Psychological Science*, 11(4), 119–123.

- Showers, C. (1992). The motivational and emotional consequences of considering positive or negative possibilities for an upcoming event. *Journal of Personality and Social Psychology*, 63(3), 474-484.
- Sirois, F. M. (2004). Procrastination and counterfactual thinking: avoiding what might have been. *The British Journal of Social Psychology*, 43, 269-286.
- Sirois, F. M., Monforton, J., & Simpson, M. (2010). 'If only I had done better': perfectionism and the functionality of counterfactual thinking. *Personality and Social Psychology Bulletin*, 36(12), 1675-1692.
- Smallman, R., & Roese, N. (2009). Counterfactual thinking facilitates behavioral intentions. *Journal of experimental social psychology*, 45(4), 845-852.
- Snyder. (1974). Self-monitoring of expressive behavior. *Journal of Personality and Social Psychology*, 30(4), 526-537.
- Sorrentino, R., Short, J.A., & Raynor, J. O. (1984). Uncertainty orientation: Implications for affective and cognitive views of achievement behavior. *Journal of Personality and Social Psychology*, 46(1), 189-206.
- Sparks, E. A., Ehrlinger, J., & Eibach, R. P. (2012). Failing to commit: Maximizers avoid commitment in a way that contributes to reduced satisfaction. *Personality and Individual Differences*, 52, 72-77.
- Squire, S. J. C., & Churchill, W. (1931). *If it had happened otherwise*. New York: St. Martin's Press.
- Stagner, R. (1977). On the reality and relevance of traits. *The Journal of general psychology*, 96, 185-207.
- Steele, C.M. (1988). The psychology of self-affirmation: sustaining the integrity of the self. *Advances in Experimental Social Psychology*, 21, 261-302.

- Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending with group image: The psychology of stereotype and social identity threat. *Advances in experimental social psychology*, 34, 379-440.
- Stefanou, C. R., Perencevich, K. C., DiCintio, M., & Turner, J. C. (2004). Supporting autonomy in the classroom: ways teachers encourage student decision making and ownership. *Educational Psychologist*, 39(2), 97-110.
- Summerville, A., & Roese, N. (2008). Dare to compare: fact-Based versus simulation-based comparison in daily life. *Journal of Experimental Social Psychology*, 44(3), 664-671.
- Tal-Or, N., Boninger, D., Poran, A., & Gleicher, F. (2004). Counterfactual thinking as a mechanism in narrative persuasion. *Human Communication Research*, 30(3), 301-328.
- Taylor, S. E. (1983). Adjustment to threatening events: A theory of cognitive adaptation. *American Psychologist*, 38(11), 1161-1173.
- Tesser, A. (2000). On the confluence of self-esteem maintenance mechanisms. *Personality and Social Psychology Review*, 4(4), 290 -299.
- Tesser, A., & Cornell, D. P. (1991). On the confluence of self processes. *Journal of Experimental Social Psychology*, 27, 501-526.
- Trotter, E. (2006). Student perceptions of continuous summative assessment. *Assessment & Evaluation in Higher Education*, 31(5), 505-521.
- Turnbull, W. (1981). Naive conceptions of free will and the deterministic paradox. *Canadian Journal of Behavioural Science*, 13(1), 1-13.
- Vallacher, R. R., & Wegner, D. M. (1989). Levels of personal agency: Individual variation in action identification. *Journal of Personality and Social Psychology*, 57(4), 660-671.

- Van Putten, M., Zeelenberg, M., & Van Dijk, E. (2009). Dealing with missed opportunities: Action vs. state orientation moderates inaction inertia. *Journal of Experimental Social Psychology, 45*(4), 808–815.
- Walsh, C. R., & Byrne, R. M. (2004). Counterfactual thinking: the temporal order effect. *Memory & cognition, 32*(3), 369–378.
- Walsh, C. R., & Byrne, R. M. (2005). The mental representation of what might have been. In D. R. Mandel, D. J. Hilton, & P. Catellani (Eds.), *The psychology of counterfactual thinking*. (pp. 61–73). New York, NY US: Routledge.
- Walsh, C. R., & Byrne, R. M. (2007). How people think ‘If only...’ about reasons for actions. *Thinking & Reasoning, 13*(4), 461–483.
- Wanberg, C. R., Zhu, J., & van Hooft, E. A. (2010). The job search grind: perceived progress, self-reactions, and self-regulation of search effort. *Academy of Management Journal, 53*(4), 788-807.
- Watkins, E., & Baracaia, S. (2002). Rumination and social problem-solving in depression. *Behaviour Research and Therapy, 40*(10), 1179–1189.
- Weiss, H. M., & Adler, S. (1984). Personality and organizational behavior. *Research in Organizational Behavior, 6*, 1–50.
- Wells, G., & Gavanski, I. (1989). Mental simulation of causality. *Journal of Personality and Social Psychology, 56*(2), 161–169.
- Wells, G., Taylor, B.R., & Turtle, J.W. (1987). The undoing of scenarios. *Journal of Personality and Social Psychology, 53*, 421 - 430.
- White, K., & Lehman, D. R. (2005). Looking on the bright side: downward counterfactual thinking in response to negative life events. *Personality and Social Psychology Bulletin, 31*(10), 1413 –1424.

Zuckerman, M., Levitt, E., & Lubin, B. (1961). Concurrent and construct validity of direct and indirect measures of dependency. *Journal of Consulting Psychology, 25*(4), 316-323.

Appendices

Appendix A: Vignette used in Experiment 1

“Imagine you have been asked to participate in an experiment that is trying to examine how people reason. You agree to participate in the study. The experimenter explains that you will be asked to attempt a mental multiplication task. If you give the correct answer, you will be rewarded with a prize. You are brought into a room to be given the task. When in the room, the experimenter shows you two identical envelopes and explains that within one of them is a difficult mental multiplication task while the other contains an easy mental multiplication task. You are asked to make a choice. You are then told that when the envelope is opened and you are shown the task, you will have 30 seconds to solve it. The experimenter opens the card you chose and it turns out to be the difficult task (68x72). You attempt to solve the problem but before you arrive at the correct answer, your time elapses. You have failed the task. You receive no prize”.

Appendix B: Counterfactual generation sheet

Please list at least one way in which things could have been different, using “If only” type statements.

1)

2)

3)

4)

5)

6)

Appendix C: Autonomy questionnaire (Bekker & van Assen, 2006)

Below is a list of statements with possible responses ranging from 1 (Doesn't fit me) to 7 (Completely fits me). Please tick the response that best applies to you.

1. I often go into the feelings and experiences of others.	1	2	3	4	5	6	7
2. I am seldom occupied with the feelings and experiences of others.	1	2	3	4	5	6	7
3. I am rarely occupied with other people's view of me.	1	2	3	4	5	6	7
4. I often wonder what other people think of me.	1	2	3	4	5	6	7
5. I can easily put aside other people's comments.	1	2	3	4	5	6	7
6. I can hardly bear it when other people are angry with me.	1	2	3	4	5	6	7
7. I hate detachment.	1	2	3	4	5	6	7
8. When I take important decisions about my life, I leave other people's wishes and opinions out of consideration.	1	2	3	4	5	6	7
9. I feel a strong need for other people's advice and guidance.	1	2	3	4	5	6	7
10. If I do something that bothers other people, I can easily dismiss that from my mind.	1	2	3	4	5	6	7
11. I am seldom inclined to ask other people's advice.	1	2	3	4	5	6	7
12. I can easily back out of the things that people who are important to me want me to do.	1	2	3	4	5	6	7
13. I often long for love and warmth.	1	2	3	4	5	6	7
14. Usually I can dismiss another person's misery from my mind.	1	2	3	4	5	6	7
15. If I imagine myself having to say goodbye to a beloved person, I feel broken hearted in advance.	1	2	3	4	5	6	7
16. If I have things my own way against the will of others, I usually get very restless.	1	2	3	4	5	6	7
17. Somebody else's experiences leave a strong mark on my own moods.	1	2	3	4	5	6	7
18. I quickly feel at ease in new situations.	1	2	3	4	5	6	7

19. I easily come to grips with a new problem on my own.	1	2	3	4	5	6	7
20. I need a lot of time to get accustomed to a new environment.	1	2	3	4	5	6	7
21. I am a very adventurous type.	1	2	3	4	5	6	7
22. If it were up to me, I would spend most of my time in familiar surroundings.	1	2	3	4	5	6	7
23. I find it hard to start new activities on my own.	1	2	3	4	5	6	7
24. I often don't know what my opinion is.	1	2	3	4	5	6	7
25. I have outspoken opinions on most subjects.	1	2	3	4	5	6	7
26. I often find it difficult to determine what I really want.	1	2	3	4	5	6	7
27. Usually it is very clear to me what I like most.	1	2	3	4	5	6	7
28. If I disagree with others, I make that very plain.	1	2	3	4	5	6	7
29. If I am asked what I want, I mostly know the answer immediately.	1	2	3	4	5	6	7
30. Hearing the opinions of other people often makes me change my mind.	1	2	3	4	5	6	7

Appendix D: Information sheet



PARTICIPANT INFORMATION SHEET

PLEASE KEEP THIS PAGE FOR YOUR INFORMATION

My name is David Maloney and I am currently conducting postgraduate research in the Department of Psychology in Mary Immaculate College under the supervision of Dr. Suzanne Egan. You are being invited to participate in my study. Thank you for taking time to read this information.

STUDY TITLE: Self-regulatory individual differences and counterfactual thinking

WHAT ARE THE OBJECTIVES OF THIS STUDY? In my research, I am interested in finding out whether personal motivation influences how people think counterfactually. Counterfactual thinking is the ability to think about what might have been.

WHY HAVE I BEEN CHOSEN? You have been approached to participate in this research as participants are being selected from the student body of Mary Immaculate College.

WHAT WILL HAPPEN IF I VOLUNTEER? Your participation is entirely voluntary. If you initially decide to take part you can subsequently change your mind and withdraw from the study without penalty. If you agree to participate you will be asked to engage with cognitive exercises, and complete an anonymous questionnaire. Participation will take 10-15 minutes approximately and will take place on campus.

RIGHT TO WITHDRAW: You can withdraw from the study at any point prior to returning your questionnaires. However, once the questionnaire has been returned it is not possible to withdraw your data as it will be anonymous.

ARE THERE ANY BENEFITS FROM MY PARTICIPATION? Studies like these can make an important contribution to our understanding of the factors effecting how people think counterfactually. As such, the findings from this study may be presented at national and international conferences and may be submitted for publication in peer-reviewed journals. However no individual participant will be

identified in any publication or presentation. Individuals will not be offered any monetary or other rewards for their participation.

ARE THERE ANY RISKS INVOLVED IN PARTICIPATING? The risks associated with participation are minimal and any inconvenience involved in taking part will be limited.

WHAT HAPPENS IF I DO NOT AGREE TO PARTICIPATE? Participation is voluntary so you are not obligated to take part in the study if you do not wish to. There is no penalty for not participating.

CONFIDENTIALITY: All individual information collected as part of the study will remain anonymous and you will be instructed not to put your name anywhere on the questionnaires. Hard copies of questionnaires will be kept in a locked filing cabinet. Hard copies of the data will be held for 5 year after the research has been published, while electronic data will also be held for a period of 5 years, after publication. The research will act in accordance to the data protection act.

CONTACT DETAILS If you have any further questions about the research you can contact:

David Maloney (Researcher): david.maloney@mic.ul.ie

Dr. Suzanne Egan (Supervisor): Suzanne.egan@mic.ul.ie

If you have any concerns about this study and wish to contact someone independently, you may contact:

Emma Barry,
MIREC Administrator,
Mary Immaculate College,
South Circular Road,
Limerick,
061-204515
Emma.barry@mic.ul.ie

Thank You,
David Maloney.

Appendix E: Consent form



Consent Form

Self-regulatory individual differences and counterfactual thinking

My name is David Maloney and I am currently conducting postgraduate research in the Department of Psychology in Mary Immaculate College under the supervision of Dr. Suzanne Egan. Thank you for your interest in taking part in my study.

Please note that participation in this study is voluntary and you may withdraw your participation at any time without penalty.

As described in the information sheet any data you provide will be stored anonymously and cannot be traced back to you.

By signing in the space below I confirm that I am 18 years of age or older, that I have read and understood this form and the information sheet completely and I consent to participant in the above named study.

Signed: _____

Date: _____

Thank You,

David Maloney.

Appendix F: Anagrams used in Experiments 2, 3 & 6

Score of 1 point for each correct answer here:

ACNFY	
CNIFH	
HSAFL	
NRTOF	
AUGRD	
NOEHY	

Score of 3 points for each correct answer here:

ODRCW	
PHTED	
LTIGN	
FNKIE	
EMCYR	
KASNC	

Score of 5 points for each correct answer here:

GBTIO	
TELSY	
OUSTC	
RETIV	
OFREC	
HRCUS	

Total

Answers:

FANCY, FINCH, FLASH, FRONT, GUARD, HONEY.
CROWD, DEPTH, GLINT, KNIFE, MERCY, SNACK.
BIGOT, STYLE, SCOUT, RIVET, FORCE, CRUSH.

Score of 1 point for each correct answer here:

NEIBR	
BNHUC	
CIAHR	
HMIEC	
OWNLC	
NIRDK	

Score of 3 points for each correct answer here:

ONAPR	
ADEBL	
PLIMB	
NBIAC	
LKCOA	
TCUON	

Score of 5 points for each correct answer here:

CRIAV	
IUNYT	
KTENO	
GBRUY	
YAORV	
HAENY	

Total

Answers:

BRINE, BUNCH, CHAIR, CHIME, CLOWN, DRINK.
APRON, BLADE, BLIMP, CABIN, CLOAK, COUNT
VICAR, UNITY, TOKEN, RUGBY, OVARY, HYENA.

Appendix G: Manipulation check of participant satisfaction used in Experiments 2, 3 & 7

To assist you in determining how you did in the anagram task, below you will find a scale indicating how performance in the task is usually determined. In theory, by answering all the anagrams correctly, a score of 54 is possible.

40 – 54: Excellent

30 – 40: Good

20 – 30: Average

10 – 20: Below average

0 – 10: Poor

How satisfied are you with your performance on the anagrams?

Not satisfied at all

Somewhat satisfied

Very satisfied

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Appendix H: Filer task used in Experiments 2, 3 & 6

Look at these sentences. Is there anything wrong with them grammatically? Would you like to make any changes?

1. I liked that film we saw last night and Lucy did to.

2. Albert Thomas 1932 - 1993 wrote some intresting guide books they demonstrated a wide understanding of these areas..

3. It was a hot humid day and he was sat down reading a book when his sister Tracy came to visit him she was sweating a lot.

4. She said that, 21% of students in the university were from the city.

Appendix I: Control perception measure used in Experiment 2

I am largely in control of the outcome of my score in the next trial

Disagree completely

Agree completely

1	2	3	4	5	6	7
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Appendix J: Cognitive puzzles used in training phase of Experiments 4 and 5

AlphaGRAMS (there will be 5)

Solve the anagrams. The solutions are in consecutive alphabetical order.

<u>Sample:</u>	<u>Answers:</u>
ROWEL	LOWER
SAMPLE	MAPLES
RUN LAME	NUMERAL
ROASTING	ORGANIST
SIP SCARLET	PARTICLES

Anagrams (there will be 7)

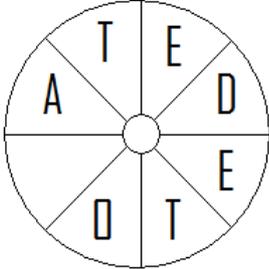
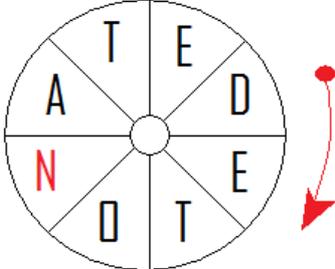
Make a word out of all of the letters provided.

<u>Sample:</u>	<u>Answer:</u>
ACNFY	FANCY

Word circles (there will be 5)

Figure out the missing letter which completes an eight-letter word reading either clockwise or anticlockwise

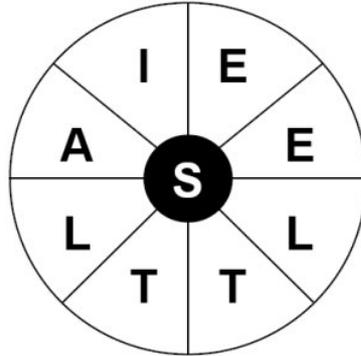
<u>Sample</u>	<u>Answer: DETONATED</u>
---------------	--------------------------

Word wheels (there will be 5)

Find the 9 letter word that is scrambled below. It starts with the centre letter

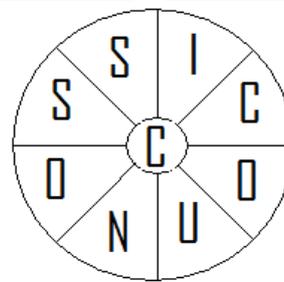
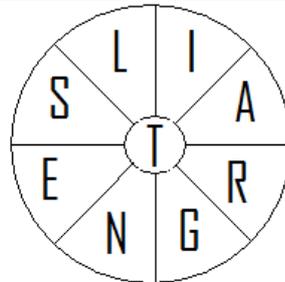
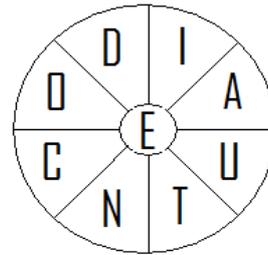
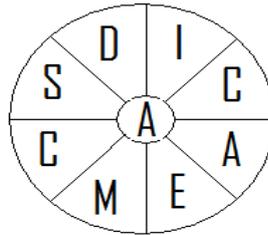
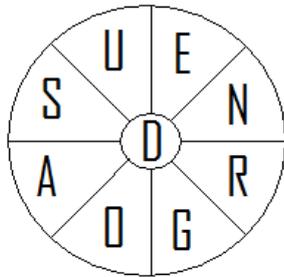
Sample:



Answer: SATELLITE

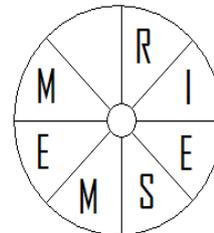
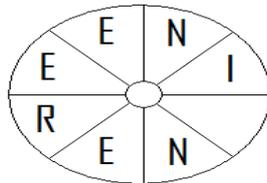
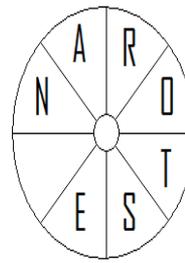
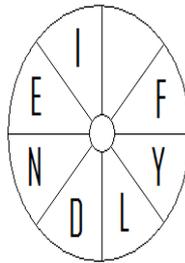
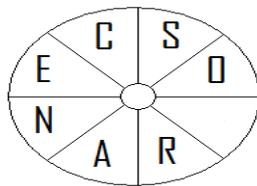
Word wheel

Find the 9 letter word that is scrambled below. It starts with the centre letter.



Word circle

Figure out the missing letter which completes an eight-letter word reading either clockwise or anticlockwise.



Anagrams

Make a word out of all of the letters provided

Answers:

HSAFL	_____
NRTOF	_____
LTIGN	_____
FNKIE	_____
GBTIO	_____
TELSY	_____
OUSTC	_____

AlphaGRAMS

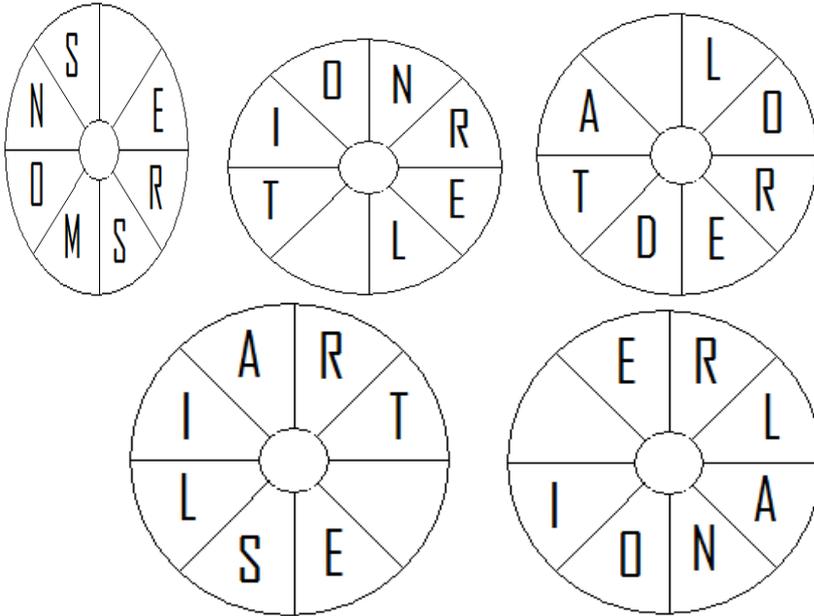
Solve the anagrams. The solutions are in consecutive alphabetical order.

Answers:

LEASE	_____
HOT FUR	_____
NOUGHTS	_____
TEACHERS	_____
SUNLIT SEA	_____

Word circle

Figure out the missing letter which completes an eight-letter word reading either clockwise or anticlockwise.



Anagrams

Make a word out of all of the letters provided

AUGRD
 NOEHY
 EMCYR
 KASNC
 RETIV
 OFREC
 HRCUS

Answers:

AlphaGRAMS

Solve the anagrams. The solutions are in alphabetical order.

Answers:

OMITS

INSECT

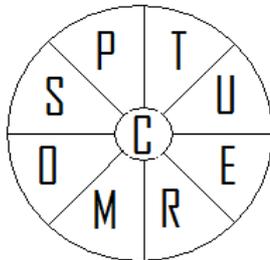
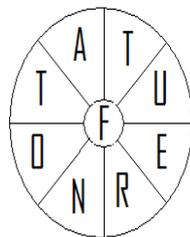
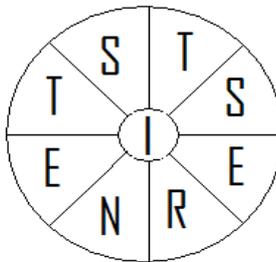
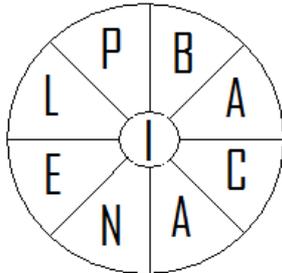
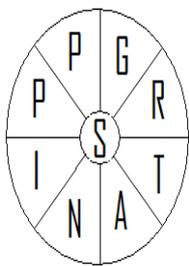
NO CIGAR

PIE CRUST

TOO QUIANT

Word wheel

Find the 9 letter word that is scrambled below. It starts with the centre letter.



Appendix L: Manipulation check of participant satisfaction used in Experiments 4 and 5

How satisfied are you with your performance on the puzzles?

Not satisfied at all Somewhat satisfied Very satisfied

1	2	3	4	5	6	7
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*Appendix M: Action\state orientation measure (Diefendorff, 2005)
used in Experiments 4 and 5*

Please tick the letter of the sentence that best describes you for each pair of statements

1. When I have lost something that is very valuable to me and I can't find it anywhere:

- (a) I have a hard time concentrating on something else.
- (b) I put it out of my mind after a little while.

2. When I know I must finish something soon:

- (a) I have to push myself to get started.
- (b) I find it easy to get it done and over with.

3. When I have learned a new and interesting game:

- (a) I quickly get tired of it and do something else.
- (b) I can really get into it for a long time.

4. If I've worked for weeks on one project and then everything goes completely wrong with the project:

- (a) It takes me a long time to adjust myself to it.
- (b) It bothers me for a while, but then I don't think about it anymore.

5. When I don't have anything in particular to do and I am getting bored:

- (a) I have trouble getting up enough energy to do anything at all.
- (b) I quickly find something to do.

6. When I'm working on something that's important to me:

- (a) I still like to do other things in between working on it.
- (b) I get into it so much that I can work on it for a long time.

7. When I am in competition and have lost every time:

- (a) I can soon put losing out of my mind.
- (b) The thought that I lost keeps running through my mind.

8. When I am getting ready to tackle a difficult problem:

- (a) It feels like I am facing a big mountain that I don't think I can climb.
- (b) I look for a way that the problem can be approached in a suitable manner.

9. When I'm watching a really good movie:

- (a) I get so involved in the film that I don't even think of doing anything else.
- (b) I often want to get something else to do while I'm watching the movie.

10. If I had just bought a new piece of equipment (for example, a tape deck) and it accidentally fell on the floor and was damaged beyond repair:

- (a) I would manage to get over it quickly.
- (b) It would take me a long time to get over it.

11. When I have to solve a difficult problem:

- (a) I usually don't have a problem getting started on it.
- (b) I have trouble sorting things out in my head so that I can get down to working on the problem.

12. When I have been busy for a long time doing something interesting (for example, reading a book or working on a project):

- (a) I sometimes think about whether what I'm doing is really worthwhile.
- (b) I usually get so involved in what I'm doing that I never think to ask whether it's worthwhile.

13. If I have to talk to someone about something important and, repeatedly, can't find her/him at home:

- (a) I can't stop thinking about it, even while I'm doing something else.
- (b) I easily forget about it until I can see the person again.

14. When I have to make up my mind about what I am going to do when I get some unexpected free time:

- (a) It takes me a long time to decide what I should do during this free time.
- (b) I can usually decide on something to do without having to think it over very much.

15. When I read an article in the newspaper that interests me:

- (a) I usually remain so interested in the article that I read the entire article
- (b) I still often skip to another article before I've finished the first one.

16. When I have bought a lot of stuff at a store and realize when I get home that I paid too much - but can't get my money back:

- (a) I can't concentrate on anything else.
- (b) I easily forget about it.

17. When I have work to do at home:

- (a) It is often hard for me to get the work done.
- (b) I usually get it done right away.

18. When I'm on vacation and having a good time:

- (a) After a while, I really feel like doing something completely different.
- (b) I don't even think about doing anything else until the end of vacation.

19. When I am told that my work has been completely unsatisfactory:

- (a) I don't let it bother me for too long.
- (b) I feel paralysed.

20. When I have a lot of important things to do and they must all be done soon:

- (a) I often don't know where to begin.
- (b) I find it easy to make a plan and stick with it.

21. When one of my co-workers brings up an interesting topic of discussion:

- (a) It can easily develop into a long conversation.
- (b) I soon lose interest and want to go do something else.

22. If I am stuck in traffic and miss an important appointment:

- (a) At first, it's difficult for me to start doing anything else at all.
- (b) I quickly forget about it and do something else.

23. When there are two things that I really want to do, but I can't do both of them:

- (a) I quickly begin one thing and forget about the other thing I couldn't do.
- (b) It's not easy for me to put the other thing I couldn't do out of my mind.

24. When I am busy working on an interesting project:

- (a) I need to take frequent breaks and work on other projects.
- (b) I can keep working on the same project for a long time.

25. When something is very important to me, but I can't seem to get it right:

- (a) I gradually lose heart.
- (b) I just forget about it and go do something else.

26. When I have to take care of something important which is also unpleasant:

- (a) I do it and get it over with.
- (b) It can take a while before I can bring myself to it.

27. When I am having an interesting conversation with someone at a party:

- (a) I can talk to him or her the entire evening.
- (b) I prefer to go do something else after a while.

28. When something really gets me down:

- (a) I have trouble doing anything at all.
- (b) I find it easy to distract myself by doing other things.

29. When I am facing a big project that has to be done:

- (a) I often spend too long thinking about where I should begin.
- (b) I don't have any problems getting started.

30. When it turns out that I am much better at a game than the other players:

- (a) I usually feel like doing something else.
- (b) I really like to keep playing.

31. When several things go wrong on the same day:

- (a) I usually don't know how to deal with it.
- (b) I just keep on going as though nothing had happened.

32. When I have a boring assignment:

- (a) I usually don't have any problems getting through it.
- (b) I sometimes can't get moving on it.

33. When I read something I find interesting:

- (a) I sometimes want to put the article down and do something else.
- (b) I will sit and read the article for a long time.

34. When I have to put all my effort into doing a really good job on something and the whole thing doesn't work out:

- (a) I don't have too much difficulty starting something else.
- (b) I have trouble doing anything else at all.

35. When I have an obligation to do something that is boring and uninteresting:

- (a) I do it and get it over with.
- (b) It can take me a while before I can bring myself to do it.

36. When I am trying to learn something new that I want to learn:

- (a) I'll keep at it for a long time.
- (b) I often feel like I need to take a break and go do something else for a while.

Appendix N: *Self-affirmation exercises used in Experiments 6 and 7*

Below is a list of characteristics and values, some of which may be important to you, some of which may be unimportant. Please rank these values and qualities in order of their importance to you, from 1 to 11 (1 = *most important item*, 11 = *least important item*). Use each number only once.

- Artistic skills/aesthetic appreciation
- Sense of humour
- Relations with friends/family
- Spontaneity/living life in the moment
- Social skills
- Athletics
- Musical ability/appreciation
- Physical attractiveness
- Creativity
- Business/managerial skills
- Romantic values

(Self-Affirmation Condition)

Write a short paragraph explaining why your top-ranked value (from the previous page) is important to you and describe a time in your life when it has been particularly important.

(No self-affirmation condition)

Write a short paragraph explaining why and when the value you ranked 7th in importance on the previous page might be important to the average college student.

Appendix O: Filler task used in Experiment 6

Look at these sentences. Is there anything wrong with them grammatically? Would you like to make any changes?

1. I saw her in the morning she left her house at 10 oclock.

2. I like George in some ways unfortunately his eating habits put me of.

3. The teacher looked at her and said, ‘Your not working hard enough.’

4. The Birmingham Area registers about 70% of all patients in the UK each year many of them are concerned with electronics.

**Appendix P: Cognitive self-affirmation inclination measure
(Pietersma & Dijkstra, 2012)**

Below is a list of statements with possible responses ranging from 1 to 5. Please tick the response that best applies to you.

I realize that besides all the “stupid” things I do, I also do some things very well.

1. Never	2. Rarely	3. Sometimes	4. Often	5. Very often
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I think about the past and all the things that I have successfully accomplished.

1. Never	2. Rarely	3. Sometimes	4. Often	5. Very often
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I notice that I do some things very well.

1. Never	2. Rarely	3. Sometimes	4. Often	5. Very often
----------	-----------	--------------	----------	---------------

When I feel bad about myself, I think about all the things that I can be proud of.

1. Never	2. Rarely	3. Sometimes	4. Often	5. Very often
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I think about all the things that I have successfully accomplished.

1. Never	2. Rarely	3. Sometimes	4. Often	5. Very often
----------	-----------	--------------	----------	---------------

When I have done something wrong that makes me feel dissatisfied with myself, I tell myself that I do not do everything wrong.

1. Never	2. Rarely	3. Sometimes	4. Often	5. Very often
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