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# Adults' and children's consideration of better and worse possible worlds: the impact on mood and preparedness

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**Adults' and children's consideration of better  
and worse possible worlds: The impact on  
mood and preparedness**

A thesis submitted in fulfilment of the  
requirements for the award of the degree of

**DOCTOR OF PHILOSOPHY**

from

**UNIVERSITY OF WOLLONGONG**

by

Rebecca Zuchetti, BPsych

School of Psychology

December 2010

## **Declaration**

I, Rebecca A. Zuchetti, declare that this thesis, submitted in fulfilment of the requirements of the degree of Doctor of Philosophy, in the School of Psychology, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not previously been submitted for qualifications at any other academic institution.

Rebecca A. Zuchetti

9<sup>th</sup> December, 2010

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## **Abstract**

Counterfactual thinking refers to our everyday thoughts of ‘what if’ and ‘if only’ when we consider an outcome and ponder over how it could have been better (upward counterfactuals) or worse (downward counterfactuals). Extensive research has investigated the nature and consequences of such thinking in the adult population. However, uncertainty is present in the functionalist account of counterfactual thinking as to how the consideration of both better and worse alternatives impacts one’s affective and preparatory feelings. The consequences arising from counterfactual thinking in the event of positive outcomes also requires clarification, as does the role of downward counterfactual generation. Further, limited research has examined counterfactual thinking and its resulting consequences in preadolescent children. Subsequently, this thesis aimed to address these primary concerns in a series of six experiments. Experiments 1a ( $N = 152$ ) and 1b ( $N = 115$ ) each consisted of a hypothetical scenario task and personal reflection task (mixed outcome valence); Experiments 2a ( $N = 86$ ) and 2b ( $N = 94$ ) were performance oriented anagram tasks with manipulated positive and negative outcomes; and Experiments 3a ( $N = 121$ ) and 3b ( $N = 81$ ) were positively valenced hypothetical scenario and anagram tasks respectively, conducted with children aged 9 to 11 years. Affect and preparedness were measured in each of the six experiments and self-efficacy was also assessed in the anagram tasks to extend upon Tal-or, Boninger, and Gleicher (2004). In the event of positive outcomes, it was found that upward counterfactuals exerted the greatest (and detrimental) influence on adults’ and children’s affect, while downward counterfactuals resulted in a stable to improved affective state for adults, but like upward counterfactuals, had a tendency to exert a mood-depressive effect in children. The sequential consideration of both directions of

counterfactuals showed no beneficial advantage in the event of positive or negative outcomes, but did result in the hypothesised mood neutralisation for neutral valenced outcomes. Stable to improved mood commonly arising from downward counterfactual generation appeared to be associated with greater feelings of preparedness. Given the findings of the negatively valenced outcomes as detailed in this thesis, and the apparent discord with the majority of the literature, it is argued that situational and dispositional factors exert a substantial influence over counterfactual thinking and its resulting consequences. Overall, the present research demonstrated that it is advantageous for adults to consider worse alternatives to reality in the event of positive outcomes, and that encouraging children to merely think counterfactually may be advantageous to their experiential learning, thus enabling them to strive for future improvement.

# Table of Contents

Declaration .....	ii
Acknowledgements .....	iii
Abstract .....	iv
Table of Contents .....	vi
List of Figures .....	x
List of Tables.....	xi
Overview .....	xiv
Chapter 1: Counterfactual Thinking: An Overview .....	1
1. 1 What is Counterfactual Thinking? .....	1
1. 2 Composition of Counterfactual Thoughts.....	3
1. 3 How People Mentally Alter Reality .....	6
1. 4 Functions of Counterfactual Thought .....	9
1.4.1 Upward Counterfactuals and the Preparatory Function .....	10
1.4.2 Downward Counterfactuals and the Affective Function.....	13
1.4.2.1 Affective Contrast and Assimilation.....	17
1.4.3 The Counterfactual ‘Trade-Off’ .....	20
1.4.4 Dual Counterfactual Generation .....	21
1. 5 New Frontiers in the Functions of Counterfactual Thought .....	24
1. 6 Summary .....	27
Chapter 2: Assessing Counterfactual Thinking.....	28
2. 1 Counterfactual Solicitation .....	29
2.1.1 Spontaneous Counterfactual Solicitation .....	29
2.1.2 Solicitation of Counterfactuals after a Prompt.....	31
2.1.3 Direction-Specific Counterfactual Solicitation .....	33
2. 2 Methodologies for Examining Counterfactual Thinking .....	36
2.2.1 Scenario Methodologies.....	37
2.2.2 Real-life Reflections.....	40
2.2.3 Laboratory Methodologies .....	42
2.2.3.1 Anagram Tasks.....	43
2.2.3.2 Other Laboratory Tasks.....	46
2. 3 Counterfactual Thinking and Outcome Valence.....	49
2. 4 Counterfactual Thinking in the Event of a Close-call.....	52
2. 5 The Relationship between Counterfactual Thinking and Self-Efficacy .....	55
2. 6 Summary .....	58
Chapter 3: Counterfactual Thinking in Children .....	60
3. 1 The Emergence of Children’s Counterfactual Reasoning.....	61
3. 2 The Ability of Preschool Children to Consider Counterfactual Alternatives .....	62



3. 3 Preschool Children's Purported Difficulty with Counterfactual Reasoning.....	64
3.3.1 The Relation between Children's Competence in Counterfactual Reasoning Tasks and Other Cognitive Processes .....	67
3. 4 The Progression of Children's Capacity to Think Counterfactually.....	70
3.4.1 The Possible Attribution of Methodological Differences .....	73
3. 5 The Importance of Continued Research.....	75
3. 6 School-aged Children's Fluency in Counterfactual Reasoning .....	76
3. 7 Consequences of Children's Counterfactual Thought .....	78
3.7.1 Children's Emotional Responses to Counterfactual Alternatives .....	79
3.7.2 Children's Counterfactual Thinking and the Preparative Function .....	83
3. 8 The Present Research .....	84
Chapter 4: Scenario Tasks with Adults.....	91
4. 1 Experiment 1a .....	93
4. 2 Method .....	94
4.2.1 Participants.....	94
4.2.2 Design .....	95
4.2.3 Materials and Procedure.....	95
4. 3 Results.....	98
4.3.1 Rating of Counterfactuals .....	98
4.3.2 Task 1 .....	99
4.3.2.1 Number of Counterfactuals Generated .....	99
4.3.2.2 Preliminary Analyses of the Data Set .....	100
4.3.2.3 Change in Mood after Counterfactual Generation .....	101
4.3.2.4 Composite Mood.....	104
4.3.2.5 Preparedness.....	106
4.3.2.6 Processing Mode .....	107
4.3.3 Task 2 .....	108
4.3.3.1 Number of Counterfactuals Generated .....	108
4.3.3.2 Preliminary Analyses of the Data Set .....	109
4.3.3.3 Change in Mood after Counterfactual Generation .....	111
4.3.3.4 Composite Mood.....	112
4.3.3.5 Preparedness.....	113
4.3.3.6 Processing Mode .....	114
4. 4 Discussion .....	114
4. 5 Experiment 1b.....	119
4. 6 Method .....	120
4.6.1 Participants.....	120
4.6.2 Design and Procedure .....	121
4. 7 Results.....	123
4.7.1 Rating of Counterfactuals .....	123
4.7.2 Task 1 .....	124
4.7.2.1 Number of Counterfactuals Generated .....	124
4.7.2.2 Preliminary Analyses of the Data Set .....	125
4.7.2.3 Perceived Controllability .....	<b>Error! Bookmark not defined.</b>
4.7.2.4 Change in Mood after Counterfactual Generation .....	128
4.7.2.5 Preparedness.....	129
4.7.3 Task 2 .....	129
4.7.3.1 Number of Counterfactuals Generated .....	129

4.7.3.2 Preliminary Analyses of the Data Set .....	130
4.7.3.3 Perceived Controllability .....	131
4.7.3.4 Change in Mood after Counterfactual Generation .....	133
4.7.3.5 Composite Mood .....	134
4.7.3.6 Preparedness .....	136
4. 8 Discussion .....	136
Chapter 5: Anagram Tasks with Adults .....	142
5. 1 Experiment 2a .....	144
5. 2 Method .....	145
5.2.1 Participants .....	145
5.2.2 Design .....	145
5.2.3 Materials .....	146
5.2.4 Procedure .....	148
5. 3 Results .....	150
5.3.1 Rating of Counterfactuals .....	150
5.3.2 Number of Counterfactuals Generated .....	150
5.3.3 Preliminary Analyses of the Data Set .....	152
5.3.4 Change in Mood after Counterfactual Generation .....	154
5.3.5 Composite Mood .....	155
5.3.6 Self-Efficacy and Preparedness .....	156
5.3.7 Performance Measures .....	159
5. 4 Discussion .....	161
5. 5 Experiment 2b .....	166
5. 6 Method .....	167
5.6.1 Participants .....	167
5.6.2 Design and Procedure .....	167
5. 7 Results .....	168
5.7.1 Rating of Counterfactuals .....	168
5.7.2 Number of Counterfactuals Generated .....	168
5.7.3 Preliminary Analyses of the Data Set .....	169
5.7.4 Change in Mood after Counterfactual Generation .....	171
5.7.5 Self-Efficacy and Preparedness .....	171
5.7.6 Performance Measures .....	173
5. 8 Discussion .....	175
Chapter 6: Scenario and Anagram Tasks with Children .....	180
6. 1 Experiment 3a .....	181
6. 2 Method .....	183
6.2.1 Participants .....	183
6.2.2 Design .....	183
6.2.3 Materials and Procedure .....	184
6. 3 Results .....	186
6.3.1 Rating of Counterfactuals .....	186
6.3.2 Number of Counterfactuals Generated .....	186
6.3.3 Preliminary Analyses of the Data Set .....	187
6.3.4 Change in Mood after Counterfactual Generation .....	190
6.3.5 Preparedness .....	191
6. 4 Discussion .....	192

6. 5 Experiment 3b .....	198
6. 6 Method .....	199
6.6.1 Participants .....	199
6.6.2 Design .....	200
6.6.3 Materials and Procedure.....	200
6. 7 Results .....	203
6.7.1 Rating of Counterfactuals .....	203
6.7.2 Number of Counterfactuals Generated.....	203
6.7.3 Preliminary Analyses of the Data Set .....	205
6.7.4 Change in Mood after Counterfactual Generation.....	207
6.7.5 Self-Efficacy and Preparedness.....	208
6.7.6 Performance Measures .....	210
6. 8 Discussion .....	211
Chapter 7: General Discussion.....	217
7. 1 Counterfactual Generation .....	218
7.1.1 Adults' Counterfactual Generation .....	218
7.1.2 Children's Counterfactual Generation .....	221
7. 2 Affective Consequences of Single and Dual Direction Counterfactual Generation .....	223
7.2.1 Observed Affective Consequences of Adults' Counterfactual Generation..	226
7.2.2 Affective Consequences of Children's Counterfactual Thinking .....	232
7. 3 Preparatory Consequences of Single and Dual Direction Counterfactual Generation .....	237
7.3.1 Preparatory Consequences of Adults' Counterfactual Thinking .....	239
7.3.2 Preparatory Consequences of Children's Counterfactual Thinking.....	244
7. 4 The influence of Counterfactual Thinking on Self-Efficacy.....	245
7. 5 Spontaneous Reflective and Evaluative Processing.....	248
7. 6 Summary of Core Insights Gleaned from the Present Research .....	249
7. 7 Limitations of the Present Research.....	253
7. 8 Suggestions for Future Research.....	256
7. 9 Conclusion .....	258
References .....	260
Appendix A .....	273
Appendix B .....	275
Appendix C .....	276
Appendix D .....	277
Appendix E .....	282
Appendix F.....	283
Appendix G .....	284

## List of Figures

Figure 4.1: Changes in mean composite mood ratings in Task 1, Experiment 1a.....	106
Figure 4.2: Changes in mean composite mood ratings in Task 2, Experiment 1a.....	113
Figure 4.3: Changes in mean composite mood ratings in Task 2. ....	135
Figure 5.1: Changes in mean composite mood ratings in Experiment 2a.....	156
Figure 5.2: Changes in mean self-efficacy ratings in Experiment 2a. ....	157
Figure 5.3: Proportional change in average trial time in Experiment 2a. ....	161
Figure 5.4: Changes in mean self-efficacy ratings in Experiment 2b.....	172
Figure 6.1: Changes in mean self-efficacy ratings across conditions in Experiment 3b. .....	209

## List of Tables

Table 4.1: Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 1, Experiment 1a.....	99
Table 4.2: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After Counterfactual Generation in Task 1, Experiment 1a .....	100
Table 4.3: Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions for Task 1, Experiment 1a .....	107
Table 4.4: Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 2, Experiment 1a.....	109
Table 4.5: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After Counterfactual Generation in Task 2, Experiment 1a .....	110
Table 4.6: Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions for Task 2, Experiment 1a .....	114
Table 4.7: Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 1, Experiment 1b .....	125
Table 4.8: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After Counterfactual Generation in Task 1, Experiment 1b .....	127
Table 4.9: Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions for Task 1, Experiment 1b.....	129
Table 4.10: Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 2, Experiment 1b .....	130
Table 4.11: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After Counterfactual generation in Task 2, Experiment 1b .....	132

Table 4.12: Mean Preparedness Ratings (with Standard Deviations in Parentheses)	
Across Conditions for Task 2, Experiment 1b .....	136
Table 5.1: Mean Number of Counterfactuals Generated Across Conditions (with	
Standard Deviations in Parentheses) in Experiment 2a .....	151
Table 5.2: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and	
After Counterfactual Generation in Experiment 2a .....	153
Table 5.3: Mean Preparedness Ratings (with Standard Deviations in Parentheses) in	
Experiment 2a .....	158
Table 5.4: Performance Measure Means (with Standard Deviations in Parentheses) in	
Experiment 2a .....	160
Table 5.5: Mean Number of Counterfactuals Generated Across Conditions (with	
Standard Deviations in Parentheses) in Experiment 2b .....	169
Table 5.6: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and	
After Counterfactual Generation in Experiment 2b .....	170
Table 5.7: Mean Preparedness Ratings (with Standard Deviations in Parentheses) in	
Experiment 2b .....	173
Table 5.8: Performance Measure Means (with Standard Deviations in Parentheses) in	
Experiment 2b .....	174
Table 6.1: Mean Number of Counterfactuals Generated Across Conditions (with	
Standard Deviations in Parentheses) in Experiment 3a .....	187
Table 6.2: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and	
After Counterfactual Generation in Experiment 3a .....	188
Table 6.3: Mean Preparedness Ratings (with Standard Deviations in Parentheses)	
Across Conditions in Experiment 3a .....	192

Table 6.4: Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Experiment 3b .....	204
Table 6.5: Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After Counterfactual Generation in Experiment 3b .....	206
Table 6.6: Mean Preparedness Ratings (with Standard Deviations in Parentheses) of Confidence and Readiness to Complete a Second Anagram Task Across Conditions in Experiment 3b .....	210
Table 6.7: Performance Measure Means (with Standard Deviations in Parentheses) in Experiment 3b .....	211
Table 7.1: Mean Number of Upward and Downward Counterfactuals (CFs) Generated Across Conditions in the Eight Experimental Tasks .....	219
Table 7.2: Mean Mood Ratings of Overall Happiness, Glad, and Frustrated Before and After Counterfactual (CF) Generation across Conditions in the Eight Experimental Tasks .....	224
Table 7.3: Mean Self-Reported Preparedness Ratings across Conditions in the Eight Experimental Tasks .....	238
Table 7.4: Mean Self-Efficacy (SE) Ratings across Conditions in the Three Anagram Experiments.....	246

## Overview

Have you ever thought about how a given outcome could have been different? If you had studied more for that exam, you might have got into a better university; if you had not been delayed that morning, it could have been you involved in that car accident; if you had chosen the other assignment topic, you could have received a worse grade; or if you had not drunk so much the night before, you would not have been so sick. Chances are, such thoughts have crossed your mind, as you reflected upon a past event and imagined how it could have turned out differently, for better or worse. The mental construction of these alternatives to reality is called *counterfactual thinking*.

The field of counterfactual thinking has received extensive investigation on the nature of such thoughts (e.g., Boninger, Gleicher, & Strathman, 1994; McMullen, 1997; Roese & Olson, 1995a), the different circumstances in which specific types of counterfactuals are likely to occur (e.g., Roese & Hur, 1997; Sanna, 1997; Mandel, 2003) and the consequences that one experiences when engaging in counterfactual thought (e.g., Markman, Gavanski, Sherman, & McMullen 1993; Roese, 1994; Sanna, 1996). Although the research conducted in this field is extant (e.g., Boninger et al., 1994; Byrne, 2002; Epstude & Roese, 2008; Markman et al., 1993; Roese, 1994, 1997; Sanna, 1997), much of the recent research has focused on the application of counterfactual thinking in areas such as mental health (e.g., El Leithy, Brown, & Robbins, 2006; Markman & Miller, 2006), delinquency (e.g., Dhimi, Mandel, & Souza, 2005; Mandel & Dhimi, 2005), consumer decision making (e.g., Tsiros & Mittal, 2000), and health (e.g., Andersson & Hovell, 2006; Callander, Brown, Tata, & Regan, 2007).



Other recent research has clarified some of the assumptions and governing factors of counterfactual thought and the functions they serve to the individual (e.g., Epstude & Roese, 2008). New theoretical frameworks and models have been proposed in an attempt to overcome some of the discrepancies in the earlier functional perspective of counterfactual thinking (e.g., Markman et al., 1993; Roese 1994, 1997; Roese & Olson, 1995b; Sanna, 1996). For example, Markman and McMullen (2003) proposed the Reflection and Evaluation Model as an organising framework, and Epstude and Roese (2008) put forward the notion of content-neutral and content-specific pathways for the behavioural consequences of counterfactual thinking.

Much however, remains unclear about the processes and functions involved with the pervasive cognitive function of counterfactual thinking. For example, what effect does the sequential consideration of both better and worse possible worlds have on one's mood? Does this sequential consideration of both directions of counterfactual comparison (i.e., better and worse alternatives to reality) result in both preparedness and improvement in affect, and thus negate the negative consequences associated with the consideration of a single direction of counterfactual? And how do the affective and preparative consequences resulting from dual direction counterfactual generation (the sequential consideration of better and worse alternatives to reality) directly compare to those experienced after thinking counterfactually in a single direction? Other aspects of counterfactual thinking that remain uncertain are the types of instances in which worse alternatives to reality improve mood; the fluency of primary school-aged children's counterfactual generation in comparison to adults; and the consequences that these children experience from engaging in counterfactual thought. It is these questions that were explored in the current research.

Although the notion of dual counterfactual generation is somewhat simplistic with the possibility of two contrast effects cancelling each other out (i.e., the negative affect associated with comparisons in the upward direction against potentially better alternatives, and the lack of preparedness associated with downward comparisons against potentially worse alternatives), this possible cancelling effect has not been explicitly examined empirically. As the consideration of both upward (better) and downward (worse) comparisons when constructing mental alternatives to reality is likely to occur in everyday life, this conception was worthy of systematic investigation. If differences in the observable consequences of single compared to dual direction counterfactual generation are present, possible implications for methodologies asking participants to consider only one direction of counterfactual comparison may result. Given the nature of this investigation, the earlier functionalist perspectives of counterfactual thinking are revisited.

Throughout the literature investigating the functions of counterfactual thinking, both scenario-based (e.g., Boninger et al., 1994; Roese & Hur, 1997; Sanna & Turley, 1996) and experience-based (e.g., Markman et al., 1993; Morris & Moore, 2000; Sanna, 1996) methodologies have been utilised. Scenario tasks are useful in providing a more generalised conception of the consequences resulting from counterfactual thinking, while experience-based tasks, such as an anagram task conducted in the laboratory, provide a uniform and direct experience from which participants can generate counterfactuals. Thus, the research conducted for this thesis has utilised both methodologies.

## **Overview of Current Research**

Six experiments were conducted for this thesis to investigate the aforementioned questions, and thus further delve into the processes and functions involved with adults' and children's counterfactual thinking. Essentially, the same experimental design and focal dependent measures were employed to examine the ways in which single direction – compared to dual direction – counterfactual generation affects mood and preparedness. Participants were assigned to one of four counterfactual conditions (two single direction conditions and two dual direction conditions) and completed dependent measures for affect and preparedness, with affect ratings made before and after counterfactual generation. The anagram experiments also examined self-efficacy to clarify whether this construct is altered by counterfactual thinking (c.f., Tal-or, Boninger, & Gleicher, 2004). In addition, a controllability measure was also incorporated into one of the scenario experiments conducted with adult participants to determine if perceived controllability affects counterfactual thinking.

As Experiments 1a and 1b were exploratory in nature, scenario methodologies were employed to ascertain any differences between single and dual direction counterfactual generation on participants' mood and preparedness. This also provided the opportunity to examine different types of events (e.g., academic, daily life, close-call) that are reasonably mundane, and to which the participants could relate, as well as to examine neutral and positively valenced outcomes. The two scenario experiments utilised a hypothetical scenario task and a personal reflection task. Experiment 1a also assessed the frequency in which reflective and evaluative counterfactuals are spontaneously generated by participants when engaging in a specified direction of counterfactual thought. The findings of the scenario tasks with a neutral or positive outcome revealed a recency effect for the direction of the last counterfactuals generated

in the dual direction counterfactual conditions. However, the close-call scenario task did not yield significant mood effects, demonstrating that the nature of the experience and subsequent outcome plays a significant role in determining the effect of counterfactual thinking on mood. No preparedness effects were evident.

Experiments 2a and 2b were conducted to generalise the findings of the scenario experiments in a performance oriented task. Thus, laboratory-based experiments were conducted utilising an adaptation of Roese's (1994, Experiment 3) anagram task. This methodology removed the participant variability associated with the scenario tasks, particularly the personal reflection task, and provided the same performance context for each participant. Further, participants were able to generate counterfactuals directly pertaining to their immediate performance in the anagram task, rather than mentally simulating a hypothetical scenario or drawing upon past memories. The anagram task also allowed for the manipulation of outcome valence, with the outcome of the first anagram experiment manipulated to be positive, and the second was manipulated to be negative, as the majority of published research on the functions of counterfactual thinking has centred on negatively valenced outcomes (e.g., Boninger et al., 1994; Roese, 1994; Mandel, 2003). The findings of the anagram experiments regarding affective consequences essentially replicated the findings of the scenario tasks according to outcome valence, while downward counterfactuals were associated with heightened preparedness.

Research has demonstrated that children from approximately 3 years of age are able to consider counterfactual alternatives to reality (e.g. Harris, German, & Mills, 1996), with vast improvements in counterfactual reasoning being observed between the ages of 3 and 6 (Beck, Robinson, Carroll, & Apperly, 2006; Chan & Warner, 2007; Guajardo & Turley-Ames, 2004; Amsel & Smalley, 2000). However, the examination

of counterfactual thinking in preadolescent children remains significantly understudied, and thus provided the impetus to seek clarification as to whether counterfactual thinking results in the same consequences for adults and primary school-aged children. Thus, Experiments 3a and 3b were conducted with 9- to 11-year-old children. It was endeavoured to ascertain the ways in which mood and preparedness are affected by single and dual direction counterfactual generation in this age cohort. Experiment 3a employed a hypothetical scenario task, and Experiment 3b utilised the positively valenced anagram task conducted with adult participants with slight modifications made to be within the capabilities of children to complete. The findings revealed that upward counterfactuals affected mood in the predicted way, however, the effect of downward counterfactuals on mood seemed to be altered by the experience and emotion in question. Thus, the dual direction counterfactual conditions reflected this variability. In contrast to adult participants, the scenario experiment involving primary school-age participants demonstrated a preparedness effect for the single direction counterfactual conditions, and children's counterfactual thinking resulted in a change in self-efficacy ratings in the anagram experiment.

## **Thesis Delineation**

Thus far, a brief introduction to the research field of counterfactual thinking has been provided, and the broad objectives of this research thesis have been outlined, along with an overview of the experimental investigations that were undertaken. This section provides a delineation of the thesis chapters that follow.

Chapter 1 presents an overview of the counterfactual thinking literature with a focus on the functions associated with this mental construct. Essentially, the literature is presented in a chronological format to provide a historical perspective of the

counterfactual literature from early conceptions to new frontiers. The chapter describes what counterfactual thinking is, and illustrates the presence of counterfactual thinking in everyday life. The composition and function of counterfactual thoughts are described, with findings from the literature on the earlier functionalist perspective presented. The notion of dual direction counterfactual generation is illustrated and an empirical investigation of this concept is proposed.

Chapter 2 delves more deeply into the literature and presents the methodologies and findings of previous research conducted on specific aspects in the field of counterfactual thinking. This chapter presents the contributions of research conducted on spontaneous and direction-specific counterfactual generation, and describes paradigms for examining the consequences for counterfactual thinking, with findings of particular studies presented. Outcome valence is also discussed with the provision of examples from the literature on the ways in which the consequences of counterfactual thinking are affected by outcome valence, and the limited research investigating the link between self-efficacy and counterfactual thinking is also presented.

As a core component of this research was to investigate the consequences of counterfactual thinking in primary school-aged children, Chapter 3 examines counterfactual research conducted with children. The majority of research has been conducted with young children of approximately 2 to 5 years of age, thus highlighting the need to examine the functions of primary school-aged children's engagement in counterfactual thought.

Chapters 4, 5, and 6 detail the six experiments conducted for this thesis, as briefly outlined in the *Overview of Current Research* section of the current chapter. The first of the empirical chapters presents the two scenario experiments conducted with adult participants, which provides a preliminary insight into the effects of single versus

dual direction counterfactual generation on affect and preparedness. Experiment 1a also investigates the frequency in which reflective and evaluative counterfactuals spontaneously occur in direction-specific counterfactual thought. The second empirical chapter takes this experimental investigation further and examines the ways in which mood, preparedness and self-efficacy change as a result of upward, downward, or both upward and downward counterfactual generation after a positive (Experiment 2a) and a negative (Experiment 2b) achievement outcome. Chapter 6 details the research conducted on the consequences of counterfactual thinking with primary school-aged children. To replicate the research performed with adult participants in Chapters 4 and 5, the scenario and anagram methodologies were adapted for use with 9- to 11-year-old children.

Finally, Chapter 7 summarises the findings of each of the experiments conducted for this thesis, and discusses the influence of single and dual direction counterfactual generation on mood and preparedness. This final chapter draws comparisons between the consequences arising from adults' and children's counterfactual generation, and considers the implications of the findings. Overall, this thesis has extended upon previous counterfactual thinking research by explicitly investigating the consequences arising from single versus dual direction counterfactual generation; establishing the aptitude of 9- to 11-year-old children and adults to generate either or both directions of counterfactuals when prompted; investigating the affective and preparatory consequences of children's counterfactual thinking; discerning the influence of positively valenced outcomes on counterfactual consequences; seeking to further clarify the function of downward counterfactuals; examining the frequency in which people spontaneously consider counterfactuals in a reflective or evaluative mode; and investigating the influence of counterfactual thinking on self-efficacy.

# **Chapter 1 : Counterfactual Thinking: An Overview**

This chapter explores the mental process of counterfactual thinking, presenting a review of research from its initial inception as a research stream to current trends in its continued investigation. Thus, the review provides a historical perspective of counterfactual thinking and its resulting consequences. The chapter presents a broad overview of counterfactual thinking, and examples are provided to illustrate this pervasive cognitive ability (Roesse & Olson, 1995a). The composition of counterfactual thoughts is discussed with reference to the early literature which paved the way for extensive research in this field. The ways in which people mentally alter reality and the reasons that may incline them to engage in such thought is also described. The literature on the functions of counterfactual thought is reviewed, with a distinction drawn between the two directions of comparison and the purported functions that they serve. The counterfactual trade-off quandary that results from the consideration of a particular direction of counterfactual thought is subsequently described, followed by a discussion of dual direction counterfactual generation, highlighting the need for the empirical examination of this concept. Lastly, new frontiers in the research on the functions of counterfactual thought are presented.

## **1.1 What is Counterfactual Thinking?**

*Counterfactual thinking* is a pervasive and essential feature of human cognitive functioning (Roesse, 1994; Roesse & Olson, 1995a), implicated in a vast array of mental activities from deductive reasoning to daydreaming (Byrne, 2002). Counterfactual thinking can be defined as the cognitive process of imagining alternative versions of actual events (Roesse & Olson, 1995a). It refers to the mental reflection of an experience



or event and the consideration of alternative antecedents and potential different outcomes, often marked by thoughts of ‘what if’ and ‘if only’. Counterfactuals abound in daily musings, whether when reminiscing after an opportunity lost or a lucky chance, or after a more dramatic event such as a car accident (Gilovich & Medvec, 1994). Thinking counterfactually assists people in learning from their experiences (Byrne, 2002) and making sense of occurrences in their lives (Galinsky, Liljenquist, Kray, & Roese, 2005), as well as provides vital tools for successful problem solving and social functioning (Wong, Galinsky, & Kray, 2009).

Counterfactual thinking enables one to evaluate an outcome by imagining alternatives to the given outcome, and compare these mentally simulated alternatives to reality (Boninger, Gleicher, & Strathman, 1994; Wells & Gavanski, 1989). Such comparisons are prominent when reflecting upon historical events and how they might have turned out differently (Byrne, 2002; Roese & Olson, 1995b). For example, if the heir to the throne of Austria-Hungary, Archduke Franz Ferdinand had not been assassinated in June 1914, would the major powers of Europe still have gone to war? If the Rosetta Stone had not been discovered, would many of the Ancient Egyptian hieroglyphics have ever been deciphered?

Counterfactual processing is also explored in fiction, with one example being the 1998 film, *Sliding Doors*. In this film, after the protagonist named Helen is fired from her job, two parallel realities are explored concurrently from Helen (a) just managing to catch the train to take her home and (b) just missing the train. In the first scenario, Helen returns home to catch her boyfriend being unfaithful. Helen leaves him and ends up falling in love with James whom she keeps meeting by chance. In the second scenario, Helen gets mugged whilst hailing a taxi. She returns home oblivious to her boyfriend’s affair. In both scenarios, Helen is involved in a serious accident and is

taken to hospital. In the first scenario, she dies in her new lover's arms, and in the second, she leaves her boyfriend, and then meets James in the elevator when leaving the hospital. Although it is not possible in the real world to concurrently explore two parallel realities in one's life, it is a common occurrence to do so in one's mind. People have a tendency to fabricate scenarios by changing events, whether slight and seemingly insignificant events, to more substantial events that occurred in reality to significantly alter the final outcome.

Counterfactual thoughts have thus been defined as 'what if' and 'if only' statements, generated by the individual to assess or reflect on an outcome that has occurred in their life. This cognitive processing of past events is a common mental phenomenon occurring in everyday life, as illustrated by the historical and fictitious examples provided above. The next section describes the defining elements of counterfactual thoughts, namely antecedents and consequences, and the ways they are commonly altered to bring about an imagined change to the given outcome.

## **1.2 Composition of Counterfactual Thoughts**

The literal meaning of the term *counterfactual* is 'contrary to the facts' (Roese, 1997; Roese & Olson, 1997). Thus, a factual outcome is considered, and an array of alternatives as to how the outcome could have been different, are imagined. Such thoughts are generally considered as causal judgements or conditional statements containing an *antecedent* and a *consequence* (Roese, 1994; Roese & Olson, 1995a; Roese & Olson, 1997), whereby the antecedent is mentally altered to bring about an imagined change in the consequence. For example, "If I had not eaten that pie" (antecedent), "I would not have been sick" (consequence). The example illustrates how the consequence of a factual outcome is assessed after the mental alteration or mutation

of an antecedent of the outcome. Thus, in order to imagine alternative outcomes to reality, one must consider false antecedents to the actual outcome, thereby rendering the falsity of the antecedent as a defining feature of a counterfactual (Roese & Olson, 1995a). If the resulting consequence is also false, the factual outcome is 'undone' by the altered antecedent. This is said to be the most important attribute of a counterfactual conditional (Boninger et al., 1994). Therefore, in order for a conditional to be counterfactual, it must contain both a false antecedent and a false consequence (Byrne, 2002). Although counterfactual thinking requires imagination, there is a close association between the processes involved in counterfactual thinking and rational thought (Byrne, 2005).

Early research on the nature of counterfactual thoughts demonstrated that when people generate counterfactuals, certain antecedent events are differentially focused upon (Roese & Olson, 1995a). Although there are many ways to mentally alter any given state of affairs, Kahneman and Miller (1986) state that some alterations are perceived to be more natural than others, and some are especially resistant to change. Kahneman and Tversky (1982) and Kahneman and Miller (1986) illustrated in their pioneering research on mental simulation, that exceptional antecedents are more likely to be mentally altered than routine ones. For example, in Kahneman and Tversky's (1982) two scenarios in which Mr. Jones is killed in a car accident after either (a) leaving work earlier than usual, or (b) taking a different route home, participants were more likely to undo the fatal outcome by mutating the exceptional events (i.e., leaving work early, or taking a different route) and restoring them to their normal values (i.e., leaving work at the normal time, or taking the normal route). This finding was corroborated by Roese and Olson (1993a) who also found a greater frequency of mutated exceptional antecedents than routine ones listed by participants when indicating

how a protagonist's positive/negative exam performance when she had a history of being a good/poor student could have been different. In contrast, Gavanski and Wells (1989) demonstrated that there is a correspondence between antecedents and the normality of the outcome, with events mutated towards normality only when the actual outcome is perceived to be exceptional, and mutated towards exceptionality when the actual outcome is perceived as normal.

The notion of *counterfactual default events* was postulated by Wells and Gavanski (1989) to explain the discrepancy of their findings (Wells & Gavanski, 1989; Gavanski & Wells, 1989) with norm theory (Kahneman & Miller, 1986). A counterfactual default event refers to a prominent and highly salient counterfactual alternative to reality, which can be used to evaluate an actual outcome. To illustrate, consider a silver medallist athlete for whom the counterfactual default event would be winning a gold medal, whereas the counterfactual default for a bronze medallist would be not winning a medal at all (Medvec, Madey, & Gilovich, 1995). The discrepancy in the findings reported above may likely be explained by situational differences, highlighting the influence of context on counterfactual thinking.

Antecedent mutability is also determined by other factors, one being natural laws (Kahneman & Miller, 1986). For example, the effort exerted by an individual on any given task is a highly mutable element in a causal chain (Roese & Olson, 1995a), whereas a factor such as gravity is immutable, because unlike effort, the force of gravity is not subject to change. Although it is easy enough for one to imagine changing a natural law to alter an outcome (e.g., John would not have died when he fell off the roof if there were no gravity), the spontaneous generation of absurd counterfactuals tends to be uncommon (Taylor & Schneider, 1989). Thus, people tend to mutate antecedents that are realistically alterable, and therefore create alternatives to reality that are deemed

plausible (Byrne, 2005). Early research has also shown that people tend to mutate actions rather than inactions (e.g., Kahneman & Tversky, 1982; Kahneman & Miller, 1986; Landman, 1987); elements that change in the external world rather than remain static, for example, the weather compared to the rising of the sun (Roese & Olson, 1995a); and controllable events rather than uncontrollable ones (e.g., Girotto, Legrenzi, & Rizzo, 1991). Early research has thus identified the conditions under which an antecedent tends to be mutated to create an imagined reality. The ways in which people mentally alter reality and imagine a past state of affairs turning out differently are examined below, with possible reasons as to why people engage in counterfactual thought indicated.

### **1.3 How People Mentally Alter Reality**

Norm theory generally provides the foundation for the content of counterfactual thought (Byrne, 2002). People mentally alter reality by first computing norms about the event in question and then compare these norms to what actually happened. Thus, a person interprets and evaluates an outcome by referring to a cognitive frame of reference, which is a mental system of standards and assumptions that one has developed from prior experience, or to their predetermined schemas or internal representation of the world (Kahneman & Miller, 1986). An event will be judged as normal if it adheres to expectation, and abnormal if it violates one's norms for the given outcome (Kahneman & Miller, 1986; Roese & Olson, 1995a). Thus, an abnormal event will evoke an array of alternatives which thus provides the basis for counterfactual thought. Norm theory, as outlined by Kahneman and Miller (1986) and Kahneman and Tversky (1982), posits that counterfactuals are essentially constructed by converting a mutable antecedent (generally perceived as unusual or exceptional) back to a normal

value. This process of normalisation is said to contribute to the realism and potential usefulness of counterfactual thoughts (Kahneman & Tversky, 1982).

According to Roese (1997; Roese & Olson, 1995a; Epstein & Roese, 2008), the activation of counterfactual thought is dependent on motivational factors. Roese and Olson (1995a) conceptualise counterfactual thinking according to early research conducted on motivation and affect, whereby avoidance behaviour is motivated by negative affect, and behaviour aimed at approaching gratifying stimuli is motivated by pleasure. Roese and Olson (1995a) postulate that these principles apply when one cognitively alters an actual event. After a negative outcome or non-attainment of a goal, negative affect is generally experienced, which thus stimulates the mental simulation of ways to avoid such an outcome and the subsequent negative affect in the future (Roese, 1997). This is illustrated by Roese and Olson's (1995a) vignette of two people witnessing a child hit by a car. One witness does not know the child; the other witness is the child's mother. Roese and Olson (1995a) suggest that the mother would be far more motivated to cognitively alter the event than the other witness. Motivational factors can, therefore, be said to drive counterfactual thought, while exceptional antecedents are mentally reversed back to normality to determine how the negative outcome could have been avoided (Roese & Olson, 1995a). This conjecture was empirically supported by Roese and Hur (1997) in two experiments. A scenario task and an anagram task were employed, with both experiments extracting spontaneous counterfactual thoughts and affect ratings. Outcome valence was manipulated, as was expectancy violation (scenario task) and antecedent normality (anagram task). The findings demonstrated that counterfactual activation is mediated by negative affect, with the anagram task also showing that antecedent normality influences counterfactual content. Roese and Hur

(1997) demonstrated that negative affect is the primary determinant of the activation of counterfactuals, a finding also corroborated by Roese and Olson (1997).

Although Roese and Hur (1997) manipulated outcome valence, and thus examined counterfactual thinking in response to positive and negative outcomes, the context of the tasks was based on achievement – a protagonist’s hypothetical performance in a graduate school test, and participant performance in an anagram task. Counterfactual thinking also occurs in daily life in the event of positive outcomes and one-time events, such as winning a raffle after being the last person to enter the draw, or luckily avoiding a lengthy traffic delay because you happened to leave home five minutes earlier. Given the prevalence of counterfactual thinking in adults’ everyday reasoning (Summerville & Roese, 2008), it is important to examine counterfactual thinking in response to an array of events, from the mundane, to the exceptional (see Sections 2.3 and 2.4 for discussion on counterfactual thinking and event outcomes).

Once the process of counterfactual thinking has been activated, when people construct their alternatives to reality, they tend to either add or remove an element from the causal chain of the actual state of affairs. To illustrate, consider a person who observes that it is a warm, sunny day and dresses accordingly. A cold change comes through while the person is out and thinks “If only I had brought a jacket, I would be warm”, thus adding the element of bringing a jacket to alter the current state of affairs. Counterfactual statements in which reality is reconstructed by the addition of new antecedent elements are referred to as *additive counterfactuals* (Roese & Olson, 1993a). In contrast, the person may think “If the cold change had not come through, I would not be cold”, thereby removing the antecedent element of the cold change to alter reality. Such reconstructions of reality in which a factual antecedent element is removed from the actual state of affairs are called *subtractive counterfactuals* (Roese & Olson, 1993a).

Research has shown that counterfactual structure is influenced by outcome valence, such that additive counterfactuals tend to be generated in the event of a negative outcome, and subtractive counterfactuals are commonly elicited after a positive outcome (e.g., Roese & Olson, 1993a; Sanna & Turley, 1996). Roese (1994) suggests that compared to subtractive counterfactuals which are restricted to the factual elements of a given state of affairs, additive counterfactuals are inherently more creative as new antecedent elements are mentally fabricated. In their review of recent research, Wong et al. (2009) found empirical support for this notion. Roese (1994) demonstrated a further value of additive counterfactuals in comparison to subtractive counterfactuals: additive counterfactuals can aid future preparation by highlighting behaviours one could adopt in the future to facilitate success. The functional basis for counterfactual thinking however, has largely been attributed to the direction of counterfactual comparison, the core component of this thesis to which we now turn.

#### **1.4 Functions of Counterfactual Thought**

In their early research, Markman, Gavanski, Sherman, and McMullen (1993) investigated some of the emotional and cognitive consequences people experience when they compare reality to better or worse possible states of affairs. Based on the social comparison literature, Markman et al. (1993) distinguished between two types of counterfactuals and the functions that they serve, namely, *upward* and *downward* counterfactuals. Upward counterfactuals are those that describe events that are better than actuality, for example, 'If only I had not missed the lectures on reasoning, I could have got an A in the final exam instead of a B'. In contrast, downward counterfactuals are those that describe events that are worse than actuality, for example, 'If I had missed even more lectures, I could have got a C or D in the exam'. To examine the



consequences experienced when one engages in such thinking in response to a relatively mundane outcome, Markman et al. (1993) employed a computer simulated blackjack game in which participants played for real money. To provide the opportunity for the generation of upward or downward counterfactuals, the game was rigged so that participants in all conditions tied the dealer and ended up with \$5. However, outcome valence and repeatability was manipulated with participants experiencing a positive, negative, or neutral outcome under the belief that they would or would not get to play another round of blackjack. Participants were asked to think aloud as they gambled and completed a questionnaire at the conclusion of the blackjack game to assess feelings of satisfaction and to directly engage participants in counterfactual thought. As can be seen in the following subsections, the fundamental finding of this early research investigation was that upward counterfactuals assist one in preparing for the future, while downward counterfactuals help one to feel better.

#### **1.4.1 Upward Counterfactuals and the Preparatory Function**

Upward counterfactuals are generally 'if only' statements, which according to Markman et al. (1993), may devalue the actual outcome and make one feel worse. However, upward comparisons may also be used as a plan for future action, as the scripts necessary to facilitate success are made salient (Roese, 1994). In their computer generated blackjack experiment, Markman et al. (1993) found that more upward counterfactuals were spontaneously generated by participants after a negatively valenced outcome, and when they expected to play a second round of blackjack. Markman et al. (1993) conjectured that upward counterfactuals tend to be generated after repeatable events as they induce the desire and goal to improve an outcome in the future. Thus, the process of imagining better alternative outcomes through generating

upward counterfactuals may assist one to prepare for the future, by assessing how a given outcome might have turned out better (Markman et al., 1993). However, this heightened sense of preparation for the future comes at a cost. The participants in the blackjack experiment who were led to believe they lost to the dealer and those that expected to play the game again, expressed significantly less satisfaction with the outcome than those in the neutral or win conditions and those in the no-repeat conditions.

Markman et al.'s (1993) pioneering demonstration of the utility of the different directions of counterfactual thought provided the indirect inference of a preparative function of upward counterfactuals. Roese (1994) extended Markman et al.'s (1993) work by providing direct support for the contention of a preparative function resulting from generating upward counterfactuals. Roese (1994) conducted three experiments to examine the effect of counterfactual direction and structure on mood and preparedness, with two experiments directly examining preparedness. Participants reporting on a poor past exam performance and considering upward counterfactuals, reported significantly higher intentions to perform success-facilitating behaviours for future college exams than those in the downward or control conditions. Participants in the upward condition also reported significantly greater feelings of disappointment than those generating downward counterfactuals, thereby demonstrating the 'cost' incurred for preparedness. Participants partaking in the anagram task for which they received failure feedback (see Section 2.2.3.1 for details regarding Experiment 3), completed a second anagram task after generating counterfactuals of a specified direction and structure. The findings provided further support for the preparative function of upward counterfactuals by demonstrating that participants in the upward condition improved significantly more than those in the downward condition in their performance in the second anagram task

compared to the first anagram task. Overall, the findings of Roese (1994) provided a direct demonstration that the hypothesised preparative function is served by upward rather than downward counterfactuals, and additive as opposed to subtractive counterfactuals. Roese (1994) was one of the first investigations to demonstrate the functions of counterfactual thinking, via tasks involving participants' reflections of personally experienced events, and an experimental task with manipulated feedback to induce different perceptions of event outcomes.

Although the research conducted by Sanna (1996) was essentially conducted to investigate the individual differences that abound in the process of thinking counterfactually, the findings of the four experiments conducted provided support for the preparative function of counterfactual thinking. The four experimental tasks included a real life university exam, a social interaction task, and two anagram tasks. Overall, Sanna's (1996) findings provided a further demonstration that upward counterfactuals assist people to prepare for the future. Also consistent with Markman et al. (1993), more upward counterfactuals were generated after failure when outcome valence was manipulated (Sanna, 1996, Experiments 3 & 4).

Morris and Moore (2000) investigated the application of counterfactual thinking in the real world. Two experiments were conducted on near accident accounts of aviation pilots. The first experiment examined archival reports filed by experienced pilots, and the second experiment involved a flight simulation task performed by college students in the laboratory. In Experiment 1, archival reports containing counterfactual statements were extracted and counterfactuals were categorised according to direction and antecedent subject (i.e., self or other), and statements regarding future learning were also extracted. After the flight simulation task in Experiment 2, participants were asked to describe any dangerous incidents that occurred during the flight and to list any

recommendations for future improvement. As in Experiment 1, counterfactual and learning statements were extracted from the flight description. In both experiments, spontaneous counterfactuals were evoked by negative outcomes, with self-focussed upward counterfactuals being more frequently generated than downward counterfactuals or other-focussed counterfactuals, particularly for private compared to organisational pilots. Taken together, Morris and Moore (2000) provide further clarification that counterfactuals generated in the upward direction as well as centre on the self rather than on others, assist in the formulation of effective plans for the future, and thus facilitate learning.

Upward counterfactuals have been consistently demonstrated to result in increased feelings of preparedness for similar future events. According to Kahneman and Tversky (1982), such thoughts can be utilised as a heuristic to identify the conditions necessary for the outcome to have occurred. This identification may thus help one to formulate plans to prevent similar outcomes from occurring again in the future (Roese, 1994; 1997; Morris & Moore, 2000), especially when the event is or is believed to be likely to occur again (Markman et al., 1993).

#### **1.4.2 Downward Counterfactuals and the Affective Function**

Markman et al. (1993) posit that downward counterfactuals are commonly ‘at least’ statements which may enable one to feel better but leave one unprepared for the future. In their computer simulated blackjack experiment, participants tended to generate more downward counterfactuals after a positive outcome that was believed to be non-repeatable. Markman et al. (1993) contend that after a once off event, preparation for the future is irrelevant; thus, the goal of the individual is to make the most of whatever outcome occurs, and hence engage in downward comparison in order

to feel better. Markman et al. (1993) observed that the generation of downward counterfactuals resulted in an increase in reported feelings of satisfaction regarding the outcome of the blackjack game. As with upward counterfactuals, the generation of downward counterfactuals incurs a cost. Although the consideration of how a given outcome might have been worse may provide comfort and assist a person to feel better, the individual is left unprepared as they are unable to identify alternative strategies to aid future improvement (Markman et al., 1993).

These findings were systematically replicated by Roese (1994) in two experiments that required participants to report on a negative life event (Experiment 1) or a poor exam performance (Experiment 2). The main finding was that affect was significantly correlated with counterfactual direction but not structure (Roese, 1994). Experiment 2 clearly showed that the consideration of downward counterfactuals resulted in significantly higher positive affect compared to those considering upward or no counterfactuals. As with upward counterfactuals, the generation of downward counterfactuals also evidenced a 'cost' to the individual considering them. Those in the downward condition reported significantly lower intentions to perform success-facilitating behaviours in the future in comparison to those generating upward counterfactuals.

As well as providing support for the preparative function of counterfactual thinking, Sanna (1996) also provided support for the affective function. Overall, Sanna's (1996) experiments demonstrated a relationship between downward counterfactuals and affect: positive affect increased after the generation of worse possible alternatives, thus providing further testament of downward counterfactuals serving a regulatory function for affect. This finding however, was specific to optimists

as compared to defensive pessimists, in the event of a negative outcome believed to be a single-time event.

In asking participants to recall a negative real-life academic or interpersonal event, Mandel (2003) investigated the relationship between counterfactual thinking and a range of emotional responses, attributional responses such as blame and perceived control, and situational context. After participants described their experience, they were asked to rate the degree of personal significance, complete a negative emotion measure, generate both upward and downward counterfactuals, and complete a blame assessment. Mandel (2003) found that more extreme feelings of several of the negative emotions examined were associated with upward counterfactual availability, in that more extreme negative mood ratings were related to a higher number of upward counterfactuals. However, the examined negative emotions were not inversely associated with downward counterfactual availability. According to Mandel (2003), these findings did not provide support for the affective function of downward counterfactuals. However, this cannot be adequately ascertained as affect was measured prior to counterfactual generation. Further, the methodology employed for extracting counterfactual thoughts may have confounded the findings as participants were explicitly provided with the opportunity to generate both directions of counterfactuals, and were then classified according to the greater proportion of a particular direction of counterfactual generated. It therefore seems that Mandel's (2003) research demonstrated the prevalence of upward counterfactuals upon reflection of a significant negative event. Mandel (2003) also discerned that counterfactuals, attributions and emotions, are influenced by situational context. Specifically, participants reflecting upon a negative academic experience as opposed to a negative interpersonal experience reported greater perceived control, self-blame, self-focused negative emotions such as regret, and a greater

frequency of upward in comparison to downward counterfactuals. The findings indicate that counterfactual thinking is dependent on context, influenced by the salience of elements in the given experience (Mandel, 2003).

Similarly, Boninger et al. (1994) conducted two scenario studies with different situational contexts. The first scenario regarded a student suffering through a horrible college course, the other scenario concerned an Olympic runner injured before a race. For each scenario, future relevance and whether counterfactual thinking would or would not undo the outcome was manipulated. After learning of the possibility of a better possible outcome, participants indicated reduced negative affect when focused on the future rather than the present. This research showed that counterfactual direction and the resulting affect response were not intrinsically linked, with the convergence of dispositional factors (e.g., consideration of future consequences, salience of learning) and situational factors (e.g., situational context, event repeatability) determining the relationship (Boninger et al., 1994).

Therefore, the affective function of downward counterfactuals is less understood in comparison to the preparative function of upward counterfactuals, with previous research providing mixed results in support of the contention that downward counterfactuals assist in regulating affect. As discussed in the current section, the findings of several studies provide compelling evidence supporting the notion that downward counterfactuals result in mood improvement, both in scenario based (e.g., Roese, 1994) and performance oriented tasks (e.g., Markman et al., 1993; Roese, 1994; Sanna, 1996, 1997). However, some findings do not support the affective function of downward counterfactuals (e.g., Mandel, 2003). Although the functions of counterfactual thinking, particularly those regarding downward counterfactuals and

affect, have been linked to counterfactual direction, it is apparent that this is not always the case (Boninger et al., 1994; Roese, 1994).

#### **1.4.2.1 Affective Contrast and Assimilation**

The inconsistency regarding the ways in which downward counterfactual thinking affects emotion may be explained by McMullen's (1997) suggestion of *affective contrast* (see also Roese, 1997) and *assimilation* effects. Affective contrast refers to the negative affect resulting from upward counterfactuals and the positive affect engendered from downward counterfactuals (as found in the majority of counterfactual research and outlined above); for assimilation effects the opposite occurs – positive affect arises from upward counterfactuals and negative affect arises from downward counterfactuals. Medvec et al. (1995) provided a real-world example that illustrates the affective contrast effect. Olympic athletes who finished in second place felt worse than athletes finishing in third place, as the salient alternative outcome for a silver medallist is winning a gold medal, while the salient alternative for a bronze medallist is of not winning a medal at all. Although the second place athlete performed objectively better than the athlete in third place, the silver medal winner felt worse due to the salience of their counterfactual alternative. To illustrate the assimilation effect from a real-world example, McMullen (1997) cited a fatal US plane crash for which some people did not board at the last minute even though they had tickets. These individuals reported distress and fear at the thought of having been on the flight. Although these people described downward counterfactuals, they clearly reported negative affect when considering what could have happened but thankfully did not.

McMullen (1997) conducted two studies to investigate the conditions under which these effects occur. In the two negative real-life recollection experiments in



which experiential and evaluative modes of mental simulation were manipulated, counterfactual thinking resulted in affective contrast and assimilation effects, with both counterfactual directions able to produce positive and negative affect. These effects were moderated by attentional focus, such that affective contrast results when attention is placed on both the factual outcome and counterfactual alternative (i.e., the individual evaluates reality according to a counterfactual standard of comparison), and assimilation occurs when attention is solely placed on the counterfactual alternative (i.e., the individual imagines the alternative outcome actually happening). McMullen (1997), therefore, demonstrated that in some circumstances, thinking counterfactually in either direction can evoke positive or negative affect, and may thus explain some of the findings inconsistent with the literature that has replicated the affective contrast effect. For example, Boninger et al. (1994) found that participants' feelings of regret and self-blame were attenuated after the consideration of a counterfactual alternative that reversed the negative outcome when they focused on the future rather than the present. Such counterfactuals that serve as scripts for future improvement may not yield – or may override – affective contrast as the individual envisions hope for the future (McMullen, 1997). It should be noted that although the notion of affective contrast and assimilation effects qualify discrepancies in findings of affect resulting from counterfactual thinking after a negative outcome, McMullen (1997) states that his subsequent research does not replicate the aforementioned effects with positive factual events. This, together with the inconsistent findings from the limited research examining counterfactual thinking in the event of positive outcomes (see Section 2.3), indicates that outcome valence may dictate the role of counterfactual thought.

McMullen and Markman (2000) extended upon McMullen's (1997) investigation of affective contrast and assimilation effects to assess the motivational

implications of downward counterfactual thinking. The researchers hypothesised that when downward counterfactuals result in affective assimilation (i.e., the negative affect arising from considering that a worse outcome was a real possibility), individuals would experience greater motivation to modify behaviour and avoid such outcomes in the future, whereas the contrast effect (i.e., the positive affect invoked by considering that reality is not as bad as it could have been) would result in lower motivation to change behaviour as the need for change is denied or glossed over. McMullen and Markman (2000) demonstrated support for their hypotheses in three experiments involving laboratory tasks and a personally consequential task. Downward counterfactuals were shown to evoke either positive or negative affect depending upon whether the counterfactual alternative was either imagined as if it were true, or used as a comparison standard from which to evaluate reality. The subsequent affect influenced motivation, such that negative affect which signalled that the current state of affairs was unsatisfactory, heightened motivation to change, whereas positive affect induced complacency by indicating that the current state of affairs was adequate deeming change to be unnecessary (McMullen & Markman, 2000).

McMullen's work (1997; McMullen & Markman, 2000) highlights that the affective response resulting from counterfactual thinking is not as straightforward as once thought. For example, for downward counterfactuals generated in response to a one-time event, insight for future action is irrelevant, thus the primary goal for the individual is to regulate their affect (Markman et al., 1993). But, when a similar future occurrence is likely, worse counterfactual alternatives may be contrasted to reality to serve as a reality check (McMullen & Markman, 2000). It seems that affective response to counterfactual thinking is dependent on situational factors such as future relevance and outcome valence (e.g., Markman et al., 1993; McMullen & Markman, 2002).

In summary, a distinction has been drawn between the two directions of counterfactual comparison and the functions that they have been demonstrated to serve. According to the affective contrast hypothesis and functionalist perspective, upward counterfactuals are thoughts that improve upon reality and assist in the preparation for future improvement while downward counterfactuals are mental alternatives that worsen a given state of affairs and provide an affect regulation function. There is consistent support that upward counterfactuals can serve a preparatory function<sup>1</sup> (e.g., Markman et al., 1993; Morris & Moore, 2000; Roese, 1994) however, uncertainty remains for the benefit of considering downward counterfactuals (Boninger et al., 1994; Mandel, 2003). Although each direction of counterfactual results in some advantage to the individual, there is also an associated cost. This is referred to as the counterfactual trade-off and is described below.

#### **1.4.3 The Counterfactual ‘Trade-Off’**

In early research conducted by Markman et al. (1993) and Boninger et al. (1994) investigating the functions of counterfactual thinking, the notion of a counterfactual ‘trade-off’ was suggested. The trade-off is the cost incurred for attaining the function or goal of the direction of counterfactual considered (Markman et al., 1993). Specifically, when individuals generate upward counterfactuals, they may receive the long term benefit of being more prepared for a similar future event, but at the expense of immediate negative affect due to the realisation that the actual outcome was not as good as it could have been (Roese & Olson, 1995b). When generating downward

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<sup>1</sup> Note however, that counterfactual thinking can be dysfunctional, giving rise to factors such as rumination and complacency (e.g., Markman, Karadogan, Lindberg, & Zell, 2009), and memory impairment of the actual state of affairs (e.g., Petrocelli & Crysel, 2009). The dysfunction of counterfactuals is a current area of inquiry, and is beyond the scope of this thesis.

counterfactuals, the individual foregoes preparation for the future in favour of immediate affective enhancement (Roesse & Olson, 1995b). McMullen and Markman (2000) expanded upon this notion by demonstrating that downward counterfactuals must first evoke negative affect in order to heighten motivation. Thus, the consideration of a single direction of counterfactual can provide the benefit of either comfort and positive affect, or the motivation or preparedness for future improvement. In their computer generated blackjack experiment, Markman et al. (1993) demonstrated that people have a tendency to favour upward counterfactuals in the event of a negative outcome and may thus be more likely to overcome the trade-off quandary.

However, some research denotes that there may be individual or situational differences that moderate the effect of counterfactual direction and therefore the counterfactual trade-off dilemma (Boninger et al., 1994). For example, Sanna (1996) demonstrated that optimists (individuals with a positive outlook) and defensive pessimists (individuals who expect the worst) were shown to utilise different strategies of mental simulation: defensive pessimists utilised preparative thoughts prior to the event, while optimists positively re-construed their performance after the event. Sanna (1997) ascertained that self-efficacy moderates the affective and preparative consequences of counterfactual thinking, such that upward counterfactuals resulted in greater preparedness and no negative affect for high self-efficacy individuals, while low self-efficacy individuals reported the least preparedness and most negative affect. Self-efficacy however, did not moderate affect resulting from downward counterfactuals.

#### **1.4.4 Dual Counterfactual Generation**

In his early research on the functions of counterfactual thinking, Roesse (1994) proposed a suggestion to assuage the trade-off quandary when one engages in

counterfactual thought. Roese (1994, p.815) stated that “Both the preparative and affective value of counterfactual thinking may be maximized simultaneously simply by increasing the frequency of considering both upward and downward alternatives.”

Although previous research has examined spontaneous counterfactual generation (e.g., Sanna & Turley, 1996; Roese & Hur, 1997; Roese & Olson, 1993a) and specified direction counterfactual generation (e.g., Roese, 1994; Sanna, 1997),<sup>2</sup> to our knowledge, no research to date has explicitly examined Roese’s (1994) contention.

After a mundane, everyday event, people are likely to consider how the outcome could have been both better and worse. For example, imagine that you are getting ready for work and just as you are about to leave, the phone rings. You answer the phone, and your mother is on the phone reminding you about a celebratory dinner for your sister that night, which you forgot about. You hurriedly end the conversation and rush out the door. You end up stuck in traffic and late for work. Upon reflecting on this experience, the average person is likely to think, “If only my mother hadn’t called, I wouldn’t be stuck in traffic and late for work”, and “At least I was reminded about my sister’s dinner tonight, how bad would I feel if I forgot?”

Given that people are inclined to spontaneously consider both directions of counterfactual for everyday events, such as your mother calling as you are leaving for work, it is surprising that no research to date has explicitly and systematically examined the affective consequences resulting from the consideration of a single direction of counterfactual (i.e., upward or downward) compared to the consideration of both directions of counterfactual. Some experimental tasks required participants to generate both upward and downward counterfactuals sequentially after reflecting upon a negative

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<sup>2</sup> Refer to Section 2.1 for a comparison of research conducted employing spontaneous versus direction-specific counterfactual solicitation tasks.

interpersonal or academic event (e.g., Mandel, 2003). However, this approach does not allow for the comparison between the consideration of better **or** worse possible outcomes and the consideration of **both** better and worse possible outcomes and the subsequent impact on affect. Other experimental tasks have examined the spontaneous direction of counterfactuals generated, with participants being provided the opportunity to consider either direction of counterfactual (e.g., Markman et al., 1993; Roese & Hur, 1997; Sanna, Meier, and Wegner, 2001; see Section 2.1 for further review of such research). Researchers such as Sanna et al. (2001) have used their data to create indices of counterfactual direction by subtracting one direction from the other. Results of the analyses conducted with the difference indices were comparable to those utilising each counterfactual direction. The key findings were that downward counterfactuals were more frequently generated when participants were in good moods or after an enjoyable outcome, and reported positive affect, whereas participants in bad moods or experiencing a negative outcome who were concerned with performance, reported preparatory feelings. Sanna et al. (2001) examined dual direction counterfactual generation; however, as counterfactual direction was a within-subjects variable rather than a between-subjects factor, a systematic assessment of the consequences of single as opposed to dual direction counterfactual generation could not be ascertained.

As it is likely that in real life, people tend to readily and spontaneously generate both directions of counterfactuals, research soliciting single direction generation may provide an artificial representation of people's experiences. Therefore, the primary focus of the current research is to examine the difference in effect of single and dual direction counterfactual generation on mood after relatively mundane events. Thus, the research conducted for this thesis was designed to extend upon previous research of the

earlier functionalist perspective. Other frameworks for counterfactual thinking have recently been proposed, with two prominent examples outlined in the next section.

## **1.5 New Frontiers in the Functions of Counterfactual Thought**

As indicated previously, the functional theory of counterfactual thinking as purported by Markman et al. (1993), Roese (1994, 1997; Roese & Olson, 1995b), and others, is based on the premise that upward counterfactuals lead to a decline in mood and increased preparedness, and that downward counterfactuals tend to result in mood improvement but less preparedness for a similar future event. However, research has demonstrated that this is not necessarily the case (e.g., Boninger et al., 1994; Sanna, 1996, 1997). Of prominent interest is the more recent research conducted by Markman and colleagues (Markman & McMullen, 2003, 2005; Markman, McMullen, & Elizaga, 2008) who extended upon the work of McMullen (1997) and proposed the Reflection and Evaluation Model (REM). This model was proposed as an organising framework for comparative thinking, with the basic conception that during such thought processes, distinct modes of mental simulation operate, namely *reflection* and *evaluation*.

Reflection is described as “an experiential (“as if”) mode of thinking whereby one imagines that information about the comparison standard is true of, or is part of, oneself or one’s present standing” (Markman et al., 2008, p.422), and evaluation occurs when “the outcome of a mental simulation run is used as a reference point against which to evaluate oneself or one’s present standing” (Markman et al., 2008, p.422). In the REM, it is proposed that both upward and downward counterfactuals can have preparatory effects and elicit positive and negative affect. A key assumption of the model is that an individual’s desire to change or maintain the status quo is provided by the recognition of their internal affective state post counterfactual generation (Markman & McMullen,

2003, 2005). The REM posits that evaluative upward comparisons entail self-improvement, and evaluative downward comparisons promote mood repair; whereas reflective upward counterfactuals involve self-indulgence, and reflective downward counterfactuals may provide a reality check (Markman et al., 2008).

In their test of the model, Markman et al. (2008) examined the effect of engagement in reflection and evaluation during single direction counterfactual generation on persistence and performance in an anagram task. Processing mode was experimentally manipulated across participants. It was found that better performance and a greater increase in persistence was elicited by evaluative upward counterfactuals than reflective upward counterfactuals, and the reverse was true with downward counterfactuals. Although this conceptualisation sheds light on discrepancies in findings within the literature and thus provides a significant advance in the field of counterfactual thinking, the frequency in which these distinct modes of processing occur spontaneously during each direction of counterfactual generation is yet to be examined empirically.

Another theoretical framework postulated to incorporate the advancement in the counterfactual thinking research was proposed by Epstude and Roese (2008). In their recent review, the authors reconceptualised the functions of counterfactual thinking to focus on the regulation of one's behaviour via goals and motivation. According to Epstude and Roese (2008), the co-ordination and management of on-going behaviour is the primary function of counterfactual thinking. As such, counterfactuals are perceived as a beneficial, useful, and necessary element of behaviour regulation, and are typically activated by a failed goal. This view purports that the encountering of a problem typically activates counterfactual thinking, which then evokes behaviours to rectify the specified problem with affect as one means of facilitating the behaviour change. The



new framework postulated by the authors for the behavioural consequences of counterfactual thinking specifies two pathways by which counterfactual thinking occurs. These pathways are the *content-specific* and *content-neutral* pathways, with the distinction based on the notion that counterfactuals are often goal related. The content-specific pathway involves the transfer of specific information from the counterfactual inference directly to a behavioural intention, then subsequently, the behaviour (e.g., using the study guide for the next exam). In the content-neutral pathway, behaviour change occurs from the activation of counterfactual processing that provides generalised rather than specific information, which may evoke the realisation, and consequently the motivation, to apply more effort in the future (e.g., employing better study habits in a future exam). Thus, the content-neutral pathway merely provides the insight that something needs to be done to achieve better in the future, whereas the content-specific pathway specifies what can be done to aid future achievement.

In terms of counterfactual direction, Epstude and Roese (2008) contend that for the content-specific pathway, upward counterfactuals are generally more useful for behavioural regulation in comparison to downward counterfactuals as elements of an upward comparison tend to focus on new strategies or actions that can be adopted for future improvement. For the content-neutral pathway, both counterfactual directions can be useful as they each may stimulate a counterfactual mind-set and also may wield affective motivational effects, not dissimilar to Markman and McMullen's (2003) REM.

Although the framework proposed by Epstude and Roese (2008) incorporates recent findings, it is only concerned with the function of behavioural regulation, and thus accounts for counterfactuals generated in response to goal or motivational issues, generally when a problem is encountered. Counterfactual thoughts however, also arise in daily musings in the absence of goal-oriented or motivational issues to alter one's

future behaviour, when the only purpose of considering alternatives to reality is for the sake of mental entertainment or to assist one in making sense of a past occurrence (Galinsky et al., 2005). This framework therefore, does not accommodate positive outcomes or one-time events, and instead focuses only on counterfactuals that are useful in regulating behaviour.

## **1.6 Summary**

In summary, Chapter 1 has provided an overview of what counterfactual thinking is, and has outlined the primary consequences resulting from the engagement in such thought. The earlier functional perspective of counterfactual thinking was presented, and the need to explicitly examine the consequences of engaging in both directions of counterfactual thought was highlighted. Chapter 2 extends upon this general overview of the counterfactual thinking field by detailing empirical research from the literature that examines the concepts associated with counterfactual thinking that are pertinent to the current research.

## **Chapter 2 : Assessing Counterfactual Thinking**

Chapter 1 presented a broad delineation of the field of counterfactual thinking with an emphasis on the earlier functionalist perspective. The nature of counterfactual thought was presented together with the demonstrated consequences of engaging in such thought. In order to extend upon the counterfactual literature, it is important to discern the key findings of previous research that pertain to the scope of this thesis and understand how such findings were ascertained. Thus, Chapter 2 delves more deeply into research conducted on counterfactual thinking, with a particular focus on methodologies employed to assess various aspects in this area of investigation. Given that the focus of this thesis regards counterfactual direction, research examining spontaneous versus direction-specific counterfactual generation is first reviewed to ascertain the knowledge that has gleaned from such research. To determine appropriate methodologies for assessing counterfactual direction and the resulting affective and preparative consequences for this thesis, the common methodologies utilised throughout the functional counterfactual literature are reviewed, with major findings of this work highlighted. These methodologies include scenario tasks, self-reflections, and laboratory tasks. As such, variations of the tasks described were employed in the current research conducted for this thesis. Given the pertinence of this factor to the current thesis, a discussion of the influence of outcome valence on counterfactual thought and its subsequent consequences is included. This is followed by the presentation of research investigating counterfactual thinking in response to close-call events. The final section of the chapter reflects on the limited research conducted on the relationship between self-efficacy and counterfactual thought, highlighting the need for further research.

## **2.1 Counterfactual Solicitation**

### **2.1.1 Spontaneous Counterfactual Solicitation**

One of the first documented investigations to examine spontaneous counterfactual generation was conducted by Markman et al. (1993). In their computer generated blackjack experiment, participants were asked to ‘think aloud’ as they gambled. These verbalised thoughts were recorded and any counterfactual thoughts elicited were extracted and coded according to direction (i.e., upward or downward). At the conclusion of the task, participants were asked to generate a list of the ways in which the outcome could have been different. Thus, this experiment examined both spontaneous counterfactual thought and prompted counterfactual thought, which produced similar results in terms of the number and direction of counterfactuals generated, as well as the effect on participants’ feelings of satisfaction. Further, participants were found to frequently reflect on how the outcome could have been better (i.e., generate upward counterfactuals) in the event of a negative or surprising outcome.

Sanna and Turley (1996) conducted a series of experiments to empirically determine whether or not people spontaneously engage in counterfactual thinking. In order to solicit spontaneous counterfactuals, participants were asked to retell the story in a vignette (Study 1) or describe their exam performance (Study 2) in detail and to provide their opinion on the events that transpired. Any counterfactuals elicited by participants were subsequently extracted. Sanna and Turley’s (1996) research concurred with Markman et al. (1993) and confirmed that people do spontaneously engage in counterfactual thinking. Their findings demonstrated that the number and structure (i.e., additive or subtractive) of counterfactual thoughts can be influenced by both expectancy violation and outcome valence.

In a follow-up investigation, Sanna and Turley (1996, Study 3) examined both spontaneous and non-spontaneous counterfactual generation in an anagram task, again with outcome valence and expectancy violation manipulated. Participants in the spontaneous counterfactual condition were asked to describe their performance in the task, whilst those in the non-spontaneous counterfactual condition were explicitly asked to think of things that could have been different about their performance in the task. Significantly more counterfactuals were generated after a counterfactual prompt compared to spontaneously generated counterfactuals and outcome valence and expectancy violation did not influence the number of non-spontaneous counterfactuals generated; however, more spontaneous counterfactuals were generated after unexpected failure. The latter finding was evident in all the three experiments, thereby demonstrating that unexpected outcomes evoke more spontaneous counterfactual thoughts.

However, McEleney and Byrne (2006, Experiment 1) found that the frequency of spontaneous counterfactuals generated after expected versus unexpected outcomes was equivalent when participants diarised their thoughts regarding a scenario involving the making of new friends after moving to a new town. Consistent with Sanna and Turley (1996), more counterfactuals were generated when the outcome was perceived as being negative, as opposed to positive. McEleney and Byrne (2006, Experiment 1) also found that more spontaneous counterfactuals were present for controllable versus uncontrollable outcomes, while they appeared in equal frequency for exceptional versus normal outcomes (Experiment 2). Further, the content of spontaneous counterfactuals was found to focus on specific rather than general antecedents aimed at preventing a bad outcome.

Research utilising spontaneous counterfactual thoughts has identified the types of circumstances in which people are more inclined to generate counterfactuals. People frequently generate counterfactuals in the event of a negative or unexpected outcome, with such counterfactuals often in the upward direction (e.g., Markman et al., 1993) and of an additive structure (e.g., Sanna & Turley, 1996). The explicit empirical research demonstrating that people do spontaneously engage in counterfactual thinking after a multitude of events (e.g., Markman et al., 1993; Sanna & Turley, 1996; McEleney & Byrne, 2006), provided the empirical validation to examine this cognitive process in greater depth. Previous research conducted on non-spontaneous counterfactual thinking was also validated as counterfactual thinking was demonstrated to be a common mental phenomenon occurring in peoples' everyday lives.

### **2.1.2 Solicitation of Counterfactuals after a Prompt**

Other research has investigated the generation of counterfactuals after a prompt, such as the thought listing task employed by Markman et al. (1993). In such research, counterfactual thoughts are commonly elicited via a prompt to consider ways in which the given outcome could have turned out differently. Thus, participants are induced to generate counterfactuals; however, the structure of the counterfactuals and direction of counterfactual comparison are spontaneously elicited.

An example of such research is an early study conducted by Roese and Olson (1993a), who examined the structure of counterfactual thoughts that were elicited via a thought listing task. They asked participants to read a hypothetical scenario regarding a protagonist's exam performance, with outcome valence and expectancy violation manipulated, and then listed any things that could have been different to change the outcome of the scenario. As noted in Section 1.3, Roese and Olson (1993a) found that

negative outcomes predicted the generation of more additive counterfactuals, while positive outcomes engendered more subtractive counterfactuals. Participants were also found to generate similar numbers of counterfactuals in the success versus failure conditions; however, more counterfactuals were recorded when the protagonist was described as a poor rather than good student. The findings are not consistent with other research demonstrating that negatively valenced outcomes evoke more counterfactuals in comparison to positively valenced outcomes (e.g., Roese & Hur, 1997; Sanna & Turley, 1996). Roese and Olson (1993a) suggest that negatively valenced outcomes may engender greater counterfactual thought under certain conditions, rather than being the norm.

Roese and Hur (1997) investigated whether affect mediates the effect of outcome valence on counterfactual activation in a scenario experiment and an anagram experiment. After reading the scenario or completing the anagram task, participants were prompted to generate counterfactuals via a thought listing task, followed by a measure of affect. The findings revealed that negative affect mediated counterfactual activation, with more than 90 percent of the counterfactuals generated being in the upward direction, and negative outcomes tended to evoke more counterfactual thoughts. Roese and Hur (1997) state that unpleasant experiences more frequently engender counterfactual thoughts and centre on how better outcomes could have been obtained, giving rise to upward counterfactuals being the default direction of comparison. As it had been determined that both directions of counterfactual comparisons are spontaneously generated, albeit in differing frequencies depending upon the event in question, many subsequent methodologies commonly employed direction-specific counterfactual generation tasks to further elucidate the principles associated with counterfactual generation.

### **2.1.3 Direction-Specific Counterfactual Solicitation**

To examine the nature of counterfactual thinking in greater depth, research has utilised the distinction between the two directions of comparison that were observed by Markman et al. (1993). This research has largely focused on the resulting consequences of counterfactual thinking that people commonly experience, as outlined in Section 1.4. Direction-specific counterfactual solicitation tasks commonly provide participants with a lay definition of counterfactual thinking, with reference made to one direction of counterfactual comparison. Participants are then asked to think of ways in which the given outcome could have been better or worse, depending upon their assigned counterfactual condition. Thus, participants are prompted to only consider a single direction of counterfactual thought, generating either upward or downward counterfactuals. By specifying the direction of counterfactual comparison participants are to consider, the researcher is able to investigate the ways in which upward and downward counterfactuals differentially affect constructs such as affect and preparedness. Research employing direction-specific counterfactual generation tasks constitutes the bulk of the functional counterfactual thinking literature. It should be noted that counterfactual solicitation tasks may also differentially examine other aspects of counterfactual thoughts, such as structure (i.e., additive and subtractive; e.g., Roese, 1994; Roese & Olson, 1993a; Sanna & Turley, 1996) and mode of mental simulation (i.e., reflection and evaluation; McMullen, 1997; Markman & McMullen, 2003, 2005; Markman et al., 2008). However, as the focus of this thesis is in regards to counterfactual direction, this section will be restricted to a review of research utilising direction-specific counterfactual solicitation tasks.

One of the first research investigations to specify the direction of counterfactual comparison for participants to generate was conducted by Roese (1994). As previously



described (see Sections 1.4.1 & 1.4.2), Roese (1994) assessed the consequences resulting from upward and downward counterfactual thinking in self-reports on negative life events, self-reports on poor exam performance, and a negatively valenced anagram task. In each experiment, participants were provided an example relevant to their assigned counterfactual condition and asked to list specific actions that either could have been done or should not have been done to either improve or worsen the outcome in question. Thus, the direction (i.e., upward or downward) and structure (i.e., additive or subtractive) of counterfactual thoughts was manipulated. Roese (1994) demonstrated the feasibility of manipulating the direction of counterfactuals that participants considered when they reflected on a recent or more distant event. As noted in Chapter 1, Roese's (1994) findings provided support for the functional hypothesis of counterfactual thinking. Specifically, more upward counterfactuals are generated after a negative outcome and amplify participants' intentions to execute behaviours in similar future situations that will facilitate success; and counterfactuals in the downward direction resulted in more positive affect, thus assisting the participant to feel better after the negative outcome (Roese, 1994).

Sanna (1997) also demonstrated that participants were able to generate either direction of counterfactual when explicitly asked to do so. After completing an anagram task, participants were informed that they did either really well or really poorly. A brief explanation of counterfactual thinking was then provided, and participants were asked to consider five ways in which their performance in the anagram task could have been either better or worse. Sanna (1997) found that there was no difference in the number of upward or downward counterfactuals generated between the two counterfactual conditions, with participants generating approximately four counterfactuals in each of the required directions. Although qualified by self-efficacy, the findings of Sanna

(1997) also provided support for the affective function of downward counterfactuals and the preparative function of upward counterfactuals.

Mandel (2003) utilised a direction-specific methodology to elicit participants' counterfactual thoughts after they described either a negative interpersonal or academic experience. Mandel's (2003) participants were informed of the nature of upward counterfactuals and were asked if such thoughts had occurred to them regarding their reported experience. Participants were asked to list these thoughts if they responded affirmatively. The same procedure then occurred for downward counterfactuals. Thus, participants were given the opportunity to list both upward and downward counterfactuals sequentially, after reflecting upon their negative academic or interpersonal experience. Mandel (2003) found that context yielded a significant influence on the direction of counterfactuals generated by participants: Participants reporting a negative academic event listed significantly more upward counterfactuals compared to downward counterfactuals; however, there was no difference between the frequency of upward and downward counterfactuals generated by participants reporting a negative interpersonal event.

The stream of research utilising direction-specific counterfactual solicitation tasks has demonstrated that it is feasible to manipulate the direction of counterfactuals that participants consider, with participants readily able to generate the specified direction of counterfactual when asked to do so (Roese, 1994; Sanna, 1997). This research has also established the consequences resulting from engagement in each of the directions of counterfactual comparison, with Mandel (2003) further demonstrating the influence of situational context on the number of upward and downward counterfactuals considered. Direction-specific counterfactual solicitation has, therefore, enabled

researchers to ascertain the consequences of engaging in each direction of counterfactual thought.

In summary, Sanna and Turley (1996) established that people do engage spontaneously in counterfactual thought, which provided the warrant for more in-depth research to be conducted. Research assessing spontaneous counterfactual thought demonstrated that unexpected outcomes - especially unexpected failure - result in a greater number of spontaneously generated counterfactual thoughts that tend to be in the upward direction (e.g., Markman et al., 1993; Roese & Hur, 1997; Sanna & Turley, 1996). The research of Roese (1994) and Sanna (1997) utilising counterfactual generation tasks of a specified direction provided support for the functionalist perspective of counterfactual thinking, and Mandel (2003) demonstrated that context can influence the direction of counterfactuals considered. Thus, much has been gleaned from research examining spontaneous and direction-specific counterfactual generation. However, as detailed in Section 2.2, the type of tasks utilised in methodologies assessing counterfactual thinking also contribute to our understanding of this common cognitive process.

## **2.2 Methodologies for Examining Counterfactual Thinking**

An array of methodologies devised to examine counterfactual thinking abounds in the literature. The tasks commonly employed by researchers interested in the functional value of counterfactuals are scenario tasks, self-reflections, and laboratory tasks such as anagram tasks. These types of tasks allow researchers to investigate various aspects of counterfactual thinking in a reasonably controlled manner. As such, each of these methodologies is described with examples from the literature in the following sections.

### **2.2.1 Scenario Methodologies**

Early research examining the functions of counterfactual thinking often employed scenario methodologies. These methodologies have provided a general understanding of the nature of counterfactual thinking and the resulting consequences on mood, behaviour, motivations and cognitions. They generally require participants to read a short vignette and adopt the protagonist's perspective. Thus, participants can mentally simulate the experience, imagining the experience actually happening to them. This type of task is useful to glean generalised insights on the nature of counterfactual thinking, and provides a consistent frame of reference across participants as all participants reflect upon the same hypothetical vignette.

One type of scenario design involves participants reading a vignette in which a counterfactual alternative is embedded within the plot that either does or does not change the outcome. Participants then respond to the dependent measures employed by the researchers to examine their hypotheses. An example of this type of scenario methodology was conducted by Boninger et al. (1994) who examined how future behaviour is influenced by counterfactual relevance on judgements of regret and self-blame. In Boninger et al.'s (1994) research, the scenarios ended with a negative outcome with a choice made that either did or not change the final outcome. In imagining themselves as the protagonist who made the decision resulting in the negative outcome, participants indicated more regret and self-blame when considering the counterfactual choice that undid the outcome. However, this was moderated by the degree participants considered the future consequences of the given outcome.

Another common scenario methodology requires participants to read a story, whether fabricated or actual, and then consider ways in which the outcome could have been different. Thus, participants are prompted to engage in counterfactual thought. An

early example of this type of task was used by Wells and Gavanski (1989) who examined the association between counterfactual thought and causal judgement in two well-known scenario tasks. The scenarios involved tragic one-time events with a highly mutable decision made in one version of each scenario that would undo the fatal outcome (e.g., boss choosing the meal that unknowingly contained the allergic ingredient over a meal that did not), whereas the mutation of the choice made in the second version would not alter the outcome (e.g., boss choosing between two dishes that both contained the allergic ingredient). In both experiments, when the choice made by the protagonist undid the factual outcome, the event was attributed a greater causal role. Thus, Wells and Gavanski's (1989) research provided evidence that counterfactual thoughts influence causal reasoning.

Another example of this type of scenario task can be seen in Mandel and Lehman (1996) in the investigation of preventability and causal ascriptions and counterfactual thinking. Two studies each contained a single scenario with counterfactual alternatives embedded within it (e.g., the protagonist having a car accident after taking an unusual route home). Whilst taking the perspective of a specified character, participants generating counterfactuals completed "If only" stems as to how the accident may have been avoided, while the remaining participants listed preventability or causal ascriptions. The third study consisted of a scenario with manipulations made to the mutability of one of the two character's choices made. Participants listed what could have been different to avoid the outcome, and also rated the causality of specified elements in the story. Overall, the main finding of Mandel and Lehman's (1996) research was that counterfactual thinking tends to centre on controllable antecedents to mentally simulate how the outcome could have been prevented, rather than focussing on causal ascriptions of the outcome, which thus

contrast to the findings of Wells and Gavanski (1989) utilising a similar scenario methodology.

A variation of this type of scenario methodology involves asking participants to read a scenario, then consider antecedents preceding the outcome of the story and mentally alter them to bring about either a better or worse imagined outcome. An example is Sanna, Turley-Ames, and Meier's (1999, Study 1) investigation of the influence of mood and self-esteem on counterfactual thoughts. A positive or negative mood was induced to participants of previously determined high and low self-esteem prior to completing the scenario task. Hypothetical scenarios were presented to participants, which contained both positive and negative events that could be used to generate counterfactuals. Participants generated counterfactuals for each scenario by listing things that could have been different to make the respective situation better or worse. Sanna et al.'s (1999) findings demonstrated that mood can influence counterfactual direction, such that more downward counterfactuals were generated by participants in positive moods, and more upward counterfactuals were elicited by participants in negative moods.

As illustrated above, scenario tasks can be used to examine an array of factors associated with counterfactual thinking (e.g., mood, causality, preventability) and garner general insights into the nature of this cognitive process. Utilising a scenario methodology allows the researcher to devise a scenario appropriate to the investigative aims and examine factors of, or associated with counterfactual thinking, such as antecedent mutability, causality, future relevance, mood, and counterfactual direction. Employing a scenario task also provides task consistency between participants, as they are provided with a uniform, hypothetical experience to consider. However, such tasks rely on the ability of individuals to utilise their imagination and mentally place

themselves in the situation depicted in the scenario (Sanna et al., 1999), as well as adopt the perspective of a protagonist in a vignette. Consequently, scenario tasks may not adequately induce emotion in the participant, or evoke feelings of preparedness or motivation for future betterment, and may thus provide findings with limited generalisability.

### **2.2.2 Real-life Reflections**

In a similar fashion, studies on counterfactual thinking have also utilised participants' autobiographical accounts of a particular type of event. Such tasks require individuals to consider an experience they encountered in the recent past within specified parameters, for example, a negative academic experience. Participants are usually instructed to reflect upon this experience, and then write it down, including as many details as they can recall. This creates a personalised scenario for the participant to consider, which may elicit real emotions, or at least a recollection of the emotions experienced at the time. After considering their experience, participants are generally required to think counterfactually and complete a mood assessment, and other such measures necessary for the given research hypotheses.

In an empirical investigation conducted on the functions of counterfactual thought, Roese (1994) employed real-life reflection tasks in two experiments. Participants described a negative or disappointing interpersonal situation they had experienced in the past year (Experiment 1) or a recent and disappointing exam performance (Experiment 2). Participants generated counterfactuals of a specified direction and structure, and completed mood and self-esteem measures, with preparedness also assessed in Experiment 2. Roese (1994) found participants' feelings of disappointment and regret, which according to Kahneman and Miller (1986) are two

primary counterfactual emotions, to be significantly associated with counterfactual direction but not structure in Experiment 1, while Experiment 2 provided more firm support for the functionalist perspective of counterfactual thinking: downward counterfactuals led to more positive affect, and upward counterfactuals resulted in greater intentions to perform success facilitating behaviours in the future.

In their investigation of the influence of mood and self-esteem on counterfactual thinking, Sanna et al. (1999, Study 2) conducted a recalled life events experiment in which participants described in detail a situation that occurred to them during the past year that could have turned out differently. After a positive or negative mood was induced to participants via music, a generic brief on counterfactual thought was provided to participants, who then generated a list of things that could have been different to make their recalled life event better or worse. Sanna et al. (1999) found that although the life events recalled by participants varied in nature with both positive and negative situations described, the direction of counterfactuals generated by participants was influenced by their induced mood. When in a positive mood, high and low self-esteem participants generated more downward counterfactuals, while a negative mood resulted in more upward counterfactuals for low self-esteem participants and more downward counterfactuals for high self-esteem participants. Thus, Sanna et al.'s (1999, Study 2) experiment demonstrated the influence of self-esteem and mood on counterfactual thought.

Real-life reflection methodologies have extended to using participants' real-life experiences as they occur. This commonly has utilised participants' exam performance in introductory psychology courses (e.g., Sanna, 1996, Study 1; Sanna & Turley, 1996, Study 2). Although targeting such an event is extremely convenient, it captures a real experience to which the majority of participants are likely to place a degree of



importance. As such, examining their performance in the exam and the events leading up to their exam performance is beneficial to the participants and thus, facilitates the process of counterfactual thinking to which participants are likely to engage in readily. Sanna and Turley (1996, Study 2) empirically validated that students do spontaneously engage in such thought after learning of their performance in an actual exam.

Real-life reflections provide a more compelling demonstration of the consequences resulting from counterfactual thinking, as compared to hypothetical scenarios to which the participant may or may not easily relate. However, as with most empirical methodologies, real-life reflection tasks are not without limitations. This type of task is not consistent across participants, as their experiences may differ in severity of the outcome and subsequent emotional response. Also, the degree of emotion evoked from the recollected memory is not likely to be as strong as at the time the event actually occurred. Nonetheless, as with scenario methodologies, the use of real-life reflection tasks in the counterfactual literature has brought to light important theoretical conceptions regarding the nature of counterfactual thought.

### **2.2.3 Laboratory Methodologies**

The initial wave of research on counterfactual thinking tended to focus on the use of hypothetical scenario methodologies (e.g., Gleicher et al., 1990; Kahneman & Tversky, 1982; Wells & Gavanski, 1989), and recollections of personally-experienced past events (e.g., Roese, 1994; Mandel, 2003; Sanna et al., 1999). This eventually expanded to incorporate laboratory tasks to combat the issues associated with using scenario tasks, as previously described. Laboratory methodologies provide a uniform and consistent approach to examine the nature of counterfactual thinking and its consequences on affect, cognition, behaviour, and motivation. Such tasks are highly

controllable, with the degree of extraneous factors limited in comparison to non-laboratory experiments.

### **2.2.3.1 Anagram Tasks**

One of the common laboratory-based methodologies reported in the counterfactual literature is that of the anagram task. Generally, this task requires participants to unscramble a series of words, often with the provision of several options for the participant to choose to assist them in solving the anagrams, which thus provides the opportunity for them to engage in counterfactual thinking. The outcome of the anagram task can be framed for participants to perceive as being positive, negative, or neutral whilst still providing them with their actual performance data. For example, a participant may solve seven out of ten anagrams and based on his or her performance time, may receive an actual score of 754. This however, can be portrayed to be better, worse, or average in comparison to the supposed norms of that task. Participants are then able to generate counterfactuals, whether of a spontaneous or specified direction. Other dependent measures, such as affect and preparedness are commonly measured on likert-scales. A second anagram task can also be introduced, of which participants may or may not be initially aware depending upon the researchers' aims, which thus provides a quantifiable measure of the effect of counterfactual generation on participants' preparedness and subsequent performance.

An anagram methodology was devised and used by Roese (1994, Experiment 3; Roese & Hur, 1997, Experiment 2) to examine the functions (Roese, 1994) and role of affect (Roese & Hur, 1997) in counterfactual thinking. The anagram task was administered to participants on a computer on which they worked through a set of anagrams within a given time limit. Participants chose one of two topic areas for the

anagrams, the degree of difficulty, and the inter-trial interval. During the task, participants were also able to buy clues for the cost of points, and permanently skip anagrams to minimise the points lost. At the completion of the anagram set, participants were presented their performance feedback. In Roese (1994, Experiment 3), participants were provided failure feedback according to the supposed normative performance of other participants already partaking in the experiment, while Roese and Hur (1997) manipulated outcome valence in both directions, with half of the participants believing their score was high and half believing it was low. The dependent measures and remainder of the experimental task varied according to the respective research aims of Roese (1994) and Roese and Hur (1997). Thus, the anagram task provided a controlled and common methodology from which participants could engage in counterfactual thought regarding their immediate experience and performance. Several factors could also be changed in order to examine specific research aims, for example, Roese (1994, Experiment 3) examined the preparatory function in the event of a negative outcome by asking participants to complete a second anagram task after generating counterfactuals of a specific direction. Roese and Hur (1997, Experiment 2) examined the influence of normality and affect on counterfactual activation by manipulating participants' choices of the format of the anagram task to be typical or atypical, manipulated outcome valence to be positive or negative, and prompted participants to engage in counterfactual thought via a thought-listing task.

Sanna also employed anagram tasks in his research on counterfactual thinking (e.g., Sanna, 1996, Study 2 & 4; Sanna, 1997; Sanna & Turley, 1996, Study 3). Participants (Sanna, 1996, Study 4; Sanna, 1997; Sanna & Turley, 1996, Study 3) typically completed the anagram task on paper as opposed to a computer (c.f., Roese, 1994, Experiment 3; Roese & Hur, 1997 Experiment 2). A number of anagrams, with

only one correct solution, were listed on a page for participants to work through in any order in a specified time limit. This anagram methodology allowed for the manipulation of outcome valence, with participants' performance framed to be either a success or failure according to supposed established norms (Sanna, 1996, Study 4; Sanna & Turley, 1996, Study 3; Sanna, 1997). According to the research aims, different factors could also be examined such as performance expectation (e.g., Sanna, 1996, Study 4; Sanna & Turley, 1996, Study 3), self-efficacy (e.g., Sanna, 1997), preparedness (e.g., Sanna, 1997), perceived task repeatability (e.g., Sanna, 1996, Study 4; Sanna, 1997), and affect (e.g., Sanna, 1996, Studies 2 & 4; Sanna, 1997).

In more recent empirical research investigations, Markman and colleagues (Markman, et al., 2008; Markman, McMullen, Elizaga, & Mizoguchi, 2006) utilised a variation of the anagram methodology to test their Reflection and Evaluation Model of counterfactual thinking (Markman & McMullen, 2003, 2005). The anagram task employed by Markman et al. (2006; 2008) was presented to participants on a computer. Participants formed as many words as they could from each anagram with no time limit imposed. Participants' performance feedback was framed to be neutral. Although the neutral framing of participants' anagram task performance allowed for an equivalent opportunity for counterfactual generation in either direction, the task does not appear to provide the provision of constraints or choices (e.g., time limits, buying clues, etc) from which to provide a reasonable scope for participants to generate counterfactual alternatives.

The research examples described above illustrate the utility of employing an anagram methodology to examine counterfactual thinking. Components of the task may be altered or manipulated to achieve the desired research aims, such as participants being able to make choices regarding the format of the anagram task and informed that

their choices were or were not typical in order to manipulate normality (Roese & Hur, 1997, Experiment 2); limiting the time participants are given to either solve each anagram (e.g., Roese, 1994, Experiment 3; Roese & Hur, 1997, Experiment 2) or the set of anagrams (e.g., Sanna, 1996, Studies 2 & 4; Sanna, 1997; Sanna & Turley, 1996, Experiment 3); or presenting the task on a computer (e.g., Markman et al., 2006, 2008; Roese, 1994, Experiment 3; Sanna, 1996, Study 2) or on paper (e.g., Sanna, 1996, Experiment 4; Sanna, 1997). Using an anagram methodology also allows for the successful manipulation of outcome valence, as the outcome can be framed as positive or negative compared to supposed established norms (e.g., Sanna, 1996, Study 4; Sanna, 1997) or participants who have supposedly already partaken in the research (e.g., Roese, 1994, Experiment 3; Roese & Hur, 1997, Experiment 2).

### **2.2.3.2 Other Laboratory Tasks**

Although the anagram task is the more commonly used task to investigate counterfactual thinking and its consequences in stringently controlled settings, they pose the disadvantage of not being typical of everyday types of experiences that people are likely to encounter. Other laboratory tasks have been used to provide a more real-world experience for participants to engage in that is likely to naturally evoke counterfactual thought, such as the computer simulated blackjack experiment conducted by Markman et al. (1993) previously described. Other examples of real-world oriented laboratory tasks include gambling and stock investment (e.g., Markman & Tetlock, 2004); flight simulation (Morris & Moore, 2000, Study 2); and interpersonal communication (Sanna, 1996, Study 3).

In an investigation of the influence of accountability on close-call counterfactual alternatives (see Section 2.4), Markman and Tetlock (2004) devised a role-playing stock

investment task. Participants were required to choose which of two companies to invest in, at four different times, and then observed the performance of each company.

Perceived accountability of participants' choices and outcome valence were manipulated. Participants listed their thoughts and completed several dependent measures according to the research aims. This experiment assessed counterfactual thinking in a real-world context: decision-making in a gambling oriented task. The methodology also allowed for the examination of other factors, such as accountability, close-call outcomes, affect, responsibility and foreseeability.

Similarly, Morris and Moore (2000, Study 2) also examined counterfactual thinking and accountability, however did so in a specific context. Participants in this laboratory investigation performed in a flight simulation task as if they were either a private pilot or an organisational pilot flying a small plane and were forewarned of the possibility of a rough landing. After landing the simulated aircraft, participants completed a flight log, which was later scanned for counterfactual thoughts and learning statements. This experiment provided a laboratory-based investigation of counterfactual thinking and associated factors such as accountability in an organisational context, and provided converging findings to Morris and Moore's (2000, Study 1) previous experiment assessing the flight logs of actual pilots. This research provided a demonstration of the generalisability of laboratory tasks to real-world contexts.

Sanna (1996, Study 3) devised an innovative laboratory-based methodology to assess counterfactual thinking and its affective consequences in a social setting. In this experiment, a participant and confederate got to know each other whilst being observed. Participants were told that their 'getting acquainted conversation' was stopped early due to it being exceptionally good/bad, and were then asked to generate counterfactuals and complete several dependent measures. This research methodology thus allowed for the

examination of counterfactual thinking pertaining to a naturally occurring, real-life experience in a controlled laboratory setting.

Although not directly examining counterfactual thought, Larsen, McGraw, Mellers, and Cacioppo (2004) assessed mixed emotional reactions to highly salient counterfactual alternatives. Participants played a series of binary gambles in which half of the gambles had a 50 percent chance of winning while the remainder had a 50 percent chance of losing, either of the two amounts. Target outcomes were manipulated to be disappointing wins (i.e., winning the lowest amount of the winning amounts available) and relieving losses (i.e., losing the smallest amount of the amounts to be lost). Participants rated their mood after each gambling trial (Experiment 1) or pressed buttons to indicate their momentary positive and negative affect during each trial (Experiment 2). The findings revealed that participants experienced both positive and negative affect in the close outcomes, whereas outright wins and losses produced positive or negative affect. Experiment 2 also provided evidence for simultaneously mixed emotions, indicating that participants can experience both positive and negative affect at the same time, even in a simple gambling game. Larsen et al.'s (2004) research provides further insight into the affect experienced by individuals when faced with highly salient counterfactual alternatives to reality.

As can be seen, a vast array of methodologies to examine counterfactual thinking and associated constructs abound in the literature. This section has primarily reviewed the common methodologies employed, namely scenario tasks, real-life reflection tasks, and anagram tasks, with prominent examples from the literature provided. Each of these methodologies has imparted important contributions to the field, as well as provided the impetus to conduct future research. Therefore, variations of these three empirical methodologies have been utilised in the current research

investigation. The following section extends the methodological review by examining the importance of outcome valence.

### **2.3 Counterfactual Thinking and Outcome Valence**

As people frequently respond to negative events with heightened behavioural, physiological, cognitive, and affective activity in comparison to neutral or positive events (Taylor, 1991), the vast majority of research conducted to investigate the consequences of counterfactual thinking has tended to focus upon negative outcomes (e.g., Boninger et al., 1994; Mandel, 2003; Roese, 1994). Further, Gleicher et al. (1990) contend that counterfactual thinking is automatically elicited by negative outcomes, and Roese and Olson (1997) demonstrated that important triggers for the engagement in counterfactual thinking are negative emotions. Consequently, many early studies examined counterfactual thinking in response to real or hypothetical traumatic life events such as fatal car accidents (e.g., Kahneman & Tversky, 1982), fatal allergic reactions (e.g., Wells & Gavanski, 1989, Experiment 1), or death of a child from Sudden Infant Death Syndrome (e.g., Davis, Lehman, Wortman, Silver, & Thompson, 1995, Study 2). Later research subsequently examined counterfactual thinking in response to less significant negative events such as poor academic performance (e.g., Roese, 1994, Experiment 2), negative interpersonal situations (e.g., Mandel, 2003), or laboratory tasks with manipulated poor outcomes (e.g., Roese, 1994, Experiment 3; Roese & Hur, 1997).

Research investigating spontaneous counterfactual thinking with outcome valence manipulated has consistently demonstrated that considerably more spontaneous counterfactuals are generated in the event of a negative outcome (e.g., Markman & Tetlock, 2000; Roese & Hur, 1997; Sanna, 1996, Study 3; Sanna & Turley, 1996), with



participants overwhelmingly generating counterfactuals in the upward direction, particularly when the negative outcome is unexpected (Markman et al., 1993; Roese & Hur, 1997; Sanna, 1996; Sanna & Turley, 1996). Roese and Olson (1997) contend that downward counterfactuals generated in response to negative events amount to less than 10 percent of counterfactuals generated. According to Roese and Hur (1997) and Roese and Olson (1997), most counterfactuals are commonly derived from unpleasant experiences and focus on how the outcome may have been better, thus giving rise to the generation of upward counterfactuals being the default direction of comparison.

Research conducted on counterfactual thinking in response to negative events however, has commonly employed performance oriented methodologies such as laboratory tasks or exam performance, and focused on the assessment of the preparatory function. The greater frequency of upward counterfactuals may thus be a result of methodologies employed for which self-improvement motivations predominate (White & Lehman, 2005), and therefore render preparatory upward counterfactuals the default direction of comparison. As such, little attention has been attributed to downward counterfactuals and the role they play in mental simulations. To address this concern, White and Lehman (2005) conducted three studies to examine the hypothesis that self-enhancement is a predictor of downward counterfactuals generated in response to a negative outcome. The researchers found support for their hypothesis, indicating that the type of task or event is a determinant of the relevance of self-improvement or self-enhancement motives and hence the direction of counterfactual comparison. Consistent with the literature (e.g., Boninger et al., 1994; Mandel, 2003), counterfactual generation varies according to the conditions under which it is engaged. Previous research has therefore demonstrated that upward counterfactuals are the common direction of

comparison in the event of a negative outcome, however as demonstrated by White and Lehman (2005), there are instances when downward counterfactuals predominate.

In real life, people do tend to reflect more on negative outcomes in the hope to determine ways for improvement in the future, or to understand and make sense of the occurrence (Roese, 1997). However, research has also shown that people spontaneously generate counterfactuals after positive outcomes (e.g., Markman et al., 1993; Sanna, 1996; Sanna & Turley, 1996), which indicates that people also reflect upon positively valenced occurrences in the real world. Gleicher et al. (1990) purport that positive outcomes only engender spontaneous counterfactual thinking and exaggerated emotional responses when counterfactual alternatives are highly salient and made explicit, which therefore renders positive outcomes per se to have a mixed effect on the activation and subsequent affective response of counterfactual thought (see also Landman, 1987). Markman et al. (1993) however, found that outcome valence did not affect the number of counterfactuals spontaneously generated in regards to a personally experienced event. The researchers argue that an individual's motivation to either improve their future outcomes or their emotional state "will be differentially activated in different kinds of situations and will determine the direction of counterfactual generation" (Markman et al., 1993, p.103). Thus, in the event of positive outcomes, counterfactual generation appears to be dependent on the nature of the outcome and the salience of counterfactual alternatives.

Given the purported influence of situational factors on counterfactual generation in response to positive outcomes, clarity regarding the direction of counterfactual an individual is likely to consider is not definitive. However, research has demonstrated a tendency for people to consider how positive outcomes could have been worse, which serves to prolong positive affect (e.g., Markman et al., 1993). Markman et al. (1993)

found that this is especially prominent when the event is perceived as being a one-time event for which preparation for a similar future event is largely irrelevant.

In comparison to negative outcomes for which empirical research is extant, the research conducted on counterfactual thinking in the event of positive outcomes is somewhat limited. Research indicates that counterfactual thinking evokes affective reactions to negative events more readily than to positive events (Gleicher et al., 1990). Coupled with the supposed lack of need for future preparation and self-improvement after a positive outcome, an abundance of research investigating counterfactual thinking in response to negative events abounds. The consequences arising from counterfactual thinking in the event of positive outcomes thus require further investigation. Consequently, the current research project endeavoured to primarily utilise positively valenced outcomes in the methodologies. Positive and negative outcome valence, however, is not the only factor of a given outcome that exerts an influence over counterfactual thought. The closeness of an actual outcome to an alternative outcome yields a somewhat different influence over counterfactual thought, as illustrated in the section below.

## **2.4 Counterfactual Thinking in the Event of a Close-call**

Counterfactual thinking has also been researched in the event of close-call, or near-miss outcomes. Almost being involved in a serious car accident, or just making one's flight as the gates were closing, are examples of such outcomes. These types of events vehemently evoke counterfactual thinking. 'I could have been the one that got hit by the drunk driver', or 'If I had got a lift with my friend as originally planned, I wouldn't have seen the accident', and 'What if I had missed my flight? How inconvenient that would have been' and 'If only that meeting hadn't gone for so long, I

would have made my flight with plenty of time'. In the event of such occurrences, it is easy for one to reflect on the sequence of events and imagine better and worse comparisons as to how the situation could have been different, as the counterfactual alternatives to reality are highly salient (Kahneman & Varey, 1990). This, in turn, tends to create heightened emotional reactions (Gleicher et al., 1990; Johnson, 1986; Kahneman & Miller, 1986). For example, a person missing his or her flight by five minutes is judged to be more upset than someone missing their flight by thirty minutes as it is easier for one to imagine avoiding a five minute delay than a thirty minute delay (Kahneman & Tversky, 1982). However, Gilbert, Morewedge, Risen, and Wilson (2004) found that people expected to feel more regret than was actually experienced in the event of a disappointing outcome (e.g. missing the subway train), regardless of whether the margin of loss was narrow or wide. Gilbert et al., (2004) attribute the finding to participants being better at avoiding self-blame (a precursor to regret) than they realised, but also note that their findings may be dependent on the situational context of the narrow or wide loss (c.f. Medvec et al., 1995).

Close-call events commonly occur in our daily lives and have been an area of investigation for counterfactual researchers. For example, Markman and Tetlock (2000) examined how different types of accountability influenced participants' reactions to clear-cut and close-call successes and failures in a simulated stock investment competition. In a thought-listing task, participants generated more counterfactual thoughts in the near-win and near-loss conditions than the clear-loss and clear-win conditions. Of the counterfactuals generated, the near-win condition mirrored the frequency of upward counterfactuals that were more commonly generated by participants in the clear-loss condition, whereas the near-loss condition reflected the higher number of downward counterfactuals generated by participants in the clear-win

condition. In terms of affect reported by participants, more negative mood was reported by participants when they nearly lost compared to when they had a clear-win, and more positive mood was reported when participants nearly won than when they clearly lost. These differences however, were moderated by accountability.

McMullen and Markman (2002) extended upon Markman and Tetlock (2000) by providing a compelling demonstration that the affective reactions to a close-call event vary according to future possibilities. In the context of basketball games, McMullen and Markman (2002, Study 1) found that it was perceived to be better to lose a close game than a 'blowout' in the first game of a series, but opposite for a final game of a series. Similarly, at the end of the first half of a game, participants felt better when their team was down one point rather than up one point, whereas at the end of the game, participants felt better when it was a close win than a close loss (McMullen & Markman, 2002, Study 2). Thus, participants' affective reactions to a close-call event were moderated by whether there was a future opportunity in the midst. McMullen and Markman's (2002) findings indicate that affective assimilation is evoked by future possibilities whereas affective contrast is evoked by finality (see Section 1.4.2.1 for affective contrast and assimilation descriptions).

Larsen et al. (2004) demonstrated that both positive and negative emotions can be experienced simultaneously in response to highly salient counterfactual alternatives, such as disappointing wins and relieving losses. Outright wins and losses in contrast, evoked positive or negative affect. Larsen et al.'s (2004) findings suggest that positive and negative affect is better conceptualised as being bivariate rather than bipolar. As such, measures of affect, particularly in regard to highly salient counterfactual alternatives, should consist of rating scales that each measure a single emotion, rather than disparate emotions (e.g., happy-sad) as in McMullen and Markman (2002). This,

would therefore, provide the opportunity for participants to rate their simultaneously felt positive and negative feelings, rather than be directed to choose between bipolar emotions. Larsen et al.'s (2004) research provided significant insight into affective responses of highly salient counterfactual alternatives to reality.

With examples from the literature, this section has illustrated that the highly salient counterfactual alternatives of a close-call event result in different affective reactions to outright outcomes. This affective response has been shown to be moderated by perceived accountability (Markman & Tetlock, 2000) and future possibilities (McMullen & Markman, 2002), as well as consist of simultaneously mixed emotions (Larsen, et al., 2004). And as Gilbert et al. (2004) speculate, the aforementioned research indicates that findings vary according to the situational context of the narrow or wide loss. The following section diverges from affective feelings to personal feelings of competency as the potentially bi-directional relationship between self-efficacy and counterfactual thinking is explored.

## **2.5 The Relationship between Counterfactual Thinking and Self-Efficacy**

*Self-efficacy* refers to an individual's belief in his or her ability to accomplish a specific task or succeed in a particular situation (Bandura, 1986). It refers to an individual's expectation of being able to implement certain courses of action successfully (Sanna, 1997) and regards the perceived capabilities of people to implement control over events that occur in their lives (Bandura, 1989). Thus, self-efficacy does not regard the skills an individual has for any given situation, but instead concerns an individual's judgement of how he or she can utilise their pre-established skills to face the situation at hand (Bandura, 1986). Self-efficacy regulates human

functioning through the processes of cognition, emotion, motivation, and choice, and thus forms the basis of human agency (Bandura, 2000). The influence of self-efficacy in promoting learning, performance, and behaviours in a wide variety of contexts has been well documented throughout the literature (Bandura, 1989, 1997). A central finding of the extensive self-efficacy research is that a partial determinant of an individual's reaction to a state of affairs is the degree to which she or he believes that certain actions lie within their capabilities (Sanna, 1997). These efficacious beliefs arise from several primary determinants, including performance experiences, imaginal experiences, and affective states (Maddux, 1995). Given that these three factors also affect and are affected by counterfactual thinking, it is surprising that limited research has investigated the relationship between self-efficacy and counterfactual thinking.

Self-efficacy perceptions are particularly relevant in performance settings, which also frequently evoke counterfactual thoughts regarding how one's performance could have been better or worse. Take for example, a student who believes that he or she is capable of performing well in an upcoming exam, and thus expects to receive a good grade. Upon learning that his or her exam performance was below average, the student is likely to consider counterfactual alternatives regarding their exam performance and also alter their perceptions of their perceived efficacy. Do both these types of cognitions occur independently, or does one type of cognition exert an influence over the other?

One of the first empirical investigations that explored this relationship was Sanna's (1997) examination of self-efficacy as a moderator of the consequences arising from counterfactual thinking. Sanna (1997) conducted two anagram experiments and induced participants' feelings of high or low self-efficacy by telling them that their anagram performance was either really good or really bad. Participants' self-efficacy was assessed by their ratings of how capable they felt themselves to be at working out

solutions and their expectation of their capability to perform successfully on the task. Participants then generated a particular direction of counterfactual, and rated both their affect and preparedness. Overall, Sanna (1997) found that the affective and preparative consequences of engaging in counterfactual thought were moderated by self-efficacy. Specifically, participants in the high self-efficacy condition who generated upward counterfactuals reported a greater feeling of preparedness for the future, however did not feel any worse than participants generating downward counterfactuals. In contrast, participants in the low self-efficacy condition who generated upward counterfactuals reported the most negative affect and felt the least prepared of all of the experimental conditions. Participants generating downward counterfactuals reported positive affect regardless of their high or low induced self-efficacy. Thus, Sanna (1997) demonstrated the moderating effect of self-efficacy on the consequences of counterfactual thinking, but what effect does counterfactual thinking have on self-efficacy? Upon reflection of his findings and related literature, Sanna (1997) speculated the likelihood of a bi-directional relationship.

The effect of counterfactual thinking on self-efficacy was subsequently explored by Tal-or, Boninger, and Gleicher (2004), who explicitly set out to determine if and how counterfactual thinking influences people's feelings of self-efficacy as they look toward the future. The researchers hypothesised that counterfactuals in the upward direction should strengthen feelings of self-efficacy, whereas downward counterfactuals should diminish feelings of self-efficacy toward similar future events. To test their hypotheses, Tal-or et al. (2004) utilised participants' exam performance in multiple choice tests. Hypothetical scenarios were employed for which participants received an actual completed and marked answer sheet to review. Participants were either provided with a counterfactual statement in the hypothetical multiple choice exam feedback they



received (Experiment 1) or were primed to consider an upward or downward counterfactual alternative based on the marked exam answer sheet (Experiment 2). Self-efficacy was measured via several questions regarding participants' estimate of future success and the likelihood that they would do (a) better and (b) worse next time. The results of the two experiments demonstrated that self-efficacy influenced counterfactual thinking in the hypothesised ways (Tal-or et al., 2004). These findings were generalised in a real-world context in which participants actually partook in a general knowledge multiple choice exam and were explicitly given the opportunity to review and change their answers (Tal-or et al, 2004, Experiment 3). Participants generated a counterfactual alternative to their known performance, with the direction of comparison manipulated, and completed self-efficacy and perceived control measures. Although upward counterfactuals enhanced perceived self-efficacy, the effect was moderated by optimistic and defensive pessimistic dispositions. Tal-or et al. (2004) thus provided a preliminary demonstration of how self-efficacy is influenced by counterfactual thinking. However, further research employing different achievement tasks and a more rigorous method of evoking counterfactual thoughts is required to clarify the influence of counterfactual thinking on self-efficacy. Consequently, a self-efficacy measure has been included in the performance tasks of the current research.

## **2.6 Summary**

This chapter has thus reviewed the counterfactual thinking research pertinent to the current research project. The review has ascertained the knowledge gleaned from spontaneous and direction-specific counterfactual generation, and the prominent methodologies for investigating the consequences of counterfactual thinking, thus providing the foundations for the development of methodologies for the current research

project. The literature highlighting the influence of outcome valence and close-call events on counterfactual thinking and its consequences and the limited research regarding counterfactual thinking and self-efficacy, provided further areas for examination in the current thesis. The following chapter deviates from the abundance of research on counterfactual thinking in the adult population and examines children's ability to think counterfactually and the subsequent consequences that arise from their engagement in such thought.

### **Chapter 3 : Counterfactual Thinking in Children**

The first two chapters presented an overview of the field of counterfactual thinking and the methodologies frequently employed to assess this pervasive cognitive function in the adult population. Counterfactual thinking is a common form of everyday reasoning in which the adult mind engages (Summerville & Roese, 2008). Without the capacity to consider hypothetical alternatives to reality, one would be largely devoid of curiosity, ambition, and a sense of improvement (Byrne, 1997). Given the fundamental nature of this mental process, an abundance of research abounds for the adult population, as indicated throughout Chapters 1 and 2. Comparatively however, limited research has examined counterfactual thinking and the subsequent consequences that arise from children's engagement in such thought, resulting in a reduced understanding of this mental process in the child population. Consequently, the purpose of Chapter 3 is to present counterfactual research conducted with children, and highlight the benefits for continued research. This chapter reviews research on the development of young children's ability to reason from false premises, and consider counterfactual alternatives to reality. This review establishes that young children have a developing capacity to engage in counterfactual thought, and thus provides the foundation to extend this field of research to preadolescent children, a population receiving scant attention in the field of counterfactual thinking. The limited research that has thus far investigated primary school-aged children's engagement in counterfactual thought and the resulting consequences is reviewed, with the considerable need for further research brought to the forth. The final section of Chapter 3 outlines the empirical research conducted for this thesis.

### **3.1 The Emergence of Children's Counterfactual Reasoning**

The emergence of young children's ability to consider alternatives to reality can first be seen in their pretend play and in their references to unrealised outcomes. Amsel and Smalley (2000) provide the example of a child imagining that a banana is a telephone, and argue that such play demonstrates counterfactuality, as the child knows it is holding a piece of fruit but is instead imagining the banana as being a telephone. The child is therefore able to lay aside their knowledge of the actual state of affairs (i.e., that the banana is a piece of fruit) and imagine an alternative or counterfactual state of affairs (i.e., that the banana is a telephone). Harris (1997) further argued that the emergence of basic counterfactual reasoning in young children is apparent in 2- and 3-year-olds by their references to unrealised outcomes through terms such as 'almost' or 'nearly'. For example, children were able to indicate which toy horse almost fell off the table when two horses were made to gallop with one horse stopping just before the edge and the other horse stopping well before the edge. Harris (1997) also found 2- and 3-year-old children's free responses and spontaneous language production to contain references to outcomes that almost, but did not happen, such as a teddy bear's hat nearly getting blown off by the wind. Harris' (1997) research thus demonstrates that 2- and 3-year-old children have an understanding that a given outcome could have been different.

In order to more explicitly examine the ability of young children to consider counterfactual alternatives to reality, early research primarily focused on deductive reasoning from false premises (Riggs & Peterson, 2000). For example, children are presented with a false or incorrect proposition to reality, such as, 'All dogs can fly. Max is a dog.', and are then asked if Max can fly. Children are thus required to consider a hypothetical or counterfactual alternative to reality. According to Harris and Leivers (2000), reasoning from false premises is a natural example of counterfactual thinking.

As such, the early empirical research conducted with young children centred on false premises rather than explicitly on counterfactual alternatives to reality. False premises research has generally been conducted with preschool-age children of approximately 3 to 5 years of age and thus centres on the development of young children's ability to engage in counterfactual reasoning.

Research has established that children from approximately 3 years of age can accurately reason from false premises, both with fantasy and those related to their own experience. For example, Dias and Harris (1988) demonstrated that children between 4 and 6 years of age were reasonably competent in reasoning from false premises provided they were instructed to adopt a make-believe stance and thus temporarily set aside their own empirical knowledge. Leever and Harris (1999) extended this research with 4-year-old children. The researchers ascertained that preschool children instructed to reason on the basis of the given premise were just as likely to provide logical responses as those encouraged to use imagery in determining their responses, in comparison to children receiving no instruction. Leever and Harris (1999) subsequently contended that the use of a make-believe prompt or the instruction to think about the premise assists in highlighting the importance of the premise content to the child. This serves to indicate that the premise should be temporarily accepted regardless of its empirical truth, thus facilitating accurate reasoning from false premises.

### **3.2 The Ability of Preschool Children to Consider Counterfactual Alternatives**

One of the first direct examinations of preschool children's ability to consider counterfactual alternatives was conducted by Harris, German, and Mills (1996). Three experiments were designed to examine whether 3- to 5-year-old children were able to

consider counterfactual alternatives and use these considerations to generate a causal conclusion in explaining a given event. Overall, support was obtained for Harris et al.'s (1996) hypotheses. Essentially, in each of the experiments, several causal sequences were presented to children in the form of narratives regarding a minor mishap occurring for the protagonist (e.g., a doll leaving dirty footprints on a clean floor). Children as young as 3 years of age were competent in their ability to judge if an observed outcome could have been prevented by a counterfactual alternative. Children also demonstrated their capacity to consider different antecedents that would have prevented the observed outcome, with children in Experiment 3 spontaneously referring to a different course of action that would have prevented the outcome when asked to reflect on the causal sequence (e.g., if Sally had used a crayon instead of the blue or black pen that was offered in the narrative). Harris et al. (1996) demonstrated that young children are able to consider counterfactual alternatives when reasoning about cause and effect. According to Harris et al. (1996), this finding replicates the results of Wells and Gavanski's (1989) study with adults, whereby causal reasoning was found to be influenced by counterfactual thinking.

However, German (1999) hypothesised that children's ability to think counterfactually is not part of the process of causal reasoning, but perhaps may have been invoked by negative outcomes. Five-year-old children were asked to explain outcomes of stories similar to those in Harris et al. (1996); however, the stories had either positive or negative outcomes. The children were found to refer to counterfactual alternatives when explaining negative outcomes, thus replicating the results obtained by Harris et al. (1996). However, reference to counterfactual alternatives declined when explaining positive outcomes. German (1999) therefore concluded that negative

outcomes, even if only minor mishaps, invoke counterfactual thoughts, as children counterfactually undo negative events.

Harris (2000) suggests that children engage in counterfactual thinking in their deliberation of both positive and negative events. In explaining events, when children mentally contrast what might have occurred with what actually occurred, they refer to a counterfactual antecedent in the event of a negative outcome, and the actual antecedent in the event of positive outcomes. For example, in explaining why a protagonist ended up full after choosing a big sandwich over a small sandwich, children would respond with the actual choice made. Thus, for positive outcomes, children's mental contrast of actual and counterfactual antecedents goes unnoticed. The findings of Kavanaugh and Harris (2000, cited in Harris, 2000) provided support for this contention.

### **3.3 Preschool Children's Purported Difficulty with Counterfactual Reasoning**

Research in the children's literature has also yielded findings that contrast those indicating young children's aptness in considering counterfactual alternatives, and instead highlight young children's difficulty with counterfactual reasoning tasks. Of particular note, Riggs, Peterson, Robinson, and Mitchell (1998) found 3- and 4-year-old children to make a considerable number of errors on counterfactual tasks involving the location or property change of an object (e.g., chocolate being moved from the fridge to the cupboard). It has been suggested that children's difficulty with counterfactual reasoning in the tasks employed by Riggs et al. (1998) may be a result of the nature of the event in question, because the alteration of the outcome was neutral and centred on the location or property change of an object, rather than being a mishap to be prevented (Harris & Leivers, 2000). Considerable errors have also been found in other tasks

employing neutral valenced location change conditionals (e.g., Rafestseder & Perner, 2010; see Section 3.4.1), indicating that such tasks pose substantial difficulty to preschool-aged children.

To investigate the discrepancy in findings between Harris et al. (1996) and Riggs et al. (1998), German and Nichols (2003) suggested that preschool children's difficulty with counterfactual reasoning may lie in the complexity of the causal inference chain, rather than a difficulty in reasoning counterfactually. The authors proposed that the number of steps in the causal inference chain contribute to counterfactual task complexity. In examining responses of 3- and 4-year-olds to a narrative containing four causally related events leading up to a minor mishap, both 3- and 4-year-olds were accurate in their judgements of a protagonist's counterfactual emotions when considering a counterfactual event that was one causal step away from the story outcome (i.e., short causal chains). However, the consideration of counterfactual alternatives two (medium causal chains) or three (long causal chains) causal steps away from the given outcome posed significant difficulty, particularly for 3-year-olds.

In terms of task complexity, similar findings were found by Perner, Sprung, and Steinkogler (2004) in their use of simple versus complex travel scenarios. Simple scenarios entailed three travel departure points, each with a single mode of transport and to one destination, whereas in complex scenarios, there were two travel departure points, each with two modes of transport to two destinations. Three- to 5-year-old children, and particularly 3-year-old children, provided correct answers for the counterfactual questions for the simple scenario significantly more than the complex scenario. These findings provide further testament to the element of task complexity as a contributor to young children's difficulty with counterfactual reasoning tasks, as both



German and Nichols (2003) and Perner et al. (2004) found that counterfactual inference ability was dependent on child age and task complexity. Note, however, that German and Nichols' (2003) research methodology focused on children's judgement of a protagonist's emotion, whereas in Perner et al. (2004), the counterfactual reasoning task centred on location.

However, such findings regarding task complexity and children's difficulty with counterfactual reasoning tasks have not been replicated in recent research. In advancement of German and Nichols' (2003) research, Chan and Hahn (2007) endeavoured to qualify potential methodological constraints of German and Nichols (2003) to ascertain whether children are insensitive to the causal order effect that has been observed with the adult population (e.g., Wells, Taylor, & Turtle, 1987). The causal order effect refers to the notion of the first event being the most mutable in a sequence of causally related events, because each subsequent event in the sequence is contingent upon the first event. Chan and Hahn's (2007) findings were contradictory to those of German and Nichols (2003), such that children considering short causal chains reported a substantially smaller proportion of correct counterfactual inferences than when considering medium and long causal chains. This finding attests that children, like adults (e.g., Wells et al., 1987), are sensitive to causal order effects. Similarly, Beck, Riggs and Gorniak (2010) found that 3- to 4-year-olds had more difficulty with short compared to long causal chains. However, this finding only appeared for children with lower language ability.

Several investigations have found preschool children's performance in short and long causal chain counterfactual inference tasks to be comparable. Chan and Scott (2008), in an extension of Chan and Hahn (2007), found no discernable differences in preschool children's counterfactual task performance for short, medium or long causal

inference chains in either of two tasks requiring a counterfactual emotion judgement or a counterfactual inference about a physical event. These findings were substantiated by Beck, Riggs, and Gorniak (2009; 2010, Experiments 1 and 3) who found no difference in 3- and 4-year-olds' counterfactual reasoning performance between long and short causal chains. Further, Beck et al. (2009) found that young children's performance on short causal chain conditionals, location change conditionals, and false premise tasks were significantly correlated, thus demonstrating the three tasks to measure a common element in counterfactual reasoning, namely the reasoning about a false state of affairs.

### **3.3.1 The Relation between Children's Competence in Counterfactual Reasoning Tasks and Other Cognitive Processes**

The disparity in findings regarding preschool-aged children's competence in counterfactual reasoning tasks has led researchers to compare children's performance in counterfactual tasks and other cognitive tasks such as false belief (e.g., Riggs et al., 1998; Perner et al., 2004) and working memory (e.g., Beck et al., 2009; Chan & Hahn, 2007). Other research has considered the associations between the development of children's counterfactual thinking and other cognitive processes and abilities, such as language, executive function and theory of mind (e.g., Guajardo & Turley-Ames, 2004). Such research is currently determining and clarifying the presence of these associations, some of which are described later in this section.

To investigate preschool children's difficulty with counterfactual reasoning tasks, several studies have compared children's performance in these tasks with their performance in false belief tasks. One example is Riggs et al. (1998), who found a significant correlation between performances in the two tasks. The authors suggest that the same fundamental element underlies performance in both types of tasks. In an

attempt to replicate these findings, Perner et al. (2004) also found false belief and counterfactual reasoning task performance to be significantly related. However, the correlations became non-significant after participant age and verbal ability were statistically partialled out. In a recent investigation, Drayton, Turley-Ames, and Guajardo (in press) found that the significant positive correlation between children's counterfactual thinking and false belief performance remained strong even when age and language ability were controlled for. Thus, mixed results have yielded from research comparing children's performance in false belief and counterfactual reasoning tasks, leaving the issue of children's purported difficulty with counterfactual reasoning unresolved. German and Nichols (2003) however, contend that children's generalised difficulty with counterfactual reasoning may not be directly associated with difficulty with false belief but rather be a result of information processing.

Several studies have also compared preschool children's performance between a counterfactual task and a future hypothetical task, with the latter producing significantly better performance than the counterfactual (i.e., past hypothetical) task (Perner et al., 2004; Rafetseder, Cristi-Vargas, & Perner, 2010; Riggs et al., 1998, Experiment 4; Robinson and Beck, 2000, Studies 1 & 7; see also Beck, Robinson, Carroll, & Apperly, 2006). Riggs et al. (1998) and Robinson and Beck (2000) note that 3- and 4-year-olds seem to have a specific difficulty considering counterfactual situations. Robinson and Beck (2000) further investigated preschool children's difficulty with counterfactual reasoning and ascertained that the language used (i.e., pretend vs. 'if-then' reasoning), current or past events, seeing or merely hearing the narrative, surety of the actual state of affairs, and the salience of the counterfactual alternative did not affect children's counterfactual task performance. It therefore appears that preschool children's difficulty

is with considering a counterfactual alternative in conjunction with the actual state of affairs (Robinson & Beck, 2000).

Recently, Beck et al. (2009) delved further into children's difficulty with counterfactual reasoning by examining the influence of executive function, particularly inhibitory control and working memory. Inhibitory control was found to be a significant predictor of 3- and 4-year-olds' ability to reason counterfactually, indicating that preschool children's difficulty with counterfactual tasks is due to their struggle inhibiting their empirical knowledge, of what they know to be factual. The executive function of working memory in contrast, was not found to be associated with counterfactual reasoning ability as was predicted. Similar findings were obtained by Chan and Hahn (2007). Three and 4-year-old children's performance in measures of working memory and inhibitory control were not associated with their counterfactual judgements regarding medium and long causal chains, but were correlated with short causal inference performance. This association however, was partially dependent on children's language ability, a finding consistent with the literature (e.g., Beck et al., 2006; Chan & Warner, 2007; Guajardo & Turley-Ames, 2004), indicating that children's competence in counterfactual reasoning is substantially associated with their language development. Although Drayton et al. (in press) also found that age and language comprehension were related to preschoolers' counterfactual thinking and false belief performance, both working memory and inhibitory control each partially accounted for the positive relationship between false belief and counterfactual thinking, with working memory appearing to be more important for 5-year olds than 3- and 4-year olds.

Children's counterfactual reasoning has also been found to be associated with theory of mind understanding. Guajardo and Turley-Ames (2004) found that improved

verbal ability from 3 to 5 years of age was associated with a greater number of counterfactuals and better performance in theory of mind tasks. These findings were corroborated by Chan and Warner (2007) who also found a significant positive correlation between counterfactual thinking and theory of mind performance of 3- to 5-year-old preschool children, with language ability accounting for the observed age differences. In their extension of Guajardo and Turley-Ames (2004), Drayton et al. (in press) conclude that the developmental changes that are observed in the association between theory of mind understanding and early counterfactual reasoning, are underpinned by improvement in young children's executive function.

Thus, empirical links have been established between young children's competence in counterfactual reasoning and other cognitive abilities and processes. Preschool children's performance in counterfactual reasoning tasks has also frequently been found to improve with age (e.g., Beck et al., 2006; Chan & Warner, 2007; Guajardo & Turley-Ames, 2004), indicating a progression in young children's capacity to reason counterfactually. This progression is explored in the following section.

### **3.4 The Progression of Children's Capacity to Think**

#### **Counterfactually**

The aforementioned research has indicated a progression in young children's capacity to reason counterfactually, a development that appears to be associated with the development of other cognitive processes, and in particular, improvement in language competence. As such, the presence of observable age differences in counterfactual reasoning competence may be a result of the cognitive demands required of the child when participating in the given task. This section provides examples of

research demonstrating observable age improvements in children's performance in counterfactual reasoning tasks, with consideration given to task requirements.

An example of research demonstrating an improvement in counterfactual reasoning performance during the preschool years is Guajardo and Turley-Ames (2004). Children's ability to consider antecedent and consequent counterfactuals significantly improved from 3 to 5 years of age, with verbal ability accounting for the significant age improvement. Although the number of counterfactuals generated varied according to age and subsequent verbal ability, children of all ages were able to generate counterfactual antecedents in the open-ended antecedent counterfactual task (e.g., "What could you have done so the kitchen floor would not have gotten dirty?") and counterfactual consequences in the counterfactual consequent task (e.g., "If there had not been a fire, where would Peter be?"). A high correlation between the two types of counterfactual tasks was found indicating that children are equally able to consider alternative antecedents and alternative outcomes to a given state of affairs. This finding clarifies that research methodologies asking children to consider counterfactual antecedents (e.g., Harris et al., 1996) or counterfactual consequences (e.g., Riggs et al., 1998), is not a contributing factor to inconsistent findings regarding children's competence with counterfactual reasoning.

One of the few studies comparing preschool children (age 3-4 years) and young school-age children's (age 4-6 years) ability to consider alternative possibilities was conducted by Beck et al. (2006). Beck et al. (2006, Experiment 2) found that preschool children demonstrated good performance in standard counterfactual questions that are commonly employed throughout the literature (e.g., "What if it had gone the other way, where would it be?"). However, these children found the open counterfactual questions (e.g., "Could it have gone anywhere else?") significantly more difficult. In comparison,

the open counterfactual trials did not pose any difficulty for the school-age children. These results indicate that 3- to 4-year-old children can consider counterfactual alternatives when in isolation from reality, but struggle with the consideration of multiple possibilities occurring at a given point in time. This is likely a result of the ease of imagining a single alternative to reality in comparison to imagining multiple alternatives. This finding is consistent with Beck et al. (2009), demonstrating that preschool children seem to put aside what they know to be true in order to consider a counterfactual alternative. The ease with which 5- to 6-year-old school children correctly answered the open counterfactual questions indicated that children's ability to consider multiple alternatives to reality develops at approximately 5 years of age, and thus denotes a considerable maturation in children's ability to think counterfactually. Like Guajardo and Turley-Ames (2004) and Chan and Warner (2007), the observed age differences in Beck et al. (2006) may have resulted from differences in children's language ability. Language ability may also explain the performance differences between the standard and open counterfactual questions, as different linguistic requirements are likely to be involved in answering the two types of counterfactual questions.

In a comparison between preschool children and college students' judgement of a protagonist's emotions after considering a counterfactual alternative, Amsel, Robbins, Tumarkin, Foulkes, Janit, and Smalley (cited in Amsel & Smalley, 2000) found that children and adults reason about false states of affairs in the same way. Adults and children were found to rate a protagonist's happiness equally when considering the counterfactual alternative of the protagonist choosing the other box (see Section 3.7.1 for further detail). However, children did not seem able to compare actual states of affairs to alternative false affairs. Thus, young children's difficulty with counterfactual

tasks does not appear to be in their direct inability to reason about counterfactual situations, but rather seems to lie with their inability to evaluate actual and counterfactual situations (Amsel & Smalley, 2000). The authors broadly suggest that children's ability to think counterfactually improves as their cognitive capabilities develop. These findings are consistent with the maturation of counterfactual thinking observed by Beck et al. (2006) and Guajardo and Turley-Ames (2004).

### **3.4.1 The Possible Attribution of Methodological Differences**

The aforementioned research demonstrates that although children from approximately 3 years of age can consider counterfactual alternatives to reality, a difficulty with counterfactual reasoning tasks is apparent. The literature indicates a developmental transition between the ages of 3 and 5 years occurs in children's ability to think counterfactually, with a marked improvement in counterfactual reasoning occurring by age 6. However, in a recent investigation of this generally held contention, Rafetseder et al. (2010) demonstrated that proper counterfactual reasoning does not emerge until 5 or 6 years of age. The authors argue that the methods used to assess the counterfactual reasoning abilities of young children have tapped basic conditional reasoning instead. Here, Rafetseder et al. (2010) refer to basic conditional reasoning as occurring when typical or universal concepts are applied to counterfactual questions with no consideration of actual events, while in counterfactual reasoning, actual events must be considered in the conditional reasoning process. Thus, Rafetseder et al. (2010) designed narratives that would yield different answers for counterfactual and basic conditional reasoning. As hypothesised, 3- to 6-year-old children had significantly more difficulty answering counterfactual questions correctly when the correct response was different to that obtained through conditional reasoning, with minimal and non-



significant age differences observed. Consistent with Amsel and Smalley (2000), children did not seem able to compare and contrast reality with possible alternatives. Note, however, that although memory and control question performance was at ceiling, the narratives may have been too complex for young children to reason counterfactually (c.f., German & Nichols, 2003; Perner et al., 2004).

In an extension of Rafetseder et al. (2010), Rafetseder and Perner (2010) investigated the reasoning strategies 3- to 6-year-old children employed when reasoning about counterfactual antecedents. Overall, counterfactual reasoning was used by 37.6% of children, basic conditional reasoning – 21.1%, realist reasoning (i.e. reasoning based on reality or what is known to be true) – 11.3%, and mixed reasoning strategies – 30.1%. Rafetseder and Perner (2010) found that 84% of the children using counterfactual reasoning were aged 5 years or older, and noted the dominance of children's ability to reason counterfactually by 6 years of age. Although Rafetseder et al. (2010) and Rafetseder and Perner (2010) suggest that children younger than 5 years of age do not engage in counterfactual reasoning and instead use basic conditional reasoning in counterfactual tasks, reasoning from false premises is a natural example of basic counterfactual thinking in which young children engage (Harris & Leivers, 2000). Thus, it may be more accurate to contend that although young children from approximately 3 years of age are able to consider counterfactual alternatives to reality, proper counterfactual reasoning does not emerge until approximately 6 years of age.

As indicated by Rafetseder et al. (2010), published research on young children's ability to think counterfactually has centred on conditional reasoning. The only known research in the literature that has explicitly examined the types of counterfactuals *generated* by young children was conducted by Guajardo and Turley-Ames (2004). The researchers examined the direction (i.e., upward and downward) and structure (i.e.,

additive and subtractive) of counterfactual statements and found consistency with the findings in the adult counterfactual literature. The scenario narratives were designed to facilitate the generation of upward or downward counterfactuals, which children were able to generate equally well. Whereas counterfactual direction was prompted, counterfactual structure was elicited spontaneously, with children generating significantly more additive compared to subtractive counterfactuals. Although performance improved from 3 to 5 years of age, children as young as 3 years were able to generate both directions of counterfactuals with apparent ease when prompted. Given this finding, together with the abundance of research in the adult literature, research investigating the affective and preparative consequences resulting from children's consideration of better and worse alternatives to reality is warranted.

### **3.5 The Importance of Continued Research**

In terms of the importance of counterfactual thinking in children, Harris and Leever (2000) conclude that young children use counterfactual conditionals to explain why an outcome may have occurred and how it may have been prevented, particularly in the event of negative outcomes. Furthermore, they contend that children are likely to encounter many occasions in their everyday life in which they will think about what may have happened, and thus reason from false premises (Harris & Leever, 2000). Similarly, Riggs and Peterson (2000) argue that as well as being an important factor in causal reasoning, the development of counterfactual thinking in preschool children may also play a role in their social interaction and understanding the beliefs of others. This notion was empirically demonstrated by Chan and Warner (2007) who found that 3- to 5-year-old children's counterfactual generation performance was positively associated with teacher-rated social competence, and theory of mind, with the latter finding

consistent with Guajardo and Turley-Ames (2004). It therefore seems that children's counterfactual thinking is implicated in an array of developmental trajectories, thus warranting the need for further research.

As the above review has illustrated, the vast majority of the children's counterfactual literature has centred on the development of young children's ability to reason counterfactually. Although there is contention as to what age counterfactual thinking actually emerges in young children, there is general consensus that by 6 years of age, children are able to adequately consider counterfactual alternatives to reality. The development however, of children's improvement in counterfactual reasoning from age 6 to adulthood is yet to be established (Rafetseder et al., 2010), as are the resulting consequences of the engagement in such thought.

### **3.6 School-aged Children's Fluency in Counterfactual Reasoning**

As noted in Section 3.5, the improvement of school-aged children over 6 years of age to consider counterfactual alternatives to reality is yet to be established. As it is generally accepted that children are able to adequately reason counterfactually by 6 years of age (Beck et al., 2009; Rafetseder et al., 2010) with vast developmental improvements observed between ages 3 and 6 (Beck et al., 2006; Chan & Warner, 2007; Guajardo & Turley-Ames, 2004; Amsel & Smalley, 2000), it stands to reason that children's fluency in counterfactual reasoning ability should continue to improve during their school-age years. Alternatively, by approximately 6 years of age, counterfactual thinking may have approximated an adult-like level, with no significant developmental improvements necessary. However, research suggests the former argument predominates.

Support was received for this contention in a preliminary investigation conducted by Chan, Philp, and Ali (2002). This research examined upward and downward counterfactual generation of adults and primary school children after the presentation of a somewhat negative narrative. Children aged 5 to 6 years generated significantly fewer counterfactuals than adults or children aged 11 to 12 years (Study 1). As no difference in counterfactual generation was found between 11- to 12-year-olds and adults, Chan et al. (2002) conclude that the ability to think counterfactually attains an adult-like level by approximately 12 years of age. Developmental improvement was also found in a follow-up study (Chan et al., 2002), however, the difference between counterfactual thinking competence of children aged 7 to 8 years and children aged 5 to 6 years or 11 to 12 years was not significant. Chan et al. (2002) contend that the ability of children to think counterfactually relies on the same cognitive processes that underlie adults' counterfactual reasoning. Although language ability was not assessed (which may have explained the observed age-related differences in counterfactual thinking task performance), the finding in both studies that upward counterfactuals were generated more readily than downward counterfactuals in all age groups was noteworthy. This finding is consistent with the adult counterfactual literature in the event of negative outcomes (e.g., Roese & Hur, 1997; Roese & Olson, 1997).

In an extension of this research, Chan, Elliott, Fordham, Sydenham, and Zuchetti (2003) examined upward and downward counterfactual thinking in adults and children aged 7 to 8 years and 10 to 11 years after their performance – perceived to be somewhat negative – in a computer-administered task. Consistent with the findings of Chan et al. (2002, Study 1), counterfactual thinking task performance varied across age groups with a significant difference occurring between adults and 7- to 8-year-olds, with no difference occurring between older children and adults. This suggests that although

young school-age children have demonstrated competence in generating counterfactual alternatives, the ability continues to improve during preadolescence. In contrast to the findings of Chan et al. (2002) and the bulk of the adult counterfactual literature, children (irrespective of age group) demonstrated equal ability to generate upward and downward counterfactuals, thus indicating that children are capable of considering better and worse alternatives to reality. Similarly, Guajardo and Turley-Ames (2004) demonstrated preschool children's equal competence in generating both upward and downward counterfactuals when prompted. Continued research is thus required to enhance our understanding of this cognitive process during the childhood years, and to elucidate the consequences children experience from engaging in counterfactual thought.

### **3.7 Consequences of Children's Counterfactual Thought**

Although extensive research has examined the consequences and functions of counterfactual thinking in the adult population (e.g., Boninger et al., 1994; Markman et al., 1993; Roese, 1994; Sanna, 1997), very little research has been conducted in this area with children. Whether children experience the same consequences as adults from engaging in counterfactual thought is yet to be established. Do children obtain a greater sense of preparedness from considering how a particular outcome could have been better, thus facilitating future improvement, as frequently observed in the adult population (e.g., Markman, et al., 1993; Roese, 1994; 1997; Roese & Olson, 1995b), and does children's affective state improve after considering how things could have been worse? This is a core focus of the current research investigation.

### **3.7.1 Children's Emotional Responses to Counterfactual Alternatives**

A small number of preliminary studies have investigated children's emotional responses to counterfactual alternatives. As noted previously, Amsel and colleagues (cited in Amsel & Smalley, 2000) examined preschool and college students' emotional judgements of a protagonist's happiness after learning of the counterfactual alternative to a given outcome. Adults and children were found to rate the protagonist's initial happiness equally upon learning the contents of a chosen gift box (toy figurine/\$5), and when considering the counterfactual alternative of the protagonist choosing the other box containing a gift of higher or lower value (a block/\$0.50 or stickers/\$20). However, when asked to rate the protagonist's happiness with the gift they actually chose, adults rated the protagonist as being less happy when the counterfactual alternative was better and more happy when the counterfactual alternative was worse, whereas children did not rate the protagonist's happiness as being any different after learning the contents of the other gift box. As these results were replicated in two follow-up studies conducted by Amsel and colleagues (cited in Amsel & Smalley, 2000), the researchers suggest that young children's consideration of counterfactual alternatives does not affect their feelings about true states of affairs. This is likely to be a result of children's inability to compare and evaluate true states of affairs with counterfactual ones. However, this finding could be partially explained by young children's relatively limited perspective taking ability and emerging theory of mind (e.g., Pelletier & Astington, 2004; Wimmer & Perner, 1983). Overall, Amsel and colleagues (cited in Amsel & Smalley, 2000), demonstrated that preschool children's judgement of others' emotions is not affected by learning of counterfactual possibilities.

Amsel and colleagues' (cited in Amsel & Smalley, 2000) findings were corroborated by Guttentag and Ferrell (2004) in their assessment of age differences in

the understanding of regret and relief. Adults and children aged 5, 7, and 9 were presented with negatively valenced narratives and judged if one story character felt better or worse than another story character, given the different choices each character made (e.g., the same negative outcome occurring for both characters but resulting from a typical vs. atypical choice). Consistent with Amsel and colleagues (cited in Amsel & Smalley, 2000), 5-year-olds judged both protagonists to feel the same, regardless of the respective counterfactual alternatives of each protagonist. Guttentag and Ferrell (2004) found a significant development in children's judgements of regret by age 7, with emotional responses matching those of adults. This indicates that by approximately 7 years of age, children take into account counterfactual alternatives to a negatively valenced outcome when considering the emotional response of others. Similar findings were also obtained in Ferrell, Guttentag and Gredlein (2009) in that judgements of regret in response to highly salient counterfactual alternatives were significantly more adult-like by 8 years of age. However, Guttentag and Ferrell's (2004) findings of children's judgements of regret did not extend to 7-year-olds' judgement of relief or elation in the neutral and positively valenced outcomes of narratives in which they judged both story characters to feel the same, irrespective of the counterfactual alternative for each story character.

Guttentag and Ferrell's (2004) findings suggest that by 7 to 8 years of age, counterfactual alternatives have an effect on children's judgement of emotional response in the event of negative outcomes only. Although examining children two years younger, this is consistent with German (1999) in which counterfactual reasoning was evident for negative outcomes only. Thus, when prompted, young children are able to consider and use counterfactual alternatives in their judgements regarding negative but not positive outcomes. Although adults are adept in their prompted consideration

and subsequent use of counterfactuals in their judgements of positive and negative outcomes, as discussed in Chapter 2, the adult literature has established that positive outcomes engender spontaneous counterfactual thinking to a substantially lesser degree than negative outcomes. The age at which children take into account counterfactual alternatives in the event of positive outcomes in their judgements of emotion is yet to be determined. Further, the findings of Amsel and colleagues (cited in Amsel & Smalley, 2000) and Guttentag and Ferrell (2004) refer to children's judgement of the emotional response of others. Can these findings be extrapolated to children's own emotional state after their consideration of counterfactual alternatives to a self-relevant event?

In a recent investigation of 5- to 8-year-old children's experience and understanding of regret and relief, Weisberg and Beck (2010) found that children experience the counterfactual emotions of regret and relief at an earlier age than they are able to judge others' to feel these respective emotions. Based on Amsel and colleagues (cited in Amsel & Smalley, 2000, and described earlier), children and adults chose or watched another choose between one of two gift boxes that contained more or less stickers than the unchosen box. In replication of Guttentag and Ferrell (2004), a developmental difference was observed between children's judgements of regret and relief, with children experiencing regret at age 5 and relief at age 7. However, 5- to 7-year-old children demonstrated great difficulty in accurately judging regret and relief in others. The differences in findings between Guttentag and Ferrell (2004) and Weisberg and Beck (2010) may be explained by two distinct methodological differences: (i) Guttentag and Ferrell (2004) employed scenario tasks, while in Weisberg and Beck (2010), participants played or watched another play a decision-making game, and (ii) participants in Guttentag and Ferrell (2004) judged which of two story characters would have felt worse, while Weisberg and Beck (2010) asked participants to rate their own or



another's emotion on a scale consisting of five faces ranging from very sad to very happy. Taken together, the findings of these two investigations indicate that counterfactual alternatives influence children's emotions before they are able to understand counterfactual emotions in others, and that an understanding of regret emerges at an earlier age than relief. The latter finding indicates the greater prominence of negative outcomes in comparison to positive outcomes in children's deliberation of a given state of affairs.

An exploration of the affective function of upward and downward counterfactual thinking in children aged 5 to 6 years, 7 to 8 years, and 11 to 12 years was conducted by Chan et al. (2002) in which children's emotional response to a familiar story context with a negative outcome was assessed. Children's mood was found to improve after the generation of downward counterfactuals, and a significant association between downward counterfactual competence and mood change was found for 7- to 8-year-olds and 11- to 12-year-olds. This finding conforms to the functionalist perspective of counterfactual thinking in which the generation of downward counterfactuals assists in restoring mood in the event of a negative outcome (e.g., Markman et al., 1993; Roese, 1994). In follow-up research conducted by Chan et al. (2003) that employed a self-relevant performance oriented task, the affective function was again substantiated. Adults and children aged 7 to 8 years and 10 to 11 years in the downward counterfactual or control conditions reported a significant improvement in mood post-counterfactual generation in comparison to those generating upward counterfactuals. It therefore appears that the direction of counterfactual considered in the event of a negative outcome has an effect on children's own emotional state by approximately 7 years of age.

From the small number of investigations on children's counterfactual thinking and emotion, it has been ascertained that counterfactual alternatives to a negative or worse state of affairs affects children's own emotional state by 7 years of age, whilst counterfactual alternatives to more positive outcomes exert an influence somewhat later. The present research therefore endeavoured to examine the affective consequences arising from 9- to 11-year-olds' counterfactual thinking in response to positive outcomes<sup>3</sup>.

### **3.7.2 Children's Counterfactual Thinking and the Preparative Function**

To date, the literature appears to be devoid of research investigating the preparatory consequences that may result from children's engagement in counterfactual thought. The only known investigation is Chan et al. (2003). In this research, observable preparedness was assessed by comparing participants' (adults and children aged 7 to 8 years, and 10 to 11 years) performance across trials in a computer-administered performance task modelled from the *Trail Making Test* (Reitan, 1992). Contrary to expectation, the performance measures did not vary according to counterfactual direction. A relationship was found between mood repair and preparedness in all age groups for upward counterfactual generation: the more mood improved post-counterfactual generation, the greater the improvement in trial completion time for adults and 7- to 8-year-old children, and greater mood improvement for children aged 10 to 11 years was associated with a decline in study time. However, as constraints of the methodology may not have adequately evoked observable preparedness effects, and as participants' preparatory feelings were not assessed, a firm conclusion cannot be drawn from Chan et al.'s (2003) research as to whether children's consideration of

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<sup>3</sup> see Section 3.8 for justification to examine this age cohort.

upward and downward counterfactual alternatives produces a preparative effect. Further research is required to ascertain if children's counterfactual thinking results in the same preparatory consequences as those observed in the adult population.

As the generation of upward counterfactuals in the adult population has been shown to facilitate future success through evaluating and learning from mistakes and past negative experiences (e.g., Boninger et al., 1994; Markman et al., 1993; Roese, 1994), this function is likely to be of great benefit also to children who are constantly learning about themselves and the world (Davidson Films, 1997; Wood, 1998). Through assessing the preparative function of counterfactual thinking in children, greater knowledge can be gained as to how children may think about and learn from their past experiences, and how this may subsequently affect their future performances.

The limited research presented above highlights the need for further investigation into the resulting consequences of children's engagement in counterfactual thinking. Thus, a primary aim of the current research was to examine primary school-aged children's fluency in considering upward and downward counterfactual alternatives to reality and the subsequent consequences that may arise. The section below outlines the way this objective and the other principal aims of the current research were investigated.

### **3. 8 The Present Research**

The primary aim of the present research was to explicitly examine the effect of single compared to dual direction counterfactual generation on mood and preparedness. Although two contrast effects cancelling each other out is an intuitive assertion, the effect has not been empirically examined. Methodologies explicitly asking individuals to generate only one specific direction of counterfactual may not provide a complete

examination of the ways in which people use counterfactual thinking in their daily lives and how such thinking impacts their mood and feelings of preparation for a similar future event. Roese (1994) suggested that the consideration of both better and worse alternatives to reality may simultaneously maximise both the affective and preparative benefits of counterfactual thinking. However, to my knowledge, this contention has not been explicitly investigated in the published literature. It has only been assumed that by considering both directions of counterfactuals, the negative effects associated with each direction (i.e., lack of preparedness for downward counterfactuals and a decline in global affect for upward counterfactuals) should cancel each other out (see also Section 1.4.4).

Thus, the research conducted for this thesis endeavoured to empirically investigate this assumption. This aim was achieved by conducting six experiments that employed the same statistical design to allow for the assessment of both single directions of counterfactuals, namely upward and downward, compared to the consideration of both directions of counterfactuals. Based on Roese (1994), it was anticipated that the dual direction counterfactual conditions would evidence a decline in the negative effects often associated with each of the counterfactual directions, namely the lack of mood repair for upward counterfactuals and the lower preparedness for future events for downward counterfactuals.

Mundane events were utilised in the current investigation as much previous research has focused on more extreme, single occurring events that are typically negatively valenced (e.g., Kahneman & Tversky, 1982; Wells & Gavanski, 1989; Davis et al., 1995). Although mundane, everyday events can be positive or negatively valenced, they do not evoke extreme reactions and are thus more likely to be representative of the counterfactual consequences people experience in their everyday

lives. Whilst employing such events, the present research also set out to examine the ways in which single and dual direction counterfactual thinking affects mood and preparedness after a somewhat positive outcome. As discussed in Section 2.3, a relatively limited amount of past research has examined the consequences arising from counterfactual thinking in the event of positive outcomes. Although counterfactuals tend to be commonly generated after traumatic or surprisingly negative outcomes, with ways as to how the outcome could have turned out better being the default mode of thinking (Roesse & Hur, 1997; Roesse & Olson, 1997), research has shown that counterfactuals are also spontaneously generated in response to positive outcomes (e.g., Markman et al., 1993; Sanna, 1996; Sanna & Turley, 1996), particularly when the counterfactual alternatives are highly salient (e.g., Gleicher et al., 1990; Medvec et al., 1995).

Another primary objective of this thesis was to investigate counterfactual thinking in children. Specifically, this thesis aimed to: (i) demonstrate preadolescent children's ability to generate both upward and downward counterfactuals in the event of a somewhat positive outcome; (ii) examine the affective and preparative consequences resulting from children's engagement in such thought; and (iii) examine the observed differences in the effects of single versus dual direction counterfactual generation between adults and primary school-aged children. As discussed earlier in this chapter (see Section 3.6), the examination of counterfactual thinking in this age cohort remains largely understudied. Given the findings of previous research (e.g. Beck et al., 2009; Rafetseder et al., 2010), it is generally accepted that children are able to adequately reason counterfactually by 6 years of age. And research by Chan et al. (2002) demonstrated that 7-8 year olds did not differ in their counterfactual competence in comparison to 5-6 year olds and 11-12 year olds, while counterfactual competence significantly differed between 7-8 year olds and adults but did not differ between 10-11

year olds and adults (Chan et al., 2003). As young school-aged children's counterfactual competency appears to undergo continued improvement during preadolescence, for the present research, it was decided to investigate counterfactual thinking in 9-11 year old children. Besides examining preadolescent children's fluency in generating both directions of counterfactuals, whether counterfactual thinking results in the same consequences for preadolescent children as adults, also requires clarification.

Given the scant literature examining counterfactual thinking and its functions in both primary school-aged children and adults, it would be instrumental to devise and employ a research design capable of discerning the fluency of generating both directions of counterfactual and examining the purported functions that result from such thought in both populations. Such a methodological design should allow the observation of the differences occurring between adults and preadolescent children in their counterfactual thinking and resulting consequences. Hence, assessing both adults and children in the one research project should assist in ascertaining whether preadolescent children are fluent in considering both upward and downward counterfactuals as adults are, and if counterfactual thinking affects children's mood and preparedness in a similar manner to the adult population.

The present research employed two distinct types of empirical tasks to investigate single versus dual direction counterfactual generation in adults and preadolescent children. Previous research (Giroto, Ferrante, Pighin, & Gonzalez, 2007) has demonstrated that the content of participants' counterfactual thoughts vary according to their role in the task: participants that read about a protagonist's choices and experience undo the negative outcome by altering the protagonist's choices, whereas a participant actively taking part in the same task will undo the negative outcome by altering features of the task. Thus, different methodologies were employed

in the current investigation. Firstly, in order to gain an indication of the type of effects to be expected from this investigation, scenario studies were conducted with adult participants. Two such experiments were conducted, each involving a hypothetical scenario task based on a relatively common occurrence relative to the population examined, and a self-reported scenario based on the participants' own experience of a reasonably mundane event, and within specified parameters. All scenario tasks were designed to have somewhat positive outcomes. The second empirical task employed in the current research was an anagram task, based on that devised by Roese (1994, Experiment 3). This task was utilised twice with different adult samples, once with participant performance manipulated to be positive, the other manipulated to be negative, relative to other participants. The experimental tasks devised for this thesis were originally designed for use with adults and children alike, with only slight modifications being required. Thus, potential differences in the observed consequences arising from adults' and children's counterfactual thinking in the same experimental tasks could be discerned.

Previous research assessing the affective function of counterfactual thinking has provided mixed results in support of the contention that downward counterfactuals result in the alleviation of negative mood and enhancement of positive mood. For example, as discussed in Section 1.4.2, researchers such as Mandel (2003) did not find support for this affective function of downward counterfactuals. Thus, a further aim of the current research was to provide clarification of the role that downward counterfactuals play in regards to affect. A selection of specific positive and negative mood adjectives (taken from Sanna, 1996; 1997) were rated by participants, and were examined individually. Following the methodology of researchers such as Roese (1994) and Sanna (1996; 1997), the mood ratings were also combined to form a composite

mood variable to provide a global perspective of the ways in which affect is altered by the process of thinking counterfactually.

Each of the six experiments also assessed participants' feelings of preparedness for a similar future event. This was achieved by the inclusion of a rating scale at the end of each of the scenario tasks, which asked participants to rate their degree of preparedness for a similar future event. This methodology is consistent with that presented in the literature (e.g., Roese, 1994; Sanna, 1997). In the anagram experiments, two preparedness rating scales were presented immediately prior to being informed of having to complete a second anagram task. The preparedness measure assessed participants' degree of readiness and confidence to complete a second anagram task, and was taken from Sanna (1997). The inclusion of a second and unexpected anagram task allowed for the assessment of quantifiable preparedness for a similar future event.

In the performance oriented anagram experiments, participants' feelings of self-efficacy were also assessed. This was provided more as an exploratory measure, as limited research has directly examined the ways in which self-efficacy is altered by upward and downward counterfactual comparisons. As previously discussed (see Section 2.5), research has indicated that self-efficacy is a moderating factor of the consequences of engaging in counterfactual thought (Sanna, 1997), and Tal-or et al. (2004) demonstrated the reverse of this relationship. A self-efficacy measure was included in the anagram experiments and extended upon the work of Tal-or et al. (2004) by explicitly asking participants to consider better and/or worse alternatives rather than including a counterfactual prompt of a specified direction in the task feedback that participants received.

The primary objectives of the present research investigation have thus been outlined. To summarise, it was aimed to: (i) examine single versus dual direction



counterfactual generation on affect and preparedness; (ii) clarify the ways in which counterfactual thinking affects mood; (iii) elucidate the consequences arising from counterfactual thinking in the event of a positive outcome; (iv) ascertain the ways in which counterfactual thinking affects self-efficacy; (v) examine counterfactual thinking and its resulting consequences in preadolescent children; and (vi) discern any observed differences in the consequences of counterfactual thinking between adults and children. Chapters 4 to 6 of this thesis present the empirical research conducted to investigate these aims.

## **Chapter 4 : Scenario Tasks with Adults**

The primary purpose of Experiments 1a and 1b was to examine how the sequential consideration of both upward and downward counterfactuals affects mood and preparedness. This was achieved by four experimental conditions that determined the direction of counterfactuals generated and whether participants were required to generate counterfactuals in one or both directions. Thus, the four counterfactual conditions were: (i) upward only, (ii) downward only, (iii) upward followed by downward, and (iv) downward followed by upward, with the direction of the first counterfactual generated and the number of counterfactual opportunities provided, used as the independent variables for the experimental conditions.

The purpose of the current set of experiments was largely exploratory. Scenario tasks were employed, because as discussed in Section 2.2.1, the use of scenario tasks in the counterfactual literature is extant, and contributes substantially to the knowledge on counterfactual thinking. These include studies that used hypothetical scenarios (e.g., Boninger et al., 1994; Roese & Hur, 1997; Wells & Gavanski, 1989) and those that used self-reported scenarios (e.g., Mandel, 2003; McMullan, 1997; Roese, 1994).

Each experiment reported in this chapter consisted of two tasks; in Task 1, a hypothetical scenario was provided, and in Task 2, participants were required to generate a self-described scenario based upon their own experience and within certain parameters. The two tasks were employed to generalise the findings across a hypothetical scenario to which the participants could relate, and a scenario based upon participants' personal experience. Girotto et al. (2007) demonstrated that the way an individual acquires information (e.g., reading a scenario compared with being an active participant in an experimental game) affected the types of counterfactuals that

participants generated, which further necessitated the two types of scenario tasks. The situational context of the scenarios was chosen according to perceived relevance to the sample population of university students (c.f., Mandel, 2003).

As the affective function was a focal point of the present research, both experiments utilised several mood assessment ratings. The procedure was adapted from Sanna (1996; 1997) who used a series of positive and negative emotion adjectives to assess participants' mood after counterfactual generation. However, in the present experiments, mood ratings regarding the outcome of the scenario were made before and after counterfactual generation. This enabled the assessment of how affect changes as a result of counterfactual generation and therefore, to determine differences among the four counterfactual conditions. In order to combat the possibility of affect ratings being centred around the midpoint of bipolar scales as a result of participants experiencing positive and negative affect simultaneously (Larsen et al., 2004), unipolar rating scales were used.

Although the preparatory function of counterfactual thinking is well documented in the literature (e.g., Markman et al., 1993; Roese, 1994; Sanna et al., 2001), and the focus of the current research is on the affective function of counterfactual thinking, the two scenario experiments utilised a preparative rating scale as a final measure in each task. This feature was used to assess participants' degree of perceived preparedness after thinking counterfactually about the scenarios that were based on controllable and common events. Preparedness ratings were obtained by ratings of the likelihood that a similar future event would occur. The preparatory rating scale was included to determine if a difference in preparedness was apparent between the two single and two dual direction counterfactual conditions.

## **4.1 Experiment 1a**

This experiment was primarily conducted to explore the difference in the effects of single and dual direction counterfactual generation on mood, achieved through employing the four counterfactual conditions. It was also intended to assess the affective function of counterfactual thinking in response to somewhat positive outcomes, as the majority of research in this field has focused on the generation of counterfactuals after negative outcomes (e.g., Boninger et al., 1994; Mandel, 2003; Roese, 1994). Following the research conducted by Markman et al. (2008), a final aim was to assess the frequency in which participants spontaneously generated reflective and evaluative counterfactuals (see Section 1.5) when asked to think counterfactually in a specified direction.

In line with the literature, it was expected that the results would replicate the established functions of counterfactual thinking in that upward counterfactuals would lead to a decline in positive mood and an increase in negative mood, and a greater sense of preparedness for similar future events (Markman et al., 1993; Roese & Olson, 1995b). Downward counterfactuals would result in an increase in positive mood and a decline in negative mood (Boninger et al., 1994; Roese, 1994). It was also hypothesised that participants explicitly asked to generate both upward and downward counterfactuals about the same event would report no significant change in their mood. It was expected that similar patterns in mood change after counterfactual generation would be apparent across the hypothetical scenario task and the personally experienced scenario task. Finally, it was hypothesised that there would be more evaluative counterfactuals in upward counterfactual generation, and that downward counterfactual generation would engender more reflective counterfactuals.

## 4.2 Method

### 4.2.1 Participants

Participants consisted of 152 (119 female and 33 male) first year Psychology students from the University of Wollongong. Students received partial subject credit for their voluntary participation. Six participants were excluded from data analysis in Task 1 for: (i) generating inappropriate counterfactuals (see below for criteria) (4 participants), (ii) not completing all task components (1 participant), or (iii) producing mood ratings more than 2.5 standard deviations outside the mean (1 participant). Thus, 146 participants were included in the data analysis for Task 1, with a mean age of 20.12 years ( $SD = 4.92$ , range = 17-57 years). In Task 2, 44 participants were excluded for: (i) writing a scenario that was ambiguous or did not comply with the task requirements (26 participants), (ii) inappropriate or no counterfactual generation (10 participants), (iii) not completing all task components (2 participants), or (iv) producing mood ratings more than 2.5 standard deviations outside the mean (6 participants). Thus, a final sample of 108 participants was obtained for the data analysis for Task 2. The mean age of participants was 19.69 years ( $SD = 2.98$ , range = 17-40 years). The higher exclusion rate for Task 2 was a result of the self-described nature of the task. As participants were asked to describe an experience that had happened to them which was within certain parameters (see Section 4.2.3), a broader scope for participant interpretation and their subsequent responses ensued<sup>4</sup>.

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<sup>4</sup> For each of the experiments conducted for this thesis, all participants were recruited and tested in accordance with research protocol approved by the University of Wollongong Human Research Ethics Committee.

#### **4.2.2 Design**

Participants were randomly assigned<sup>5</sup> to one of the four counterfactual conditions of upward only, downward only, upward followed by downward, and downward followed by upward, with 36-38 participants in each condition. A 2 (direction of first counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design was employed. The dependent measures for each task were: (a) two positive and negative mood assessment measures, one immediately after reading the scenario/describing the experience, and one after generating counterfactuals, (b) the number of appropriate counterfactuals generated, and within this, (c) the number of reflective and evaluative counterfactuals generated, and (d) a preparatory rating scale (refer to Sections 4.3.1 and 4.3.2.6 respectively, for the scoring criteria for appropriate counterfactuals and reflective versus evaluative counterfactuals).

#### **4.2.3 Materials and Procedure**

In groups of approximately 20 students, participants were administered a pen-and-paper test booklet containing the hypothetical scenario task (Task 1) and the self-described scenario task based on an actual experience (Task 2). Task 1 consisted of a short scenario detailing the experience of forgetting about a University assessment for which the student managed to do some last-minute revision to end up obtaining an average mark of 14/20 (i.e., 70%; see Appendix A for the text used in the scenario).

Participants were instructed to ‘Read the scenario below and imagine the experience happening to you. You may read the scenario more than once. When you

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<sup>5</sup> For all experiments reported in this thesis, random assignment of participants to experimental conditions, occurred by blindly selecting a condition out of an envelope without replacement to ensure equal distribution of participants across conditions.

have finished, turn to page two.’ After reading the scenario, participants were asked, ‘How do you feel about your performance in the quiz? Please answer on each of the five scales below by circling a number on the line that reflects how you feel.’ Participants thus rated how they felt about the outcome of the scenario on five 9-point mood rating scales ranging from 1 = “not at all” to 9 = “very”. This method of mood solicitation utilising 9-point rating scales is consistent with Roese (1994, Experiments 1 & 2) and Sanna (1996, Experiment 1; 1998). The first mood rating scale assessed overall happiness with a happy and sad face as polar opposites. The other four scales assessed the emotions of *satisfied*, *glad*, *frustrated*, and *disappointed* (taken from Sanna, 1996; 1997), with the order of presentation of the positive and negative emotions counterbalanced (see Appendix B for mood rating scales).

Depending upon their assigned counterfactual condition, participants were then provided with the counterfactual generation task, containing the following instructions: ‘Counterfactual thinking refers to thoughts about how a given outcome could have been different. For example, after eating a pie and becoming sick, you may think, “If only I hadn’t eaten that pie, then I wouldn’t have gotten sick.” Can you think of as many ways as possible as to how your performance in the quiz could have been **worse (better)?**’ Participants in the dual direction counterfactual conditions were then provided a secondary task with the instructions ‘Now can you think of as many ways as possible as to how your performance in the quiz could have been **better (worse)?**’ Thus, participants were asked to list as many ways as they could as to how their hypothetical performance in the quiz could have been: (a) better, (b) worse, (c) better and then worse (as two separate tasks), or (d) worse and then better (also as separate tasks). Participants were then required to complete the second set of mood ratings by responding to the question, ‘After thinking about how your performance in the quiz could have been

different, how do you feel now about getting 14/20?' answering on the same five mood rating scales. A final 9-point rating scale assessed preparedness by asking, 'After thinking about how the outcome could have been different, how likely do you think this experience is of happening again?' with the scale ranging from 1 = "not at all likely" to 9 = "very likely".

In Task 2, participants were required to answer several open-ended questions regarding an experience in which they were running late for University but somehow managed to arrive on time. Task 2 was presented to participants as follows: 'For the second task, I would like you to think of a time when you were running late for uni, but somehow managed to arrive on time. Recall the events that occurred, and how you felt during this experience.' Participants completed this task by answering the following: 'a) How long ago did this experience happen? b) Now describe this experience as fully as you can, including how you were feeling at the time, and c) In the end, what happened to allow you to arrive to uni on time?' After describing their experience, and thus generating their own self-described scenario, participants were asked to rate how they felt about the outcome of the experience on the same 9-point mood rating scales as used in Task 1. According to their assigned condition, participants were then provided with the same counterfactual generation task as that used in Task 1, and were then required to complete the second set of mood ratings prompted by the question, 'After thinking about how the outcome of your experience could have been different, now how do you feel about having arrived at uni on time?' answering on the same five mood rating scales. After rating their preparedness for a similar future event on the same measure as



used in Task 1 and thus completing all tasks in the test booklet, participants were debriefed.<sup>6</sup>

## **4.3 Results**

### **4.3.1 Rating of Counterfactuals**

Counterfactuals were classified as thoughts “that alter reality, create hypothetical scenarios, or express an opinion as to what might have been had a different decision been made” (Tsiros & Mittal, 2000, p. 411). Counterfactuals were considered appropriate if they were in the specified direction, and related to the context of the given scenario. Of the 146 participants in Task 1 and 108 in Task 2, 20 percent of the test booklets were randomly selected and the number of upward and downward counterfactuals generated by participants was rated independently by a second rater using the abovementioned criteria. Cohen’s kappa revealed a high average inter-rater reliability of  $K = .82$  ( $N = 30$ ) for Task 1, and  $K = .88$ , ( $N = 22$ ) for Task 2. Any discrepancies were resolved through discussion, and several counterfactuals not cross-rated were subsequently scored differently as a result of the discussion. Examples of upward counterfactuals generated by participants when thinking about how their hypothetical performance in the quiz could have been better include, ‘If I had not gone out on Thursday night’, ‘Planned and organised myself better’, and ‘Not forgotten my textbook’. Examples of downward counterfactuals include ‘I could have not found out about the quiz’, ‘If I was severely hung-over’, and ‘If I didn’t get the textbook’.

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<sup>6</sup> To maintain consistency, the same methodological design for mood solicitation and counterfactual generation was employed for all tasks conducted for this thesis.

### 4.3.2 Task 1

#### 4.3.2.1 Number of Counterfactuals Generated

To determine the number of upward and downward counterfactuals generated by participants across conditions in Task 1, two separate between groups one-way ANOVAs were conducted with counterfactual condition as the independent variable in each analysis. No significant difference between the upward only, upward followed by downward and downward followed by upward conditions was evident in the number of upward counterfactuals generated [ $F(2,105) = 1.96$ ,  $p = .15$ ]<sup>7</sup>. Similarly, no significant difference between the downward only, downward followed by upward, and upward followed by downward conditions was found for the number of downward counterfactuals generated [ $F(2,107) = 0.00$ ,  $p = 1.00$ ; see Table 4.1 for the mean number of counterfactuals generated across conditions]. Thus, participants in different experimental conditions did not vary systematically in their readiness to generate counterfactuals in either the upward or downward direction.

**Table 4.1**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 1, Experiment 1a.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward Only	3.89 (0.98)	-
Downward Only	-	3.79 (1.21)
Upward/Downward	4.08 (1.05)	3.81 (1.04)
Downward/Upward	3.56 (1.36)	3.81 (1.19)

<sup>7</sup> An alpha level of .05 was used for all statistical tests in Experiments 1a and 1b, unless otherwise stated.

**Table 4.2**

*Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After  
Counterfactual Generation in Task 1, Experiment 1a.*

Mood/Condition	Before	After
Overall Happiness		
upward	5.85 (1.28)	4.82 (1.59)
downward	5.50 (1.42)	6.47 (1.28)
upward/downward	5.60 (1.67)	6.03 (1.61)
downward/upward	6.03 (1.96)	5.24 (1.84)
Satisfied		
upward	5.00 (1.20)	4.19 (1.72)
downward	4.95 (1.77)	5.79 (1.74)
upward/downward	4.86 (1.96)	5.08 (1.73)
downward/upward	5.14 (2.33)	5.06 (1.85)
Frustrated		
upward	5.56 (1.95)	6.25 (2.09)
downward	5.29 (2.09)	4.68 (1.85)
upward/downward	5.39 (2.10)	4.89 (1.97)
downward/upward	5.69 (2.00)	5.78 (2.15)
Glad		
upward	5.36 (1.38)	4.44 (1.54)
downward	4.92 (1.94)	6.00 (1.68)
upward/downward	5.00 (1.60)	5.36 (1.73)
downward/upward	5.53 (1.95)	4.83 (1.81)
Disappointed		
upward	4.75 (1.66)	5.67 (2.00)
downward	5.37 (1.75)	4.24 (1.72)
upward/downward	5.19 (1.89)	5.00 (1.76)
downward/upward	4.94 (2.23)	5.39 (2.14)

#### **4.3.2.2 Preliminary Analyses of the Data Set**

Preliminary assessments were performed on the data prior to statistical analysis to ensure a consistent sample. As such, the four counterfactual conditions were treated as four levels of a single independent variable, rather than as parts of the 2 x 2 factorial design later employed to test the hypotheses in question. Specifically, participants'

overall happiness ratings elicited at Time 1 were assessed to determine whether overall happiness ratings varied across the four counterfactual conditions, and if the outcome was perceived as positive, negative, or neutral. This scale was chosen as it provided a global mood assessment of how participants felt about the outcome of the scenario. Across conditions, mean overall happiness ratings ranged from 5.50 to 6.03 (refer to Table 4.2 for descriptive statistics of mood variables). Although it was expected that participants would perceive the outcome of the hypothetical scenario of getting 70% in the university assessment as being somewhat positive, the outcome was perceived as being relatively neutral. A between groups one-way ANOVA was conducted on overall happiness ratings with counterfactual condition as the independent variable, and as expected, no significant difference was found among conditions [ $F(3, 137) = 0.59, p = .62$ ].

#### **4.3.2.3 Change in Mood after Counterfactual Generation**

To determine how participants' mood changed post-counterfactual generation, a 2 (direction of first counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVA was first conducted on the overall happiness ratings elicited before and after counterfactual generation. Significant three-way interaction (direction of first counterfactuals x number of counterfactual opportunities x mood assessment) was found,  $F(1, 133) = 48.35, p = .00, \eta_p^2 = .27$ , with no other effects reaching significance. Simple main effects analyses indicate that participants' overall self-reported happiness ratings declined after upward only [mean difference = 1.03,  $SE = .23, p = .000$ ] and downward followed by upward generation [mean difference = .79,  $SE = .23, p = .001$ ] and increased after downward only [mean

difference =  $-.97$ ,  $SE = .23$ ,  $p = .000$ ] and upward followed by downward generation [mean difference =  $-.43$ ,  $SE = .29$ ,  $p = .06$ ].

To investigate the potential change in the emotion adjectives post-counterfactual generation, four separate 2 (direction of first counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on the four emotion adjective ratings of *satisfied*, *frustrated*, *glad*, and *disappointed*. Significant three-way interaction was also found for all four emotion variables when a Bonferroni adjustment of .0125 per comparison error rate was applied [*satisfied*:  $F(1, 142) = 11.39$ ,  $p = .001$ ,  $\eta_p^2 = .07$ ; *frustrated*:  $F(1, 142) = 8.14$ ,  $p = .01$ ,  $\eta_p^2 = .05$ ; *glad*:  $F(1, 142) = 36.10$ ,  $p = .00$ ,  $\eta_p^2 = .20$ ; *disappointed*:  $F(1, 142) = 15.29$ ,  $p = .00$ ,  $\eta_p^2 = .10$ ]. No further effects were found. As expected, the means (see Table 4.2) indicate that the positive emotion ratings (i.e., *satisfied* and *glad*) declined after upward counterfactual generation and improved after downward counterfactual generation, and the negative emotion adjectives of *frustrated* and *disappointed* increased after upward generation and decreased after downward generation. A smaller magnitude of change in the emotion adjective ratings was evident after counterfactual generation in the two dual direction conditions. Thus, the direction of the first counterfactuals generated and the number of counterfactual opportunities, have a significant effect on mood.

To further investigate the significant three-way interaction occurring in the mood variables, a series of 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were subsequently conducted substituting the independent variable of direction of first counterfactuals (i.e. the direction of the first set of counterfactuals participants generated in the dual

direction condition) for direction of last counterfactuals (i.e. the direction of the second set of counterfactuals that dual condition participants generated). These analyses also enabled us to determine if using direction of first counterfactuals as the independent variable confounded the significant three-way interaction reported above, by masking a potential recency effect for direction of last counterfactuals generated. Thus, it was subsequently hypothesised that for dual direction counterfactual generation, the direction of counterfactuals that participants considered last had a more prominent effect on their mood than the direction of counterfactuals that were generated first. The five 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs resulted in significant direction of last counterfactuals and mood assessment interaction for each of the five mood variables, producing the same F values as the three-way interaction reported in the previous analyses that employed the independent variable of direction of first counterfactuals. Thus, using direction of last counterfactuals as the independent variable seems more accurate in illustrating the changes occurring in mood after dual direction counterfactual generation than using direction of first counterfactuals. The significant two-way interaction occurring for each of the mood variables also illustrates the presence of a recency effect for the direction of last counterfactuals generated. Three-way interaction among direction of last counterfactuals, number of counterfactual opportunities and mood assessment was also found for the *satisfied* [ $F(1,142) = 5.38, p = .02, \eta_p^2 = .04$ ] and *disappointed* [ $F(1,142) = 4.21, p = .04, \eta_p^2 = .03$ ] variables. However, these findings did not reach statistical significance when a Bonferroni adjustment of .0125 per comparison error rate was applied. No further analyses yielded statistically significant findings.

Simple main effects analyses on the two-way interactions revealed that the changes in mean mood ratings after counterfactual generation were significant for several of the variables. Mean ratings for overall happiness, *satisfied* and *glad* increased significantly after downward only and upward followed by downward counterfactual generation [overall happiness: mean difference = -0.70,  $SE = .16$ ,  $p = .00$ , *satisfied*: mean difference = -0.54,  $SE = .21$ ,  $p = .01$ , and *glad*: mean difference = -0.73,  $SE = .18$ ,  $p = .00$ ] and declined after upward only and downward followed by upward counterfactual generation [overall happiness: mean difference = 0.91,  $SE = .17$ ,  $p = .00$ , *satisfied*: mean difference = -0.44,  $SE = .21$ ,  $p = .04$ , and *glad*: mean difference = 0.81,  $SE = .18$ ,  $p = .00$ ]. For the negative emotion adjectives, the downward only and downward last conditions demonstrated a significant decline in *disappointed* ratings [mean difference = 0.68,  $SE = .24$ ,  $p = .01$ ], and a marginally significant decline in *frustrated* ratings [mean difference = 0.55,  $SE = .23$ ,  $p = .02$ ]. In the upward only and downward followed by upward conditions, mean *disappointed* ratings increased significantly [mean difference = -0.68,  $SE = .25$ ,  $p = .01$ ], however there was no significant change in mean *frustrated* ratings post counterfactual generation [mean difference = -0.39,  $SE = .24$ ,  $p = .10$ ].

#### 4.3.2.4 Composite Mood

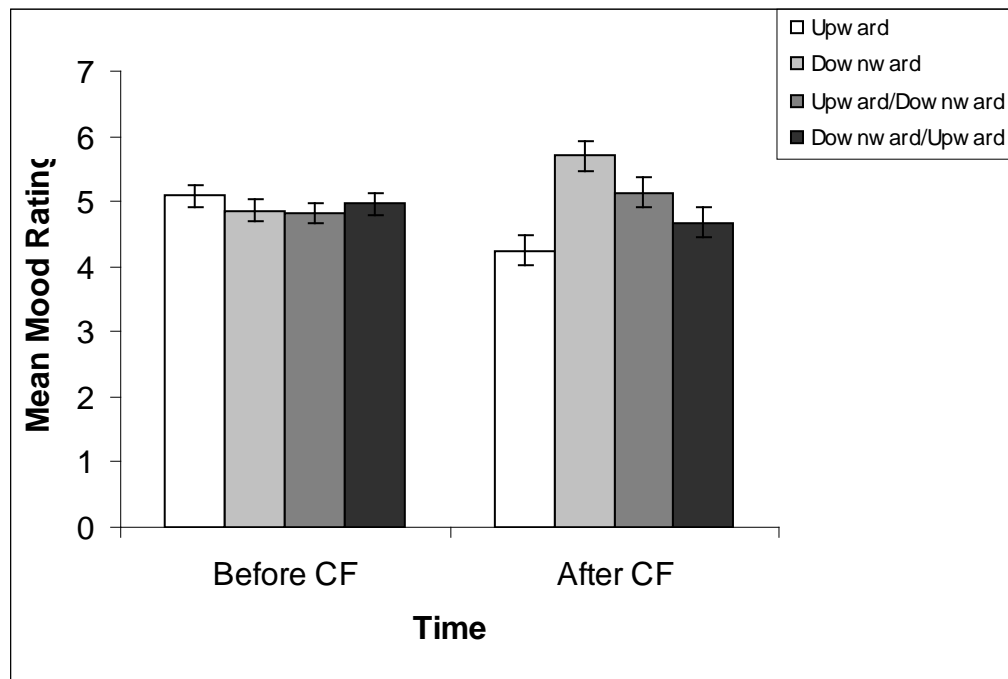
To determine the level of association between the mood variables, Pearson correlations were conducted with the four emotion adjectives. All were significantly correlated at the .01 level in the anticipated direction with the magnitude of association ranging from .44 to .66. In line with the literature (e.g., Roese, 1994; Sanna, 1996; 1997), a composite mood variable was thus formed by averaging reverse-scored negative mood adjectives with the positive mood adjectives (see Figure 4.1 for mean

composite mood ratings). A mixed design ANOVA was conducted on the composite mood ratings before and after counterfactual generation, with number of counterfactual opportunities (one vs. two) and direction of last counterfactuals (upward vs. downward) as the independent variables. Significant two-way interaction between direction of last counterfactuals and mood assessment [ $F(1,142) = 30.84, p = .00, \eta_p^2 = .18$ ], and significant three-way interaction among direction of last counterfactuals, number of counterfactual opportunities, and mood assessment [ $F(1,142) = 6.54, p = .01, \eta_p^2 = .04$ ] were found. No further effects were evident. The three-way interaction suggests that both the direction of counterfactual considered and the opportunity to generate one or both directions of counterfactuals have a significant effect on mood.

Simple main effects analyses on the three-way interaction indicate that mood significantly declined in the upward only condition and significantly improved in the downward only condition. Mean differences of the first mood rating minus the second mood rating were 0.83 ( $SE = .22, p = .00$ ), and -0.91 ( $SE = .21, p = .00$ ), respectively. There was no significant change in mood in either of the dual direction counterfactual conditions, with mean differences of -0.32 ( $SE = .21, p = .14$ ) for the upward/downward condition, and 0.33 ( $SE = .21, p = .14$ ) for the downward/upward condition.

These results support established findings of affective contrast in that upward counterfactual generation results in a decline in mood, and the generation of downward counterfactuals leads to an improvement in mood. The lack of change in affect in both dual direction counterfactual conditions provides preliminary support for the hypothesis that the consideration of both upward and downward counterfactuals sequentially has a neutralising effect on mood.





**Figure 4.1:** Changes in mean composite mood ratings in Task 1, Experiment 1a.

*Note:* Error bars indicate one standard error of the mean<sup>8</sup>.

#### 4.3.2.5 Preparedness

To assess if counterfactual generation had an effect on participants' sense of preparedness across conditions, a 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVA was conducted on preparedness ratings. No significant main effects or interaction between the independent variables was found<sup>9</sup> [ $F(1,142) = 0.64, p = .42$ ; see Table 4.3]. Therefore, participants considering either single direction of counterfactual or both directions of counterfactuals did not differ in their self-reported rating of preparedness for a similar future event. Thus, the initial prediction that upward counterfactuals would

<sup>8</sup> This applies to all of the graphs of means presented in this thesis.

<sup>9</sup> Where no significant effects were found in factorial ANOVAs, interaction is reported.

result in a greater sense of preparedness was not supported within the present experimental context.

**Table 4.3**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions for Task 1, Experiment 1a.*

Condition	Mean Preparedness Ratings
Upward	4.14 (1.87)
Downward	3.92 (2.01)
Upward/Downward	3.35 (1.76)
Downward/Upward	4.08 (2.02)

#### **4.3.2.6 Processing Mode**

Processing mode was rated for all counterfactuals based on the definitions provided by Markman et al. (2008). Reflection was defined as “an (‘as if’) mode of thinking whereby one imagines that information about the comparison standard is true of, or is part of, oneself or one’s present standing” (Markman et al., 2008, p. 422). Examples of participants’ reflective counterfactuals include, “The quiz was postponed due to a fire alarm” (upward direction), and “If I slept in and missed the quiz altogether” (downward direction). Evaluation was defined as “the outcome of a simulation run is used as a reference point against which to evaluate oneself or one’s present standing” (Markman et al., 2008, p. 422). Examples of evaluative counterfactuals generated by participants included “I could have gone home to study on Thursday night rather than staying out” (upward direction), and “If I had decided to wait in the line of traffic and not turn around, I would have been late” (downward direction).

Twenty percent of the test booklets were rated independently by a second rater blind to the hypotheses of the research, according to the abovementioned criteria. Following Markman et al. (2006), counterfactuals were rated on a 3-point scale from -1 = reflective to +1 = evaluative. An inter-rater reliability of  $K = .77$  was obtained. To determine the frequency of reflective and evaluative counterfactuals in both upward and downward generation, paired samples  $t$ -tests were conducted. As anticipated, the number of evaluative upward counterfactuals [ $M = 2.69$ ,  $SD = 1.35$ ] was significantly greater than the number of upward reflective counterfactuals [ $M = 1.16$ ,  $SD = 1.39$ ;  $t(108) = 6.46$ ,  $p = .00$ ,  $d = 1.19$ ], and the number of reflective downward counterfactuals [ $M = 2.53$ ,  $SD = 1.53$ ] was significantly greater than the number of evaluative downward counterfactuals [ $M = 1.22$ ,  $SD = 1.16$ ;  $t(108) = 5.59$ ,  $p = .00$ ,  $d = .97$ ].

### **4.3.3 Task 2**

#### **4.3.3.1 Number of Counterfactuals Generated**

As in Task 1, two separate between groups one-way ANOVAs were conducted to test the difference in the number of counterfactuals generated across the counterfactual conditions. No significant difference was evident in the number of upward counterfactuals generated between the upward only, upward followed by downward and downward followed by upward conditions [ $F(2,76) = 0.35$ ,  $p = .71$ ]. Similarly, no significant difference in the number of downward counterfactuals generated between the downward only, downward followed by upward, and upward followed by downward conditions was found [ $F(2,76) = 0.94$ ,  $p = .40$ ]. Consistent with Task 1, there were no systematic differences among the experimental conditions in participants' readiness to generate either upward or downward counterfactuals after thinking about the outcome in their self-described scenario.

**Table 4.4**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 2, Experiment 1a.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward	3.07 (1.41)	-
Downward	-	4.03 (0.94)
Upward/Downward	2.96 (1.24)	3.64 (1.29)
Downward/Upward	2.76 (1.42)	3.88 (0.93)

As can be seen in Table 4.4, participants generated a greater mean number of downward counterfactuals than upward counterfactuals when reflecting upon the outcome of their self-described scenario. A paired-samples  $t$ -test was thus conducted on the number of upward and downward counterfactuals generated by participants in the two dual direction conditions. This revealed that the difference was significant [ $t(49) = 5.64, p = .00, d = .74$ ], and suggests that participants' self-described scenarios provided greater scope for the generation of downward counterfactuals as compared to upward counterfactuals, likely a result of the positively perceived outcome (see Section 4.3.3.2).

#### **4.3.3.2 Preliminary Analyses of the Data Set**

As in Task 1, overall happiness ratings elicited at Time 1 in Task 2 were assessed to see whether these initial ratings varied across the four counterfactual conditions and to determine if the outcome of the self-described scenario was perceived as positive, negative, or neutral. As intended, mean overall happiness ratings across the four counterfactual conditions in Task 2 indicated that participants perceived the outcome of their self-described scenario as being positive, with means ranging from

7.64 to 8.21 (refer to Table 4.5 for descriptive statistics). A one-sample  $t$ -test was conducted with a test value of 5 to verify the perception of a positive outcome [ $t(102) = 27.47, p = .00, d = 2.71$ ]. As expected, a between groups one-way ANOVA indicated that there was no significant difference occurring among the counterfactual conditions for initial overall happiness ratings in Task 2 [ $F(3,99) = 1.15, p = .33$ ].

**Table 4.5**

*Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After Counterfactual Generation in Task 2, Experiment 1a.*

Mood/Condition	Before	After
Overall Happiness		
upward	7.81 (0.93)	6.71 (1.35)
downward	8.21 (0.72)	8.17 (1.34)
upward/downward	7.64 (1.04)	7.76 (1.41)
downward/upward	8.00 (1.62)	7.35 (1.81)
Satisfied		
upward	7.34 (1.14)	6.31 (1.73)
downward	7.52 (1.92)	7.83 (1.69)
upward/downward	7.14 (1.51)	7.12 (1.72)
downward/upward	7.20 (2.04)	6.96 (1.74)
Frustrated		
upward	3.41 (2.08)	4.38 (2.47)
downward	3.34 (2.13)	2.14 (1.48)
upward/downward	4.20 (2.04)	3.72 (2.03)
downward/upward	3.80 (2.63)	3.60 (1.83)
Glad		
upward	7.59 (1.64)	6.83 (1.51)
downward	8.00 (1.46)	8.21 (1.01)
upward/downward	7.56 (1.58)	7.74 (1.49)
downward/upward	8.00 (1.66)	6.92 (1.82)
Disappointed		
upward	2.72 (2.02)	3.55 (1.68)
downward	2.24 (1.64)	2.03 (1.43)
upward/downward	2.82 (1.88)	2.72 (1.43)
downward/upward	2.80 (2.20)	3.44 (2.02)

#### 4.3.3.3 Change in Mood after Counterfactual Generation

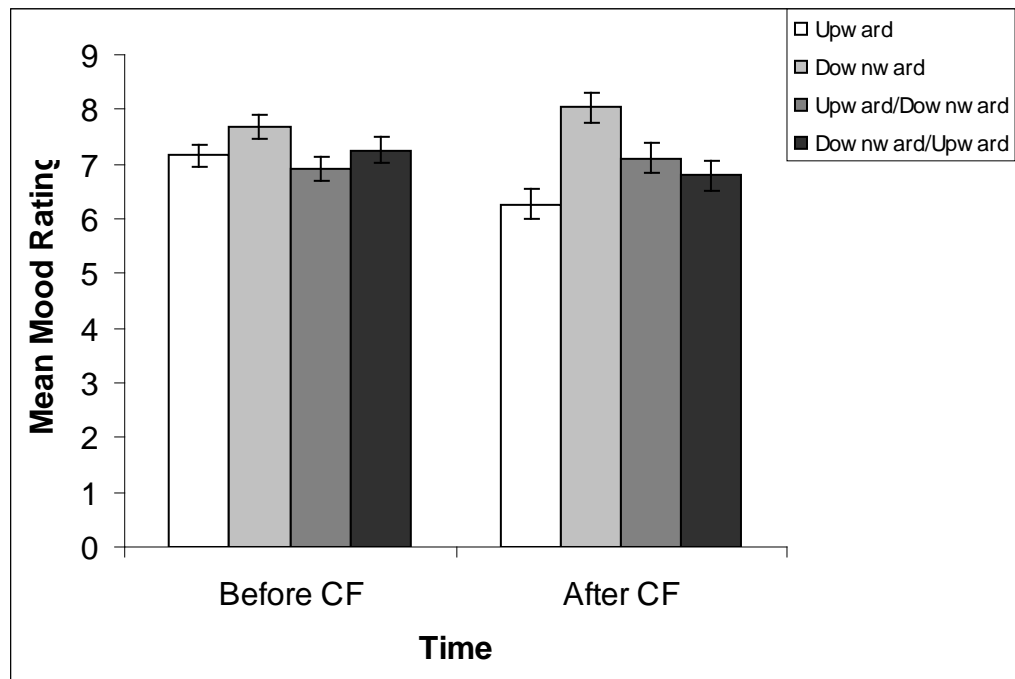
Given the findings of Task 1 regarding the presence of a recency effect for the direction of last counterfactuals variable, five separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on overall happiness and the emotion adjective ratings of *satisfied*, *frustrated*, *glad*, and *disappointed* before and after counterfactual generation (see Table 4.5 for descriptive statistics). These analyses produced similar results to Task 1 in that direction of last counterfactuals and mood assessment interaction was significant with a Bonferroni adjustment of .0125 per comparison error rate for overall happiness [ $F(1,82) = 9.96, p = .002, \eta_p^2 = .11$ ], *frustrated* [ $F(1,104) = 9.54, p = .01, \eta_p^2 = .05$ ] and *glad* [ $F(1,104) = 9.60, p = .01, \eta_p^2 = .08$ ], and approached significance for *disappointed* [ $F(1,104) = 5.13, p = .03, \eta_p^2 = .05$ ], and *satisfied* [ $F(1,104) = 6.17, p = .02, \eta_p^2 = .06$ ]. Three-way interaction for direction of last counterfactuals, number of counterfactual opportunities and mood assessment, was found for *frustrated* [ $F(1,104) = 5.68, p = .02, \eta_p^2 = .05$ ], however did not reach statistical significance when a Bonferroni adjustment of .0125 per comparison error rate was applied. No further effects were found.

Simple main effect analyses were conducted on the aforementioned significant two-way interactions. Mean ratings for the overall happiness variable and *glad* variable significantly declined after upward counterfactual generation in the upward only and downward followed by upward conditions [mean difference = 0.88,  $SE = .21, p = .00$ , and mean difference = 0.91,  $SE = .25, p = .00$  respectively]. Mean ratings for the *frustrated* variable significantly declined after downward counterfactual generation in

the downward only and upward followed by downward conditions [mean difference = 0.87,  $SE = .29$ ,  $p = .01$ ]. No other analyses reached statistical significance.

#### **4.3.3.4 Composite Mood**

Pearson correlations were conducted on the four emotion adjective variables, and consistent with Task 1, all variables were significantly correlated in the anticipated direction, with the magnitude of association ranging from .22 to .57 ( $p < .05$ ). Subsequently, the four emotion adjectives were combined to form a composite mood variable for Task 2, on which a mixed design ANOVA was conducted with direction of last counterfactuals and number of counterfactual opportunities. The analysis revealed significant two-way interaction between direction of last counterfactuals and mood assessment [ $F(1,104) = 12.15$ ,  $p < .001$ ,  $\eta_p^2 = .11$ ]. Simple main effect analyses were performed on the two-way interaction and revealed that composite mood ratings significantly declined in the upward last conditions (i.e. the upward only and downward/upward conditions), producing a significant mean difference of .69 [ $SE = .21$ ,  $p = .001$ ]. Composite mood ratings in the downward last conditions (i.e. downward only and upward/downward conditions) did not alter significantly post-counterfactual generation [mean difference = 0.35,  $SE = .21$ ,  $p = .09$ ]. The significant two-way interaction in Task 2 indicates that the direction of the last counterfactual generated has a significant effect on mood, with the greatest change occurring after upward counterfactual generation. In contrast to Task 1, the three-way interaction did not reach significance [ $F(1,104) = 1.72$ ,  $p = .19$ ], indicating that the number of counterfactual opportunities did not interact with the direction of the last counterfactual to have a significant effect on mood in Task 2 (see Figure 4.2). No further effects were found.



**Figure 4.2:** Changes in mean composite mood ratings in Task 2, Experiment 1a.

#### 4.3.3.5 Preparedness

To examine participants' feelings of preparedness across conditions, a 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVA was conducted on preparedness ratings (see Table 4.6). As in Task 1, no significant main effects or interaction between the two independent variables was found [ $F(1,104) = .55, p = .46$ ]. Therefore, participants generating either upward or downward counterfactuals or both directions of counterfactuals did not differ in their sense of preparedness for a similar future event. In contrast to our initial hypothesis, upward counterfactual did not result in a greater sense of preparedness in the given task.



**Table 4.6**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions for Task 2, Experiment 1a.*

Condition	Mean Preparedness Ratings
Upward	5.14 (2.55)
Downward	5.17 (1.93)
Upward/Downward	4.28 (2.07)
Downward/Upward	4.88 (2.28)

#### **4.3.3.6 Processing Mode**

Counterfactuals generated by all participants were coded as being reflective or evaluative according to the criteria outlined in Task 1. An inter-rater reliability of  $K = .86$  was obtained for processing mode in Task 2, after 20 percent of the test booklets were rated independently by a second rater blind to the research hypotheses. As in Task 1, paired samples  $t$ -tests revealed support for the hypothesis that the number of evaluative upward counterfactuals [ $M = 2.01$ ,  $SD = 1.27$ ] would be significantly greater than the number of reflective upward counterfactuals [ $M = 0.99$ ,  $SD = 1.10$ ;  $t(80) = 4.67$ ,  $p = .00$ ,  $d = .86$ ], and the number of reflective downward counterfactuals [ $M = 3.24$ ,  $SD = 1.30$ ] would be significantly greater than the number of evaluative downward counterfactuals [ $M = 0.62$ ,  $SD = 0.78$ ;  $t(77) = 12.30$ ,  $p = .00$ ,  $d = 2.52$ ].

## **4.4 Discussion**

The purpose of Experiment 1a was to explore how mood might be affected by the sequential consideration of better and worse alternatives of a given outcome. In the hypothetical scenario task, no change in participants' composite mood ratings was apparent after the sequential consideration of better and worse alternatives to the

neutrally perceived outcome of the scenario, and thus demonstrates a neutralisation of mood. However, in the somewhat positively perceived outcome of the self-described scenario of Task 2, the dual direction counterfactual condition of downward followed by upward counterfactual thinking, mirrored the significant decline in mood evident in the upward condition. Similarly, the upward followed by downward counterfactual condition reflected the lack of change occurring after downward only counterfactual generation, illustrating a recency effect of the direction of the last counterfactuals generated. However, the direction of change in mean mood ratings for each condition is comparable to those in Task 1.

As for mood change in the two single direction counterfactual conditions in both tasks, a significant decline in composite mood was found after upward counterfactual generation, as hypothesised and consistent with established findings (e.g., Mandel, 2003; Markman et al., 1993). Contrary to expectation, downward counterfactuals did not evidence a significant change in composite mood in Task 2. This finding contrasts to results from studies typically involving negative outcomes (e.g., Roese, 1994; Sanna, 1996), and the previously conceived notion that downward counterfactuals lead to an improvement in mood. However, the non-significant effect of downward counterfactuals on composite mood in Task 2 is consistent with Mandel (2003) whereby affect was not associated with downward counterfactuals. Thus, it would appear that the role of downward counterfactuals is not strictly as once perceived, and the effect of generating such counterfactuals may vary with the nature of experience.

As for the individual mood variables assessed in Task 1, overall happiness and *glad* ratings significantly declined in the upward only and downward/upward conditions and increased in the downward only and upward/downward conditions, with *satisfied* ratings following the same trend. Mean *disappointed* ratings declined after downward

counterfactual generation in the downward only and upward/downward conditions and increased after upward generation in the upward only and upward last conditions.

Similarly, in Task 2, mean overall happiness and *glad* ratings significantly declined in the upward only and downward followed by upward conditions and *frustrated* ratings lessened in the downward only and downward last counterfactual conditions.

In both tasks, there was no systematic difference between the single and dual direction counterfactual conditions in the number of upward or downward counterfactuals generated. This indicates that the methodology employed for soliciting counterfactuals in the dual direction conditions did not impair participants' fluency in generating a second direction of counterfactuals. Thus, the counterfactual generation task was effective in extracting participants' counterfactual thoughts in one or both directions. The lack of a systematic difference between conditions also denotes that both upward and downward counterfactuals readily come to mind when participants are explicitly asked to generate a particular direction of counterfactual after a somewhat positive or neutral outcome. This finding contrasts with previous findings which show that downward counterfactuals tend to be generated less readily than upward counterfactuals when considering alternatives to a negative outcome. This result has been observed for both spontaneous counterfactual generation (e.g., Roese & Hur, 1997) and direction-specific counterfactual generation (e.g., Mandel, 2003). Consequently, most counterfactuals are derived from unpleasant experiences and focus on how the outcome may have been better, and thus gives rise to the generation of upward counterfactuals being the default (Roese & Hur, 1997; Roese & Olson, 1997). However, in the present research, counterfactuals were generated in response to neutral and somewhat positively perceived outcomes. When considering such outcomes, there is more scope for imagining how the outcome could have been worse than after

considering a negative outcome. This is evident by the greater number of downward counterfactuals generated in comparison to upward counterfactuals when participants reflected upon the positively perceived outcome of their self-generated scenario. The readiness of participants to generate a particular direction of counterfactual seems to depend upon the outcome being reflected upon (c.f., White & Lehman, 2005).

Further, the results of the current experiment indicate that the type of scenario task (i.e., hypothetical or self-described) did not have an observable effect on participants' counterfactual generation and resulting consequences as might have been expected, given the findings of Girotto et al. (2007). Although participants' counterfactuals cannot be qualitatively compared between the two tasks given the different situational contexts, participants generated approximately three to four counterfactuals of a specified direction for each task and affect ratings followed similar trends for Task 1 and Task 2. Therefore, the type of scenario task did not appear to have an observable effect on participants' counterfactual generation.

Following Markman et al. (2008), Experiment 1a also examined the frequency of spontaneous reflective and evaluative processing in both directions of counterfactual thought. It was found that evaluative processing occurs significantly more than reflective processing during upward counterfactual generation, and reflective processing is significantly more frequent than evaluative processing during downward generation. The current experiment therefore demonstrates that when thinking about how things could have been better, evaluative processing may be the default mode of processing during upward counterfactual generation, and when thinking about how things could have been worse, reflective processing may be the default during downward counterfactual generation. The REM posits that both upward evaluation and downward reflection should result in greater motivation and persistence in achievement tasks

(Markman & McMullen, 2003). Given that the nature of the scenarios used in the current research was centred on attending university, participants would have been likely to focus more on the consequences of the possible outcomes on their success as a student, which may thus account for the present findings.

Experiment 1a also demonstrated that downward counterfactuals may not entirely possess the functions once thought, and the type of experience and subsequent outcome may play a significant role in determining the effect of counterfactual thoughts on one's mood. This is consistent with Mandel (2003) whereby the context or situation was found to be important in influencing counterfactual thinking and the subsequent impact on emotions. This is further explored in Experiment 1b by employing different scenarios utilising the same experimental design as Experiment 1a.

In summary, Experiment 1a set out to explore how the sequential consideration of upward and downward counterfactuals primarily affects mood after somewhat positive outcomes, and to examine the frequency of spontaneous reflective and evaluative counterfactuals. No change in composite mood was found after the consideration of both directions of counterfactuals in the event of a neutral outcome (Task 1), thus demonstrating the hypothesised neutralisation of mood, whilst in the event of a somewhat positively perceived outcome (Task 2), considering both counterfactual directions resulted in the same mood effects as when the counterfactual direction considered last was considered solely, with significant affective contrast occurring for the upward only and downward/upward conditions. Experiment 1a also demonstrated that evaluative processing appears to be the default mode of processing for upward counterfactuals, and reflective processing the default for downward counterfactuals.

## 4.5 Experiment 1b

Experiment 1b was conducted to replicate and generalise the findings of Experiment 1a utilising different scenarios. In Experiment 1a, Task 1, the dual direction counterfactual conditions showed no significant change in composite mood after counterfactual generation, however in Task 2, a significant change in composite mood in one of the dual direction counterfactual conditions was apparent. Therefore, the purpose of Experiment 1b was to determine whether the different styles of the two scenario tasks (i.e., hypothetical or self-reported) were a contributing factor or if it was the nature of the scenario and subsequent outcome. The current experiment replicated Experiment 1a by employing a hypothetical scenario task and a self-described scenario task; however, the nature of the scenarios was altered. The scenario in Task 1 described a ‘close-call’ event or ‘lucky escape’, and in Task 2, participants were required to describe a personal academic experience, again within certain parameters to elicit a self-described scenario with a somewhat positive outcome. Both scenarios were based on experiences to which participants of the given sample could easily relate, each containing several controllable factors.

As research has consistently demonstrated that people tend to mutate controllable antecedents rather than uncontrollable factors when considering counterfactual alternatives (e.g., Girotto, 1991; Mandel & Lehman, 1996; Markman, Gavanski, Sherman, & McMullen, 1995), a perceived controllability measure (adapted from Mandel, 2003; and Roese & Olson, 1995c) was also included in Experiment 1b to determine how much control participants felt they had over the outcome of the scenario and self-described experience. According to Roese and Olson (1995a), the consideration of alternative outcomes pertaining to an event with at least some level of controllability is more functional for the individual, who thus has greater scope for future betterment.

All other measures replicated those used in Experiment 1a; however several mood adjectives were substituted to reflect the affect types likely to be experienced after the given outcome.

On the basis of the findings in Experiment 1a, it was expected that the generation of upward only counterfactuals would result in a decline in positive mood and an increase in negative mood, and that downward only counterfactuals would lead to a reduction in negative mood and an improvement in positive mood. It was also expected that the dual direction counterfactual conditions would reflect the direction of change in mood occurring for the last counterfactual generated when considered solely, however the magnitude of change was expected to be non-significant and thus result in a neutralising effect. Secondly, it was anticipated that similar patterns in mood changes would be evident across the two tasks and comparable to Experiment 1a, thus generalising the findings of the previous experiment. Although not significant in both tasks in Experiment 1a, in line with the established preparative function of upward counterfactuals (Markman et al., 1993; Roese, 1994; Roese & Olson, 1995b), preparedness ratings were expected to be greatest after upward only counterfactual generation.

## **4. 6 Method**

### **4.6.1 Participants**

Participants consisted of 115 undergraduate Psychology students (95 female and 20 male) from the University of Wollongong with a mean age of 21.16 years ( $SD = 4.54$ , range = 17-47 years). Participants were enrolled in one of two different courses; they either received partial subject credit for their participation or participated as part of a class activity. Of the initial sample, four participants were excluded from data analysis

in Task 1 for: (i) generating no counterfactuals (2 participants), or (ii) not completing all task requirements (2 participants). Twenty-one participants were excluded in Task 2 for: (i) generating no counterfactuals (9 participants), (ii) generating inappropriate counterfactuals (refer to counterfactual scoring criteria outlined in Experiment 1a) (8 participants), (iii) not completing all task requirements (2 participants), or (iv) describing an ambiguous or inappropriate scenario (2 participants). Thus, the final sample consisted of 111 participants in Task 1, and 94 in Task 2. Similar to Experiment 1a, Task 2, the high exclusion rate in Task 2 of the current experiment resulted from the individual nature of the experiences that participants described (see Section 4.6.2 for task requirements). Thus, some participants may not have provided the scope for counterfactual generation in their self-relevant scenarios, and were therefore, unable to complete all task requirements.

#### **4.6.2 Design and Procedure**

This study replicated the design and procedure of Experiment 1a; however, several modifications were incorporated. In order to generalise the findings of Experiment 1a, Experiment 1b employed a hypothetical scenario (Task 1) and a self-described scenario (Task 2). The scenario in Task 1 detailed a close-call traffic incident in which the participant was driving a friend's car along a country road at dusk with a few friends also in the car, and whilst changing the radio station, just managed to avoid hitting a kangaroo (see Appendix C for the text used in the scenario). Again, participants were required to complete a mood assessment after reading the scenario by rating their overall happiness followed by five emotion adjectives on 9-point scales. The emotion adjectives, namely *distressed*, *glad*, *frustrated*, *relieved*, and *sad*, were chosen after consultation with a professor in emotional intelligence to reflect the emotions one



is likely to experience in the event of the close-call traffic incident (J. Ciarrochi, personal communication, April 2005). Perceived controllability was also assessed on a 9-point scale after completing the first set of mood ratings whereby participants were asked to rate 'How much control do you feel you had over the entire situation?'. The scale ranged from 1 = "no control at all" to 9 = "complete control". As in Experiment 1a, participants were then asked to generate either upward only, downward only, upward followed by downward, or downward followed by upward counterfactuals depending upon their randomly allocated condition. Each of the four counterfactual conditions consisted of approximately 29 participants (range = 27-30). Participants were then required to rate their mood a second time, and a final measure assessed preparedness by asking, 'After thinking about how the situation could have been different, next time you are on a road trip like the one just described, how prepared do you think you would be if a similar incident were to occur again?', responding on a 9-point scale ranging from 1 = "not at all prepared" to 9 = "very prepared".

Task 2 required participants to describe an experience in which they had completed an academic assessment and received a much higher grade than expected. The instructions provided were as follows: 'For the second task, I'd like you to think of an assessment you had to complete in which you thought you hadn't done so well in, only to end up getting a much better mark than you expected.' As in Experiment 1a, participants were asked to describe their experience within specified parameters, through completing several open-ended questions: 'a) How long ago did this experience happen? b) Describe your experience of completing this assessment, c) How did you feel when you submitted the assessment? d) What mark/grade did you expect to receive?, and e) What mark/grade did you end up receiving?'. After producing their self-described scenario, participants completed the first set of mood ratings containing

the overall happiness scale and the emotion adjectives of *disappointed*, *glad*, *frustrated*, *satisfied*, and *upset*. These emotion adjectives were taken from Sanna (1996, 1997) and chosen to capture the emotions one is likely to experience in an academic event. As in Task 1, after completing the first series of mood ratings, participants were asked to rate on a 9-point scale how much control they felt they had over the entire situation. Participants generated counterfactuals depending upon their randomly assigned condition, and completed the second set of mood assessment scales. Participants were then asked to rate their preparedness: ‘After thinking about how your performance in the assessment could have been different, how prepared do you think you will be when completing a similar assessment in the future?’ and were debriefed upon completing all tasks in the booklet. The dependent measures utilised in the current experiment included those used in Experiment 1a as well as perceived controllability ratings before counterfactual generation. All other aspects of the current experiment replicated Experiment 1a.

## **4.7 Results**

### **4.7.1 Rating of Counterfactuals**

Using the counterfactual classification criteria outlined in Experiment 1a, the number of upward and downward counterfactuals generated by participants in both Task 1 and Task 2 were rated. Twenty percent of the test booklets were randomly selected and rated independently by a second rater using the same counterfactual rating criteria. Satisfactory inter-rater reliability of  $K = .81$  ( $N = 22$ ) was obtained for Task 1

and  $K = .81$  ( $N = 19$ ) for Task 2<sup>10</sup>. Any rating discrepancies were resolved through discussion and non cross-rated counterfactuals were rated accordingly. Examples of upward counterfactuals generated by participants when thinking about the kangaroo incident include ‘If I had not changed the radio station, I might have seen the kangaroo sooner’, ‘Slowed down after seeing the kangaroo sign’, and ‘If I wasn’t driving somebody else’s car’. Examples of downward counterfactuals include ‘Caused a major car pile-up’, ‘If I wasn’t quick to brake we may have hit the kangaroo’, and ‘If I hadn’t been able to accelerate the car behind would have crashed into us’.

#### **4.7.2 Task 1**

##### **4.7.2.1 Number of Counterfactuals Generated**

To determine if the number of counterfactuals generated by participants varied according to counterfactual condition, two separate between groups one-way ANOVAs were conducted (see Table 4.7 for mean number of counterfactuals generated across conditions). The dependent variable in each analysis was the number of upward and the number of downward counterfactuals generated, with counterfactual condition as the independent variable. As expected, no significant difference between the upward only, upward followed by downward, and downward followed by upward conditions was found in the number of upward counterfactuals generated [ $F(2,79) = 0.08$ ,  $p = .92$ ]. Similarly, no significant difference between the downward only, downward/upward, and upward/downward conditions was evident in the number of downward counterfactuals generated [ $F(2,82) = 0.23$ ,  $p = .79$ ]. This indicates that participants

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<sup>10</sup> As the classification of counterfactuals as upward or downward and relevant to the task was straightforward, with high inter-rater reliability obtained for each of the four separate tasks in Experiments 1a and 1b, a second rater did not rate the counterfactuals generated by participants in the subsequent experiments conducted for this thesis.

were readily able to generate both upward and downward counterfactuals with no systematic variation occurring among the different experimental conditions.

**Table 4.7**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 1, Experiment 1b.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward	3.58 (1.10)	-
Downward	-	3.93 (0.92)
Upward/Downward	3.72 (1.53)	4.03 (1.15)
Downward/Upward	3.67 (1.33)	4.11 (0.89)

#### 4.7.2.2 Preliminary Analyses of the Data Set

As in Experiment 1a, to determine whether participants' initial overall happiness ratings varied across the four counterfactual conditions and to ascertain if the outcome was perceived as positive, negative, or neutral, participants' overall happiness ratings elicited at Time 1 were assessed. A between groups one-way ANOVA was conducted on the initial overall happiness variable with counterfactual condition as the independent variable. In contrast to our expectations, these ratings varied significantly across conditions [ $F(3,107) = 4.92, p = .003, \eta^2 = .12$ ], with the upward condition having the lowest mean overall happiness rating of 2.69 and the downward condition having the highest mean rating of 4.69 (see Table 4.8 for descriptive statistics). A Bonferroni post hoc analysis revealed this difference to be significant [mean difference = 2.00,  $SE = .52, p = .001$ ]. In contrast to expectation, the relatively low mean overall happiness ratings indicate that participants viewed the outcome of almost hitting the

kangaroo as being somewhat negative. This was verified by a one-sample  $t$ -test conducted with the midpoint of 5 [ $t(110) = 6.73, p = .00, d = 0.64$ ]. Given the significant differences in mean initial overall happiness ratings across conditions, this variable was used as a covariate in subsequent analyses.

#### **4.7.2.3 Perceived Controllability**

To determine how much control participants felt they had over the outcome of the close-call traffic incident, the perceived controllability ratings elicited prior to counterfactual generation were examined. An average perceived controllability rating of 4.66 was obtained. Across conditions, the means ranged from 4.12 ( $SD = 1.63$ ) for the upward only condition, to 5.07 ( $SD = 1.93$ ) for the upward/downward condition. A between groups one-way ANOVA with counterfactual condition as the independent variable revealed that there was no significant difference among the four conditions in perceived controllability ratings [ $F(3,106) = 1.25, p = .30$ ].

**Table 4.8***Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After**Counterfactual Generation in Task 1, Experiment 1b.*

Mood/Condition	Before	After
Overall Happiness		
upward	2.69 (1.26)	3.81 (2.10)
downward	4.69 (2.25)	6.34 (1.95)
upward/downward	3.66 (2.24)	5.97 (2.31)
downward/upward	3.67 (1.71)	4.89 (1.85)
Distressed		
upward	6.85 (1.32)	5.65 (1.96)
downward	6.90 (1.26)	5.52 (1.84)
upward/downward	6.66 (1.95)	4.72 (2.33)
downward/upward	6.48 (1.72)	4.93 (1.84)
Glad		
upward	4.65 (3.05)	5.04 (2.60)
downward	6.00 (2.36)	6.86 (2.22)
upward/downward	3.90 (2.68)	5.90 (2.43)
downward/upward	4.52 (2.21)	5.07 (1.75)
Frustrated		
upward	5.12 (2.34)	5.38 (2.19)
downward	5.00 (2.25)	4.38 (1.80)
upward/downward	5.14 (1.87)	4.59 (2.46)
downward/upward	5.07 (1.90)	4.70 (1.98)
Relieved		
upward	7.73 (1.73)	7.27 (2.07)
downward	8.03 (1.50)	7.72 (1.91)
upward/downward	7.62 (1.82)	8.07 (1.00)
downward/upward	7.15 (2.05)	6.96 (1.89)
Sad		
upward	4.23 (2.07)	4.00 (2.17)
downward	3.79 (1.76)	4.03 (1.95)
upward/downward	3.34 (2.06)	3.24 (2.03)
downward/upward	3.89 (1.76)	3.67 (1.64)

#### 4.7.2.4 Change in Mood after Counterfactual Generation

In examination of mood change post-counterfactual generation, five separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on each of the emotion adjective ratings of *distressed*, *glad*, *frustrated*, *relieved*, and *sad* before and after counterfactual generation, with overall happiness ratings used as a covariate (see Table 4.8 for descriptive statistics). Of the five emotion adjectives rated by participants, significant two-way interaction between direction of last counterfactuals and mood assessment was found for the *glad* variable [ $F(1,106) = 11.23, p = .00, \eta_p^2 = .10$ ]. Direction of last counterfactual and mood assessment interaction was also found for the *frustrated* variable, however did not reach statistical significance when a Bonferroni adjustment of .0125 per comparison error rate was applied [ $F(1,106) = 4.31, p = .04, \eta_p^2 = .04$ ]. No other analyses yielded statistically significant findings.

Simple main effect analyses indicated that the mean differences for *glad* ratings significantly increased in the downward only and upward followed by downward conditions [mean difference = -1.65,  $SE = .29, p = .00$ ], denoting that downward counterfactuals when considered solely or last had a significant effect on self-reported feelings of gladness. Thus, in Task 1, after thinking about the outcome of the traffic incident, downward counterfactuals considered on their own or after upward counterfactuals, significantly improved participants' mood by increasing their self-reported feelings of gladness<sup>11</sup>.

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<sup>11</sup> As only one of the five emotion adjective variables showed significant direction of last counterfactual by mood assessment interaction between the counterfactual conditions, composite mood was not assessed.

#### 4.7.2.5 Preparedness

To assess participants' preparedness ratings across conditions, 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVA was conducted (see Table 4.9 for descriptive statistics). No significant main effects or interaction between the two independent variables was evident [ $F(1,106) = 1.93, p = .17$ ]. Thus, the generation of counterfactuals, either upward or downward, did not result in participants reporting a greater sense of preparedness for a similar future event. The means indicate that participants' feelings of preparedness for a similar future event were moderate, with an average preparedness rating of 6.13 on a 9-point rating scale.

**Table 4.9**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions for Task 1, Experiment 1b.*

Condition	Mean Preparedness Ratings
Upward	6.58 (1.45)
Downward	5.86 (1.83)
Upward/Downward	6.10 (1.93)
Downward/Upward	5.96 (1.79)

#### 4.7.3 Task 2

##### 4.7.3.1 Number of Counterfactuals Generated

As in Task 1, two separate between groups one-way ANOVAs were conducted on the number of upward and the number of downward counterfactuals generated across the counterfactual conditions in Task 2 (see Table 4.10 for mean number of counterfactuals generated across conditions). Again, no significant difference was found



among the upward only, upward followed by downward and downward followed by upward conditions in the number of upward counterfactuals generated [ $F(2,66) = 0.28$ ,  $p = .75$ ]. Similarly, no significant difference among the downward only, downward followed by upward, and upward followed by downward conditions was found for the number of downward counterfactuals generated [ $F(2,64) = 1.18$ ,  $p = .31$ ]. Consistent with Task 1, there was no systematic variation between the experimental conditions with participants readily able to generate both directions of counterfactuals after thinking about the outcome of their self-described scenario.

**Table 4.10**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Task 2, Experiment 1b.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward	3.15 (1.06)	-
Downward	-	2.84 (1.31)
Upward/Downward	3.14 (1.32)	3.09 (1.31)
Downward/Upward	2.90 (1.29)	3.45 (1.36)

#### 4.7.3.2 Preliminary Analyses of the Data Set

Consistent with Task 1, overall happiness ratings elicited at Time 1 were analysed to determine whether the initial mood ratings varied across the four counterfactual conditions, and to ascertain whether the outcome was perceived as being positive, negative, or neutral. A between groups one-way ANOVA with counterfactual condition as the independent variable was conducted on the Time 1 overall happiness variable. As predicted, there was no significant difference in initial happiness ratings

among the four counterfactual conditions [ $F(3,90) = 1.19, p = .32$ ]. As anticipated, the means of the overall happiness ratings at Time 1 indicate that participants perceived the outcome of their self-reported experience as being positive, with the ratings ranging from 8.36 to 8.70 (see Table 4.11 for descriptive statistics), and was confirmed by a one-sample  $t$ -test conducted with a test value of 5 [ $t(93) = 49.396, p = .00, d = 5.09$ ].

#### **4.7.3.3 Perceived Controllability**

Perceived controllability ratings generated by participants prior to counterfactual generation were examined to determine how much control participants felt they had over the outcome of their self-described experience. A mean controllability rating of 5.50 on a 9-point rating scale was obtained. Across the four counterfactual conditions, means ranged from 4.65 ( $SD = 1.76$ ) for the downward/upward condition, to 5.86 ( $SD = 2.36$ ) for the upward/downward condition. A between groups one-way ANOVA conducted with counterfactual condition as the independent variable revealed no significant difference in perceived controllability ratings among the four conditions [ $F(3,90) = 1.53, p = .21$ ].

**Table 4.11***Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After**Counterfactual generation in Task 2, Experiment 1b.*

Mood/Condition	Before	After
Overall Happiness		
upward	8.70 (0.47)	7.26 (1.85)
downward	8.48 (0.77)	8.24 (1.23)
upward/downward	8.36 (0.95)	7.32 (2.01)
downward/upward	8.65 (0.49)	7.50 (1.50)
Disappointed		
upward	1.59 (0.80)	3.41 (2.06)
downward	1.56 (1.00)	1.48 (1.05)
upward/downward	2.00 (1.41)	2.55 (1.99)
downward/upward	1.30 (0.57)	2.45 (1.79)
Glad		
upward	8.59 (0.69)	7.15 (1.94)
downward	8.40 (0.91)	8.48 (0.92)
upward/downward	8.14 (1.17)	7.45 (2.04)
downward/upward	8.40 (0.75)	7.55 (1.28)
Frustrated		
upward	2.41 (1.99)	4.00 (2.30)
downward	2.36 (1.68)	2.08 (1.63)
upward/downward	2.41 (1.37)	3.45 (2.13)
downward/upward	2.75 (1.20)	3.50 (2.48)
Satisfied		
upward	7.89 (1.31)	6.28 (2.16)
downward	8.16 (1.28)	7.96 (1.81)
upward/downward	7.27 (1.83)	7.00 (2.16)
downward/upward	7.85 (1.66)	7.00 (1.65)
Upset		
upward	1.96 (1.53)	2.70 (1.81)
downward	1.30 (0.70)	1.64 (1.35)
upward/downward	1.82 (1.14)	2.36 (1.56)
downward/upward	1.45 (1.36)	2.55 (2.09)

#### 4.7.3.4 Change in Mood after Counterfactual Generation

Six separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on the overall happiness ratings and the five emotion adjective ratings of *disappointed*, *glad*, *frustrated*, *satisfied*, and *upset* before and after counterfactual generation to examine the potential change in participants mood ratings after thinking counterfactually (see Table 4.11 for descriptive statistics). Two-way interaction for direction of last counterfactuals and mood assessment was significant for *disappointed* [ $F(1,90) = 14.82, p = .00, \eta_p^2 = .14$ ]; *glad* [ $F(1,90) = 8.91, p = .004, \eta_p^2 = .09$ ]; and *satisfied* [ $F(1,90) = 9.21, p = .003, \eta_p^2 = .09$ ]. Thus, it appears that a recency effect is apparent as the direction of the last counterfactuals generated is shown to have a substantial effect on several of the mood variables. However, the three-way interaction between direction of last counterfactuals, number of counterfactual opportunities and mood assessment was significant for the *frustrated* variable [ $F(1,90) = 6.55, p = .01, \eta_p^2 = .07$ ]. A three-way interaction was also found for *glad* [ $F(1,90) = 5.72, p = .02, \eta_p^2 = .06$ ]. However, it did not reach statistical significance when a Bonferroni adjustment of .0125 per comparison error rate was applied. The three-way interaction indicates that the number of counterfactual opportunities also has an effect on some emotions in conjunction with the direction of the last counterfactuals generated. No other analyses reached statistical significance.

Simple main effect analyses were performed on the variables with significant two-way interactions. *Disappointed* ratings significantly increased after upward only and downward followed by upward counterfactual generation [mean difference = -1.53,  $SE = .23, p = .00$ ]. Contrastingly, self-reported ratings for the *glad* and *satisfied* variables significantly declined after counterfactual generation in the upward and

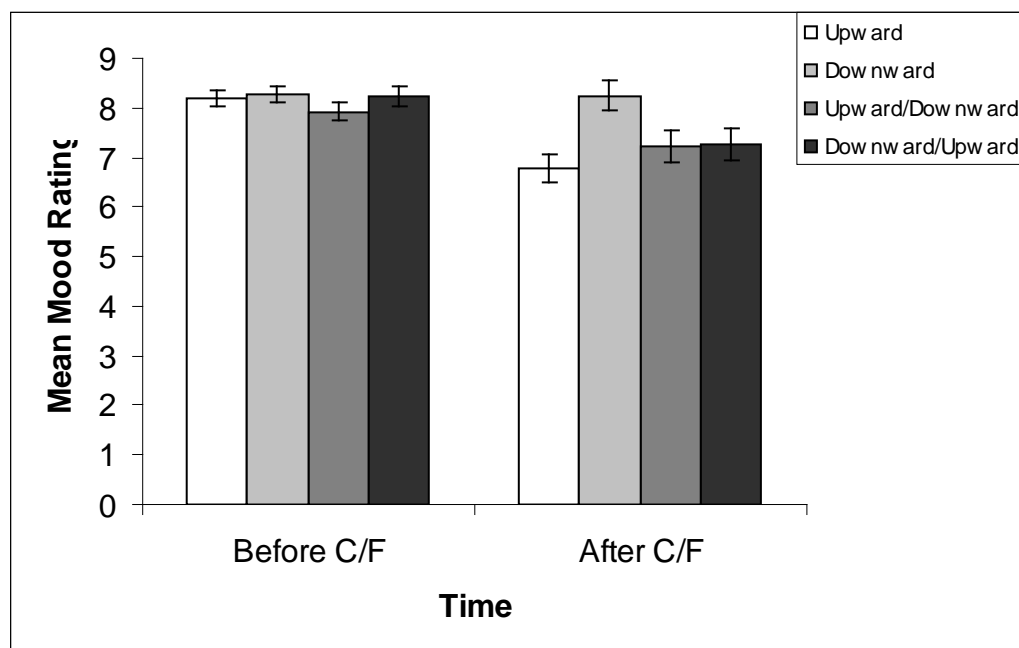
downward followed by upward counterfactual conditions [*glad*: mean difference = 1.19,  $SE = .20$ ,  $p = .00$ ; *satisfied*: mean difference = 1.21,  $SE = .22$ ,  $p = .00$ ]. A simple main effects analysis on the significant three-way interaction occurring for the *frustrated* variable revealed that participants' self-reported ratings of frustration significantly increased after upward only counterfactual generation [mean difference = -1.59,  $SE = .39$ ,  $p = .00$ ]. Ratings for the *frustrated* variable followed a similar trend in the upward/downward condition [mean difference = -1.05,  $SE = .44$ ,  $p = .02$ ], which suggests a primacy effect for the first counterfactual generated for self-reported ratings of frustration. The simple main effects analyses conducted on the significant interaction occurring for several of the emotion adjectives indicate that upward counterfactuals, when considered solely or in conjunction with downward counterfactuals, have the most significant effect on mood.

#### 4.7.3.5 Composite Mood

Pearson correlations were performed on the five emotion adjective variables, which revealed that all the variables were significantly correlated in the anticipated direction, except the correlation of the *glad* variable with *frustrated* [ $r = -.19$ ,  $p = .07$ ]. The magnitude of all other associations ranged from .22 to .57 ( $p < .05$ ). Thus, the five mood adjective ratings were combined to form a composite mood variable for each participant. A mixed design ANOVA revealed a significant two-way interaction between direction of last counterfactuals and mood assessment [ $F(1,90) = 11.60$ ,  $p = .00$ ,  $\eta_p^2 = .11$ ], suggesting that the direction of the last counterfactuals generated has the most significant impact on mood. However, the three-way interaction between direction of last counterfactuals, number of counterfactual opportunities, and mood assessment

was also significant [ $F(1,90) = 4.57, p = .04, \eta_p^2 = .05$ ], suggesting that the number of counterfactual opportunities also has a substantial effect on mood.

Simple main effect analyses indicated that mood significantly declined in all conditions except the downward only condition in which mood remained relatively unchanged. Mean differences of the second mood rating minus the first mood rating were 1.42 ( $SE = .24, p = .00$ ) for the upward only condition, .62 ( $SE = .26, p = .02$ ) for upward/downward condition, and .94 ( $SE = .27, p = .00$ ) for the downward/upward condition (see Figure 4.3). Therefore, upward counterfactuals demonstrated a significant decline in participants' composite mood ratings, with downward counterfactuals having no significant impact on participants' mood after reflecting upon the positive outcome of their self-described scenario.



**Figure 4.3:** Changes in mean composite mood ratings in Task 2.

#### 4.7.3.6 Preparedness

A 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVA was conducted to assess preparedness ratings in Task 2 (see Table 4.12 for descriptive statistics). As in Task 1, no significant main effects or interaction between the two independent variables was found [ $F(1,90) = .54, p = .46$ ]. Thus, the generation of counterfactuals in any direction had no significant effect on self-reported preparedness ratings for a similar future event. The means indicate that participants' self-reported feelings of preparedness for a similar future event was relatively high, with an average preparedness rating of 6.90 on a 9-point scale.

**Table 4.12**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions for Task 2, Experiment 1b.*

Condition	Mean Preparedness Ratings
Upward	7.07 (1.04)
Downward	6.68 (1.44)
Upward/Downward	6.95 (1.09)
Downward/Upward	6.90 (2.20)

## 4.8 Discussion

The current experiment was primarily conducted to replicate the findings of Experiment 1a using different scenarios, and thus vary the nature of the experiences considered by participants when generating counterfactuals. The results of the current experiment however, did not clearly replicate the findings as hypothesised, indicating

that the effect of counterfactual generation on affect varies with the nature of experience, consistent with Mandel (2003).

Specifically, the close-call event described in the first task in Experiment 1b, which was unexpectedly perceived by participants as being negative, showed minimal change in emotion adjective ratings between the counterfactual conditions. The *glad* variable was the only one of the five emotion adjective variables to evidence a significant change in mood post-counterfactual generation. As anticipated, participants generating downward only or downward last counterfactuals demonstrated a significant increase in *glad* ratings, thereby demonstrating a recency effect for the direction of the last counterfactuals generated. In contrast to the findings of Experiment 1a as well as the vast majority of the literature (e.g., Mandel, 2003; Markman et al., 1993; Sanna, et al., 2001), upward counterfactual generation did not result in a significant change in mood for any of the emotion adjectives assessed. Further, mean ratings for *glad* and overall happiness increased in all conditions, including the upward only condition. It seems that participants strived to improve their emotional state, regardless of the direction of counterfactual they were instructed to consider. Participants generating downward counterfactuals elicited the typical affective contrast effect; however, in order for participants generating upward counterfactuals to also improve their affect, they seemed to have engaged in a reflective or experiential mode of processing, and thus displayed the affective assimilation effect (c.f., McMullen, 1997; McMullen & Markman, 2000; Markman et al., 2008). Thus, it appears that the ‘close-call’ or ‘near-miss’ nature of the given scenario may have been a contributing factor to the effect of counterfactual generation on mood ratings in the present experiment. Participants’ mean perceived controllability of the ‘close-call’ outcome was less than the positive outcome academic scenario of Task 2 (4.66 compared to 5.50 on 9-point scales), may also



account for the lack of change in mood ratings after upward counterfactual generation, as Morris and Moore (2000) demonstrated that an individual's position of accountability shapes counterfactual thinking. Note, however, that participants' self-rated initial happiness ratings differed by group, with those in the upward counterfactual condition having the lowest initial overall happiness rating, while those in the downward counterfactual condition displayed the highest overall happiness ratings. Although this variable was consequently used as a covariate in all subsequent analyses, less scope for participants' mood change may have resulted.

The second task containing a positive outcome, in part replicated the effect of counterfactual generation on mood in Experiment 1a, Task 2, in that composite mood significantly declined in the upward only and downward followed by upward counterfactual conditions. However, composite mood also declined in the upward followed by downward condition with no significant change occurring after downward counterfactual generation. The mean composite mood ratings for all conditions except the upward/downward condition followed the same pattern as both tasks in Experiment 1a.

As for the single emotion adjective ratings in Task 2, upward only and upward last counterfactual generation evidenced a significant decline in *glad* and *satisfied* ratings, and an increase in ratings for the *disappointed* variable. Ratings for *frustrated* increased after upward counterfactual generation, however also increased after upward followed by downward generation, indicating a primacy effect for the direction of the first counterfactuals generated. The emotion of frustration may be affected differently by counterfactual generation after some types of outcomes, and thus vary with the nature of the experience. Downward counterfactuals in contrast, showed no significant change in affect for any of the mood variables. Given the high mean ratings for the

positive mood variables prior to counterfactual generation, the lack of change occurring after downward counterfactuals may be a result of a ceiling effect. Hence, participants reporting high positive mood would not have had the scope for mood improvement after considering how the outcome of their self-described scenario could have been worse. Overall, in the current experiment, upward counterfactuals had the most significant impact on mood whether considered solely or in conjunction with downward counterfactuals. This may be attributable to the nature of the given scenario of an academic event described by participants. As the scenario was personally experienced by participants and directly pertained to their academic performance, betterment for a similar future event is in their best interest, and hence the greater impact of upward counterfactuals on mood.

To summarise, Experiment 1b was conducted to generalise the findings of single compared to dual direction counterfactual generation of Experiment 1a by utilising different scenarios to vary the nature of the experiences considered by participants. The findings of Experiment 1b however, did not conform to expectation. Upward counterfactuals were found to have a mood depressive effect whether considered solely or in conjunction with downward counterfactuals in the event of a positive outcome (Task 2), whilst minimal mood change appeared after participants considered alternatives to the close-call and somewhat negative outcome of Task 1. It was therefore concluded that the nature of the experience and outcome play a significant role in shaping the effect of counterfactual thoughts on one's mood.

In three of the four experimental tasks conducted across Experiments 1a and 1b, upward counterfactuals resulted in a significant decline in mood as hypothesised and consistent with established findings (e.g., Mandel, 2003; Markman et al., 1993; Sanna et al., 2001). Contrary to our hypothesis however, downward counterfactuals did not

demonstrate a significant change in mood in three of the four experimental tasks. This finding is in contrast to several experiments documented in the literature (e.g., Roese, 1994; Sanna, 1996) and the previously conceived notion that downward counterfactuals lead to an improvement in mood. The non-significant effect of downward counterfactuals on mood in the present research may be a result of a ceiling effect as stated previously, however, is consistent with the findings of Mandel (2003) whereby downward counterfactuals were not associated with an attenuation of negative affect.

Contrary to our predictions, there was no difference in preparedness ratings across the counterfactual conditions in any of the four tasks in Experiments 1a and 1b. This result may be due to the nature of the outcome, in which the scope for future betterment is of little consequence. In comparison, after a negative outcome, the individual may perceive future improvement for a similar future event as paramount. As previous research has clearly demonstrated, upward counterfactuals when considered after a negative outcome tend to result in a greater sense of preparedness (e.g., Markman et al., 1993; Morris & Moore, 2000; Sanna et al., 2001).

Although a clear pattern in the effect of the sequential consideration of both upward and downward counterfactuals on mood is not apparent, the current set of experiments demonstrate that the type of experience and subsequent outcome plays a significant role in determining the effect of counterfactual thoughts on one's mood. As noted throughout the literature, situational factors can influence counterfactual thinking and its subsequent consequences (Boninger et al., 1994; Mandel, 2003; Sanna, 1997; White & Lehman, 2005). The primary purpose of Experiments 1a and 1b was to explore the effect of sequentially considering both better and worse alternatives to a given outcome in two experiments utilising hypothetical and self-described scenario tasks. The results demonstrated that mean composite mood ratings were lowest after upward

counterfactual generation, highest after downward generation, and evidenced the least degree of change in the dual direction counterfactual conditions in three of the four experimental tasks. The findings also suggest that in the dual direction counterfactual conditions, a recency effect may be apparent for the direction of the last counterfactuals generated. The change in participants' mood ratings in the dual direction counterfactual conditions reflected the change (or lack of change) occurring in the direction of the last counterfactual when considered solely. This was especially prominent for upward counterfactuals, which seem to have a more pervasive effect on mood than their downward counterparts. Contrastingly, downward counterfactuals did not result in significant mood improvement, with previous research (e.g., Mandel, 2003) highlighting the potential need to readdress the function of downward counterfactuals.

As Experiments 1a and 1b were conducted for investigative purposes to discern how mood is affected by dual direction counterfactual generation compared with single direction generation, Experiment 2 employs a performance oriented task utilising the four counterfactual conditions employed in the present experiments. This strategy will enable a more accurate assessment of the effect of counterfactual generation on one's mood, as such a task directly pertains to an individual's immediate past experience.

## **Chapter 5 : Anagram Tasks with Adults**

The two experiments conducted in Chapter 4 primarily explored how the sequential consideration of one or both directions of counterfactuals alters one's mood. Both hypothetical and self-generated scenario tasks were utilised with the outcomes and the nature of the experience varied. Overall, it was found that the effect of counterfactual generation on mood varied with the nature of experience. Generally, upward only counterfactuals resulted in an expected decline in mood, downward only counterfactuals little to no change in mood, and the dual direction counterfactual conditions tended to demonstrate a recency effect for the direction of the last counterfactuals generated. Further, no preparedness effects were evident for any of the counterfactual conditions. The purpose of Experiments 2a and 2b in the current chapter was to replicate the design of Experiments 1a and 1b (Chapter 4) utilising a performance task. This enabled participants to reflect upon their own experience in a task just performed. It was expected that such a task would provide a more accurate reflection of the effect of counterfactual generation on mood.

The performance task utilised in the current set of experiments was a computer-based anagram task, based upon the methodology of Roese (1994, Experiment 3). Participants were required to solve 10 anagrams within a specified timeframe and were given several options to assist them in completing the task, some at a cost to their final score. This provided the impetus for participants to generate counterfactuals in either direction when asked to consider how their performance in the task could have been better and/or worse.

After completing the task and again after counterfactual generation, participants in both experiments were asked to rate their feelings in regards to their performance in

the task on several mood rating scales, as in Experiments 1a and 1b. Again, this procedure, together with the selected emotion adjectives, was adopted from Sanna (1996; 1997). Given that the current experiments entailed participant performance in a task that required a certain level of competence, participants' self-efficacy was also examined. The self-efficacy measure was adopted from Tal-or et al. (2004), to further elucidate the relationship between counterfactual thinking and self-efficacy. Participants were asked to rate how good they thought they would be or were in the anagram task: (i) prior to task completion, (ii) after completing the task, and (iii) again after counterfactual generation. This procedure enabled the examination of the effect of both single and dual direction counterfactual generation on participants' feelings of self-efficacy.

Participants' feelings of preparedness to complete the task a second time was also assessed by asking participants to rate both how ready and how confident they would feel if they had to do the task a second time. This measure was adapted from Sanna (1997). At this point in the experiment, participants were unaware of having to complete a second anagram task. This was to prevent participants' initial performance in the anagram task and their subsequent reflection on their performance to be affected by the knowledge of having a second chance to complete the anagram task. Not knowing about the second task also ensured that participants focused their attention explicitly on the outcome of their past performance when considering counterfactuals (Roese, 1994, Experiment 3). Further, when participants believe there is no 'next time', a sense of preparation for the future is not necessary (Markman et al., 1993). Thus, if the anagram task is believed to be a single-time event, participants' attention should be focused primarily on their affect (a primary focus of the current research) rather than on looking to identify means for improvement. By asking participants to complete a second

anagram task, participants were able to demonstrate their actual preparedness rather than just rate their preparative intentions (Roese, 1994, Experiment 3).

## **5.1 Experiment 2a**

The primary aim of the current experiment was to replicate the design of the scenario experiments (Chapter 4) utilising a performance oriented task. This was to gain a more accurate assessment of the effect of single compared to dual direction counterfactual generation on mood. As little research has examined the relationship between counterfactual thinking and self-efficacy (see Section 2.5), self-efficacy ratings before and after counterfactual generation were included to further ascertain how counterfactual thinking impacts an individual's self-efficacy. As in Experiment 1a, it was also intended to assess the effect of single and dual direction counterfactual generation on mood after a positive outcome in a performance-based task. This was achieved through manipulating participants' perception of how they performed in an anagram task compared to other participants who had supposedly already completed the task. Roese (1994, Experiment 3; Roese & Hur, 1997, Experiment 2) demonstrated that this method of outcome valence manipulation is viable. Following Experiments 1a and 1b, a final aim was to clarify how the consideration of both directions of counterfactuals affects mood.

In line with the literature, it was hypothesised that upward counterfactuals would result in a decline in overall mood and increased preparedness, and downward counterfactuals would lead to an improvement in mood but reduced preparedness to complete the second anagram task. On the basis of the findings in Experiments 1a and 1b, it was predicted that the consideration of both upward and downward counterfactuals would result in a recency effect in that the direction of the last

counterfactual generated would reflect the change in mood occurring in its single direction counterpart. However, it was expected that the magnitude of change in mood occurring after dual direction counterfactual generation would be less than after considering a single direction of counterfactual. Based on the findings of Tal-or et al. (2004), it was also predicted that enhanced self-efficacy would result from the generation of upward counterfactuals.

## **5.2 Method**

### **5.2.1 Participants**

Eighty-six first year Psychology students from the University of Wollongong voluntarily participated in Experiment 2a for partial subject credit. Of the initial sample, 16 participants were excluded from data analysis for solving fewer than seven anagrams correctly and subsequently did not perceive the outcome as being positive<sup>12</sup>; three were excluded for not generating any counterfactuals; and one was excluded for failing to respond to the mood adjective ratings. Thus, the final sample consisted of 66 participants with a mean age of 21.67 ( $SD = 7.06$ ), ranging from 18 to 49 years.

### **5.2.2 Design**

The design employed in the current experiment mirrored that of Experiments 1a and 1b, entailing a 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design, producing the four counterfactual conditions to which participants were randomly assigned. The number of participants in

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<sup>12</sup> As the aim of this experiment was to examine single and dual direction counterfactual generation in the event of a somewhat positive performance outcome, it was important that participants solved 70% of the anagrams correctly so as to perceive their performance as being somewhat positive.



each condition, namely upward only, downward only, upward followed by downward, and downward followed by upward, ranged from 15-18 participants.

The dependent measures included: (a) the number of relevant counterfactuals generated by participants according to their allocated condition<sup>13</sup>; (b) task performance measures consisting of the number of anagrams solved correctly, participants' final score, the number of skips made, and the number of clues bought (see section 5.2.4 for details); (c) an overall happiness assessment conducted after completion of the first anagram task, and again after generating counterfactuals; (d) emotion adjective ratings before and after counterfactual generation; (e) a self-efficacy measure, rated prior to commencing the anagram task, after anagram task completion, and again after counterfactual generation; and (f) a preparedness measure before completing the second anagram task which participants were initially unaware of having to complete.

### **5.2.3 Materials**

A program was designed for the presentation of the anagram task and the rating scales on a PC. The program recorded all the relevant data for each participant using an anonymous participant code. The words used for the anagram task were taken from the MRC Psycholinguistic Database (1987) to form four categories: animals, body parts, food, and nature. Each of the words selected from the database consisted of five letters and had a familiarity rating, concreteness rating, and an imaginability rating between 400 and 700 for each of the parameters. The selected words were then randomly scrambled by the researcher (e.g., storm – tmsro, and chest – hsetc; see Appendix D for the full list of anagrams used). Five words were taken from each category to form two blended categories (i.e., “Animals and Nature” and “Body Parts and Food”) in order to increase

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<sup>13</sup> Refer to section 5.3.1 for counterfactual rating criteria.

the difficulty in solving the anagrams, as pilot testing revealed a category priming effect.

The mood assessment measures used in this experiment replicated those used in the first series of experiments conducted for this thesis in Chapter 4. Specifically, an overall happiness scale with a happy and sad face as polar opposites was employed, as were four rating scales utilising the emotion adjectives of *glad*, *frustrated*, *satisfied*, and *disappointed* (taken from Sanna, 1996; 1997), ranging from 1 = “not at all” to 9 = “very”. Mood was assessed after participants completed the task (Time 1) and again after counterfactual generation (Time 2), by asking participants at Time 1 to rate ‘How do you feel about your performance in the task?’, and at Time 2, ‘After thinking about how your performance in the task could have been different, now how do you feel about your performance?’. The self-efficacy measure adapted from Tal-or et al., (2004), consisted of participants rating on a 9-point scale how good they thought they would be (were) at the task, with the scale ranging from 1 = “not very good” to 9 = “really good”. Self-efficacy was measured prior to task completion: ‘How good do you think you will be at this task?’ (Time 1); after the first mood assessment: ‘How good do you think you are at this task?’ (Time 2); and again after the second mood assessment: ‘Now how good do you think you are at the task?’ (Time 3). Participants’ self-reported preparedness to complete a second anagram task was assessed on two 9-point scales ranging from 1 = “not at all” to 9 = “very”, with the questions, ‘How confident would you feel if you had to do the task a second time?’ and ‘If you had to do the task a second time, how ready would you feel?’, and was adapted from Sanna (1997). All rating scales were presented and answered by participants as part of the computer program.

#### 5.2.4 Procedure

Each participant took part in an individual session (approximately 20 minutes) with the experimenter present. After providing written consent, participants were briefed about the nature of the task and given two practice anagrams from an unrelated category (colour: “cbakl” and “tihwe”). The instructions for completion of the task were then verbally given and consisted of the following information (see Appendix E for script). Participants had two minutes to solve each anagram, after which the next anagram was presented. A timer counting down the seconds remaining of the two minutes was visible to participants on the bottom of the screen for each anagram. Based on the procedure used by Roese (1994, Experiment 3), participants were awarded one point for each second remaining of the two minutes for each anagram solved correctly. Thus, the quicker a participant solved the anagram, the more points they would receive.

Following Roese (1994, Experiment 3), participants were told that there were two options available to help them solve the anagrams, each with a cost to their final score. The first option was that participants could choose to buy one clue for each word by pressing <C> on the keyboard, which would present the first letter of the solution. Participants were told that each clue would cost them 30 points of their final score. However, unbeknownst to them these points were not deducted from their final score to assist in the deception of a positive outcome. The second option was that participants could skip an anagram if they found it too difficult by pressing <S> on the keyboard. The program then randomly replaced the skipped anagram with one of the remaining anagrams from the chosen category. Participants could not go back to the anagrams they had skipped and skipping also led to a loss of points for which one point for each second spent trying to solve the anagram was deducted from participants' final score. Participants were then told that at the completion of the task, their final score would be

presented, along with a graph illustrating their performance compared to other people who had previously completed the task. Subsequently, participants were asked to choose one of the two categories of words: (a) “Animals and Nature”, or (b) “Body Parts and Food”, each containing 10 five-letter words. Before commencing the task, participants rated their self-efficacy (Time 1).

Participants verbally stated the solution to each anagram; the experimenter answered ‘yes’ or ‘no’ to provide feedback. If the answer was correct, the experimenter clicked on the solution bar at the bottom of the screen. The solution to the anagram appeared for two seconds, after which the next anagram was randomly chosen from the specified category and displayed on the monitor. If the answer given was incorrect, the participant continued trying to solve the anagram until they figured out the correct solution, skipped to the next trial, or the time limit elapsed. After the last anagram was solved, the participant’s final score was displayed, along with the number of clues bought and the number of anagrams skipped. Below the score, a line graph was displayed, illustrating that the participant’s score was above average (approximately in the 75<sup>th</sup> percentile) in a normal distribution, compared to the other participants who had supposedly already completed the task. Participants were then asked to rate how they felt about their performance in the task on the five mood rating scales, followed by the second self-efficacy scale.

Participants were then asked to generate counterfactuals depending upon their randomly assigned condition. For example, participants in the upward followed by downward condition were asked, ‘Can you think of as many ways as you can as to how your performance in the task could have been better?’ The experimenter wrote down the participants’ responses verbatim, and then asked, ‘Now can you think of as many ways as you can as to how your performance in the task could have been worse?’ After

generating counterfactuals, participants were asked to complete the second mood assessment, followed by the self-efficacy scale (Time 3), and the two preparedness questions.

Afterwards, participants were asked to complete an unexpected second anagram task, using the other category of words not chosen for Task 1. After completing Task 2, participants were shown their performance data and were then verbally debriefed.

## **5.3 Results**

### **5.3.1 Rating of Counterfactuals**

The counterfactuals generated by participants were rated according to the criteria outlined in Experiment 1a. Counterfactuals considered appropriate were in the specified direction and relevant to the anagram task. Examples of upward counterfactuals were ‘If I had picked the other category’, ‘If I bought a clue the first few times instead of skipping’ and ‘If there wasn’t time pressure’. Downward counterfactuals included responses such as, ‘If I wasn’t given a category’, ‘Could have had a shorter time to solve them’ and ‘If I had bought clues for all of them’.

### **5.3.2 Number of Counterfactuals Generated**

To examine for variation among conditions in the number of counterfactuals generated by participants, two separate between groups one-way ANOVAs were conducted on the number of upward and downward counterfactuals generated by participants with counterfactual condition as the independent variable in each analysis (see Table 5.1 for the mean number of counterfactuals generated across conditions). No significant difference among the downward only, downward followed by upward, and upward followed by downward conditions was found for the number of downward

counterfactuals generated [ $F(2,46) = 1.31, p = .28$ ]<sup>14</sup>. Similarly, no significant difference among the upward only, upward followed by downward, and downward followed by upward conditions was evident in the number of upward counterfactuals generated [ $F(2,48) = 0.99, p = .38$ ]. Therefore, there was no systematic variation between the experimental conditions in participants' readiness to generate counterfactuals in either the upward or downward direction.

**Table 5.1**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Experiment 2a.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward Only	2.35 (0.61)	-
Downward Only	-	3.60 (1.18)
Upward/Downward	2.38 (1.45)	3.00 (1.03)
Downward/Upward	2.00 (0.84)	3.17 (0.99)

As can be seen in Table 5.1, the means indicate that participants generated more downward counterfactuals than upward counterfactuals when considering the positive outcome of their performance in the anagram task. A paired samples *t*-test conducted on the number of upward and downward counterfactuals generated by participants in the two dual direction counterfactual conditions revealed that this difference was statistically significant [ $t(33) = 4.38, p = .00$ ] with a large effect size of  $d = .91$ .

<sup>14</sup> An alpha level of .05 was used for all statistical tests in Experiments 2a and 2b, unless otherwise stated.

### 5.3.3 Preliminary Analyses of the Data Set

Preliminary analyses were conducted on the data set prior to hypothesis testing to ensure a reliable and consistent sample. As in Experiments 1a and 1b, the four counterfactual conditions were treated as four levels of a single independent variable, rather than as parts of the 2 x 2 factorial design later employed to test the hypotheses in question. A between groups one-way ANOVA was conducted on the overall happiness ratings elicited after Task 1 (first anagram task) completion to determine whether mood ratings varied across the four counterfactual conditions and whether the outcome was perceived as being somewhat positive. This analysis revealed that the difference between the initial overall happiness ratings across the four counterfactual conditions was not statistically significant [ $F(3,62) = 2.49$   $p = .07$ ,  $\eta^2 = .11$ ]. Mean overall happiness ratings ranged from 6.56 to 7.73 across conditions (see Table 5.2 for descriptive statistics), indicating that participants perceived the outcome of their performance in the anagram task as being somewhat positive. This was verified by a one-sample  $t$ -test conducted with a test value of 5 [ $t(65) = 12.29$ ,  $p = .00$ ,  $d = 1.51$ ].

**Table 5.2**

*Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After  
Counterfactual Generation in Experiment 2a.*

Mood/Condition	Before	After
Overall Happiness		
upward	6.94 (1.48)	6.24 (1.60)
downward	7.73 (0.96)	7.53 (0.92)
upward/downward	6.56 (2.00)	6.63 (1.54)
downward/upward	7.61 (0.98)	7.17 (1.04)
Glad		
upward	7.18 (1.51)	6.59 (1.37)
downward	7.33 (1.40)	7.40 (0.99)
upward/downward	6.81 (1.80)	6.81 (1.47)
downward/upward	7.50 (0.99)	6.94 (1.00)
Frustrated		
upward	2.88 (1.62)	3.59 (1.54)
downward	3.13 (2.36)	2.13 (1.25)
upward/downward	3.75 (2.08)	3.38 (1.96)
downward/upward	2.39 (1.91)	3.11 (2.00)
Satisfied		
upward	7.24 (1.20)	6.82 (1.13)
downward	7.33 (1.45)	7.60 (1.12)
upward/downward	6.56 (1.79)	7.00 (1.46)
downward/upward	7.61 (1.09)	6.94 (1.26)
Disappointed		
upward	2.47 (1.46)	3.06 (1.56)
downward	2.33 (1.68)	2.00 (1.25)
upward/downward	2.63 (1.69)	3.13 (1.69)
downward/upward	2.11 (1.32)	2.50 (1.47)

Two separate between groups one-way ANOVAs were also conducted on participants' final score in Task 1 and the number of anagrams solved correctly according to the word category chosen for Task 1 ("Animals and Nature" or "Body Parts and Food"). This was to establish that the two categories were equivalent in their



degree of difficulty to solve correctly and to thus ascertain that the anagram category variable was not a confounding factor in subsequent analyses. Thirty-one participants chose “Animals and Nature”, solving a mean number of 8.94 ( $SD = 1.09$ ) anagrams correctly and obtaining a mean final score of 918.26 ( $SD = 148.63$ ), and 35 participants chose the “Body Parts and Food” category, solving a mean number of 8.71 ( $SD = 1.07$ ) anagrams correctly and obtaining a mean final score of 849.46 ( $SD = 195.97$ ). As expected, there was no significant difference in participants’ final score or number of anagrams solved correctly as a result of the word category chosen [number correct:  $F(1,64) = 0.69, p = .41$ ; final score:  $F(1,64) = 2.53, p = .12, \eta^2 = .04$ ].

#### 5.3.4 Change in Mood after Counterfactual Generation

To determine the change in mood occurring after counterfactual generation, five separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on the overall happiness, *glad*, *frustrated*, *satisfied*, and *disappointed* variables (see Table 5.2 for descriptive statistics). Significant two-way interaction for direction of last counterfactuals and mood assessment with moderate effect size was found for *frustrated* [ $F(1,62) = 10.37, p = .002, \eta_p^2 = .14$ ] and *satisfied* [ $F(1,62) = 13.26, p = .001, \eta_p^2 = .18$ ]. A two-way interaction was also found for the *glad* variable, however it was not statistically significant when a Bonferroni adjustment of .0125 per comparison error rate was applied [ $glad = F(1,62) = 4.36, p = .04, \eta_p^2 = .07$ ].

As hypothesised, simple main effect analyses indicated that participants’ ratings for the *frustrated* variable increased in the upward last conditions (mean difference = -0.71,  $SE = .30, p = .02$ ), and declined in the downward last conditions (mean difference

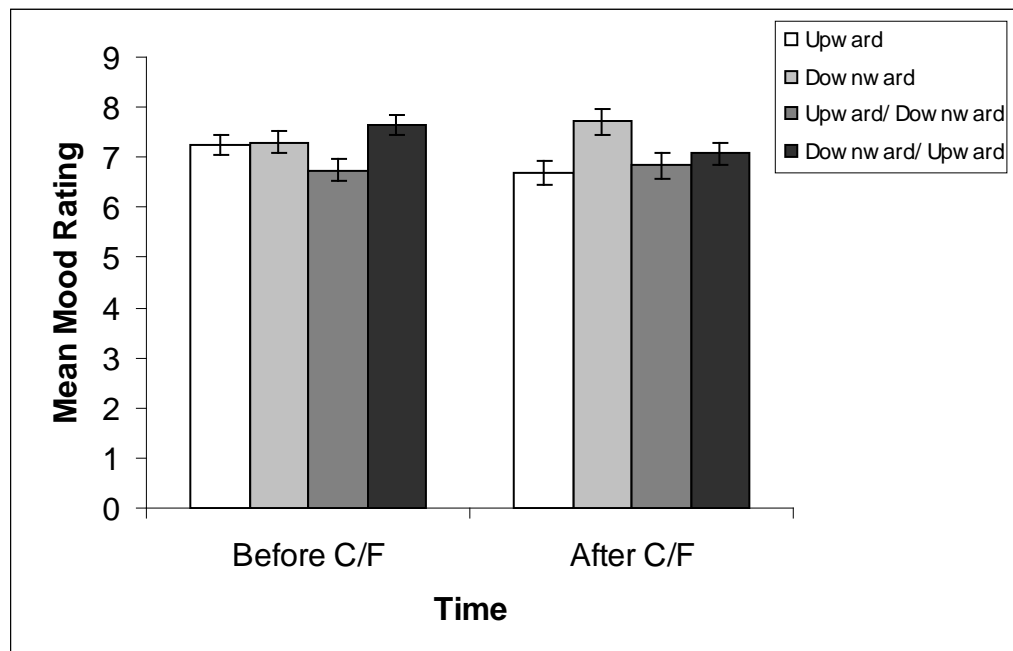
= 0.68,  $SE = .31$ ,  $p = .04$ ). Ratings for the *satisfied* variable significantly declined after upward last counterfactual generation (mean difference = .54,  $SE = .17$ ,  $p = .00$ ) and improved after downward generation (mean difference = -.36,  $SE = .18$ ,  $p = .05$ ).

Although not significant, *disappointed* was the only mood variable to demonstrate three-way interaction between number of counterfactual opportunities, direction of last counterfactuals, and mood assessment ( $F(1,62) = 3.89$ ,  $p = .05$ ,  $\eta_p^2 = .06$ ), with ratings escalating in the upward only and the upward followed by downward conditions. No other interaction or effects were found for any of the mood variables.

### 5.3.5 Composite Mood

As in Experiments 1a and 1b, the four emotion adjectives were subject to a correlation analysis. Pearson correlations revealed that all variables were significantly correlated in the anticipated direction at the .01 level with the magnitude of association ranging from .40 to .78. A composite mood variable was thus computed by averaging *frustrated* and *disappointed* (both reverse scored) with *glad* and *satisfied*. To determine the change in composite mood after counterfactual generation, a 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) mixed design ANOVA was conducted on the composite mood ratings obtained before and after counterfactual generation. A significant two-way interaction with a moderate effect size was found between direction of last counterfactuals and mood assessment [ $F(1,62) = 14.20$ ,  $p = .00$ ,  $\eta_p^2 = .19$ ], with mood significantly declining in the upward only and upward last conditions. No further effects were found. Simple main effect analyses on the significant interaction showed that the mean difference of the first and second mood ratings was .58 ( $SE = .15$ ,  $p = .00$ ), compared to -.24 ( $SE = .16$ ,  $p = .13$ ) for the downward only and downward last conditions (see

Figure 5.1). This finding suggests that a recency effect is present for the last counterfactual generated, with significant change in mood occurring after upward generation.

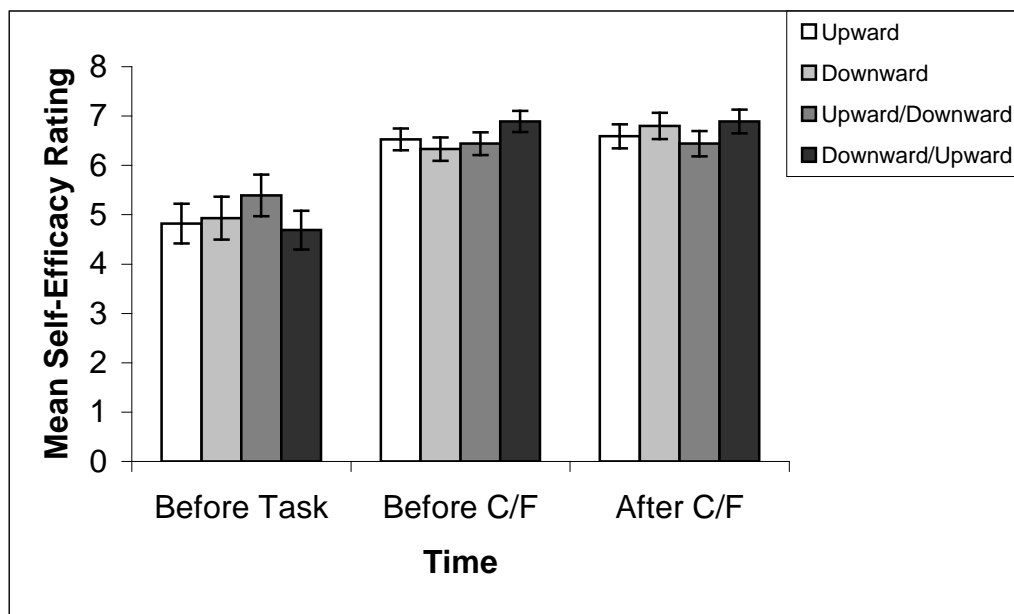


**Figure 5.1:** Changes in mean composite mood ratings in Experiment 2a.

### 5.3.6 Self-Efficacy and Preparedness

To examine the effect of counterfactual generation on participants' self-efficacy, a 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) mixed design ANOVA was conducted using the self-efficacy ratings elicited at Time 1 (prior to task completion), Time 2 (after task completion), and Time 3 (after counterfactual generation). Contrary to expectations, counterfactual generation did not result in a significant effect on participants' self-efficacy ratings, as there were no significant interactions occurring between the

independent variables and self-efficacy [ $F(2,61) = 0.75, p = .48, \eta_p^2 = .02$ ]<sup>15</sup>. The main effect for self-efficacy assessment was significant [ $F(2,61) = 36.79, p = .00, \eta_p^2 = .55$ ] with self-efficacy significantly increasing after task completion in all conditions with a Time 1 and Time 2 mean difference of -1.59 ( $SD = .20, p = .00$ ). Self-efficacy ratings remained relatively unchanged after counterfactual generation with the mean difference averaged across conditions between Time 2 and Time 3 being -0.13 ( $SD = .09, p = .44$ ). As can be seen in Figure 5.2, the only condition to show a slight increase in self-efficacy post counterfactual generation was the downward only condition.



**Figure 5.2:** Changes in mean self-efficacy ratings in Experiment 2a.

To compare the differences of the two preparedness measures among the four counterfactual conditions, two separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial

<sup>15</sup> Where no effects or interaction were found, three-way interaction between last counterfactual, number of counterfactual opportunities and the respective dependent variable is reported in Experiments 2a and 2b unless otherwise stated.

ANOVAs were conducted on participants' confidence and readiness to complete the anagram task a second time (see Table 5.3 for descriptive statistics). A significant interaction between direction of last counterfactuals and number of counterfactual opportunities was found for confidence to complete a second anagram task [ $F(1,62) = 6.01, p = .02, \eta_p^2 = .09$ ], and approached significance with a Bonferroni adjustment of .025 per comparison error rate for readiness to complete a second anagram task [ $F(1,62) = 4.22, p = .04, \eta_p^2 = .06$ ]. Post-hoc pairwise comparisons however, did not reveal the difference between the two single conditions and the two dual direction conditions to be statistically significant (mean difference = -0.85,  $SD = .43, p = .05$ ; mean difference = 0.61,  $SD = .41, p = .15$ ; respectively).

**Table 5.3**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) in Experiment 2a.*

Condition	Confidence	Readiness
Upward	6.35 (1.19)	6.94 (1.39)
Downward	7.20 (0.68)	7.87 (0.74)
Upward/Downward	6.50 (1.46)	7.25 (1.44)
Downward/Upward	7.11 (1.32)	7.61 (1.33)

Contrary to established findings, the means indicate that participants' self-reported ratings of confidence to complete a second anagram task were highest after downward only and downward followed by upward counterfactual generation and lowest for the upward only and upward/downward conditions, with ratings for readiness to complete a second anagram task following a similar trend. These findings also suggest a primacy effect for the direction of the first counterfactual generated for self-

reported ratings of preparedness. As such, a factorial ANOVA was subsequently conducted substituting the direction of last counterfactuals with first counterfactuals. This analysis produced a significant main effect for direction of first counterfactuals with the same  $F$  value as the interaction found in the previous analysis, which therefore provides clarification of the primacy effect for the direction of the first counterfactual generated on preparedness.

### 5.3.7 Performance Measures

Four separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) mixed design ANOVAS were conducted on each of the performance measures (number of skips made, number of clues bought, total number of anagrams solved correctly, and final score) for Task 1 and Task 2 (see Table 5.4 for descriptive statistics). No significant effects or interactions for any of the performance measures were found [skips:  $F(1,62) = 1.04, p = .31$ ; clues:  $F(1,62) = 0.22, p = .64$ ; anagrams solved:  $F(1,62) = 1.27, p = .26$ ; final score:  $F(1,62) = 2.68, p = .11$ ]. Thus, counterfactual generation according to condition did not have any discernable effects on the performance measures of the anagram task.

The proportion of time participants spent completing Task 2 in relation to Task 1 was calculated and a proportional change in average trial time variable was thus created. A 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVA was conducted on this variable. A significant interaction between the number of counterfactual opportunities and direction of last counterfactuals generated for the proportional change in average trial time was found [ $F(1,62) = 5.58, p = .02, \eta_p^2 = .08$ ]. However, post-hoc pairwise comparisons did not reveal a significant difference between the two single conditions

and the two dual direction conditions (mean difference = 0.06,  $SD = .04$ ,  $p = .11$ ; mean difference = -0.07,  $SD = .04$ ,  $p = .09$ ; respectively).

**Table 5.4**

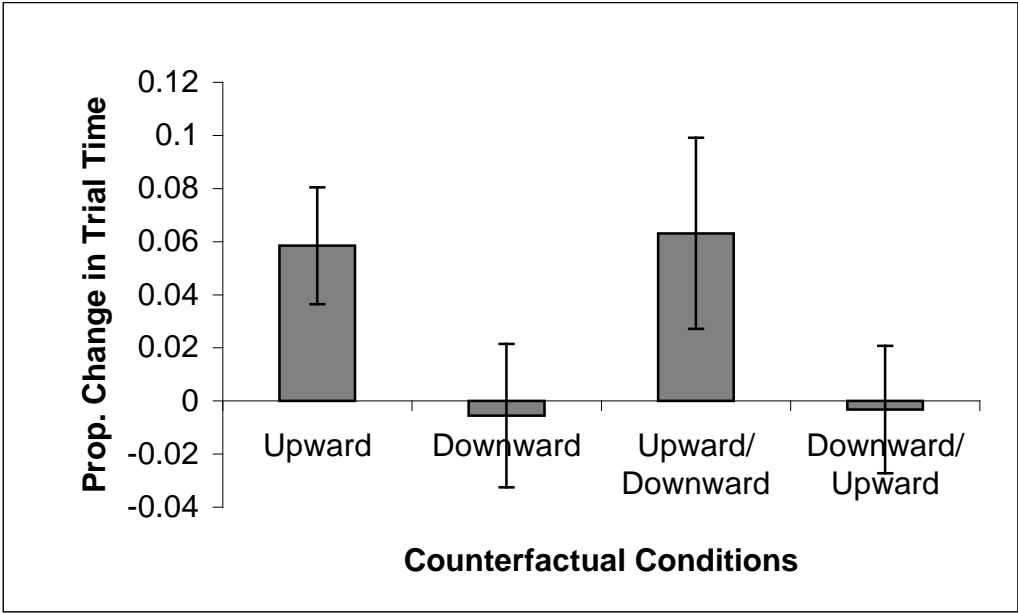
*Performance Measure Means (with Standard Deviations in Parentheses) in Experiment*

2a.

Performance Measure/Condition	Task 1	Task 2
No. of Skips		
upward	1.47 (1.07)	1.18 (0.81)
downward	0.93 (1.10)	0.53 (0.83)
upward/downward	1.25 (1.24)	0.56 (0.89)
downward/upward	0.67 (0.84)	0.61 (0.78)
No. of Clues		
upward	3.88 (2.52)	4.00 (2.35)
downward	2.13 (2.07)	2.53 (2.70)
upward/downward	4.25 (2.46)	4.50 (2.53)
downward/upward	2.50 (1.92)	3.00 (1.91)
No. Anagrams Correct		
upward	8.53 (1.07)	8.82 (0.81)
downward	9.00 (1.07)	9.33 (0.90)
upward/downward	8.63 (1.20)	9.44 (0.89)
downward/upward	9.11 (0.96)	9.28 (0.75)
Final Score		
upward	821.82 (193.58)	845.94 (166.02)
downward	903.80 (139.34)	916.80 (161.34)
upward/downward	833.13 (195.80)	926.44 (191.36)
downward/upward	963.28 (148.31)	936.83 (159.57)

Means indicate that upward only and upward followed by downward counterfactuals resulted in the greatest change in the proportion of time taken to complete Task 2 in relation to Task 1. Therefore, participants who considered only upward counterfactuals or upward followed by downward counterfactuals took a greater amount of time to complete the second anagram task. In comparison, participants

generating downward only or downward followed by upward counterfactuals spent less time completing Task 2, however the difference was minimal (see Figure 5.3). As the means indicate a primacy effect for the direction of the first counterfactuals generated, a factorial ANOVA was subsequently conducted substituting the direction of last counterfactuals variable with a direction of first counterfactuals variable. Congruent with the analyses on the preparedness ratings in Section 5.3.6, this analysis produced a significant main effect for direction of first counterfactuals with the same  $F$  value as the significant interaction between direction of last counterfactuals and number of counterfactual opportunities, thus clarifying the primacy effect.



**Figure 5.3:** Proportional change in average trial time in Experiment 2a.

#### 5.4 Discussion

The primary aim of the current experiment was to replicate the findings of Experiments 1a and 1b utilising a performance-based task. The experiment was designed to have a positive outcome from which participants could generate



counterfactuals directly pertaining to their immediate experience. This was achieved through adapting and modifying the computer-based anagram task devised by Roesse (1994, Experiment 3). Essentially, the results replicated those obtained in the scenario experiments (Chapter 4), in that upward counterfactuals had the most significant effect on mood and the consideration of both directions of counterfactuals reflected the change in mood occurring in the direction of the last counterfactual when considered solely.

As hypothesised and consistent with the findings of Experiments 1a and 1b, the generation of upward counterfactuals showed the most significant alteration in affect. In line with the literature (e.g., Boninger et al., 1994; Markman et al., 1993; Roesse, 1997; Sanna, 1996), upward only and downward followed by upward counterfactuals resulted in a significant decline in *satisfied* ratings, and an increase in ratings of frustration. Upward only and downward followed by upward counterfactuals also displayed a trend for an increase in disappointment and a decline in gladness. As expected, composite mood analyses revealed a significant decline in affect after upward only and upward last counterfactual generation, suggesting that upward counterfactuals when considered solely or last, have the most significant effect on mood after a positive outcome.

In contrast, the consideration of downward counterfactuals resulted in minimal change in participants' self-reported mood ratings, and thus reflects similar findings to the scenario experiments (Chapter 4). As for the single mood variables, significant change in affect was found for *frustrated*, whereby frustration declined in the downward only and upward followed by downward conditions. This is in line with our initial hypotheses and published research that involve negative outcomes (e.g., Roesse, 1994; Sanna, 1996), that negative emotions wane and positive emotions improve after the generation of downward counterfactuals (Boninger et al., 1994; Roesse, 1997). However, no change in mood was evident for the other mood adjectives of *glad*, *satisfied*,

*disappointed*, and overall happiness. This finding is consistent with Mandel (2003) who found that mood repair was not apparent for any of the emotions examined. Analyses of the composite mood variable revealed that downward counterfactuals when considered solely or after upward counterfactuals, had no significant effect on participants' composite mood ratings. Although not consistent with our initial hypotheses, the findings reflect those obtained in the scenario studies of Experiments 1a and 1b. It thus appears that there may be little benefit in considering and reflecting upon the ways in which a somewhat positive outcome may have been worse.

Consistent with initial predictions, in the dual direction counterfactual conditions, the direction of the last counterfactual generated reflected the change in mood occurring in its single direction counterpart. Thus, the downward/upward condition echoed the decline in the positive emotion adjective of *satisfied*; the enhanced feelings of frustration; and the reduction in composite mood ratings, of the upward only condition. Similarly, the upward/downward condition demonstrated the same pattern in mood change occurring in the downward only condition – a reduction in frustration, and no significant change in the other emotion adjectives or composite mood ratings. Thus, a recency effect of the direction of last counterfactual generated is clearly demonstrated. This finding is consistent with the results of Experiments 1a and 1b whereby mood change post counterfactual generation in the dual direction conditions mirrored the change occurring for the direction of the last counterfactual generated when considered solely in two of the four experimental tasks.

In contrast to all experimental tasks in Chapter 4, a significant difference in self-rated feelings of confidence to complete a second anagram task was found. This is in accordance with the expectation that the performance oriented anagram task of the current experiment would foster a greater sense of preparedness than a hypothetical or

self-described scenario task. However, in contrast to the initial hypothesis and the established preparative function of upward counterfactuals (c.f., Markman et al., 1993; Roese, 1994; Sanna et al., 2001), participants in the downward only and downward/upward conditions reported greater feelings of confidence and readiness to complete the second unexpected anagram task than participants generating upward only or upward followed by downward counterfactuals. This finding also suggests a primacy effect for the direction of the first counterfactuals generated.

The preparedness effects however, were not reflected in the performance measures of the second anagram task. These measures did not yield any significant difference among the counterfactual conditions in the number of skips made, the number clues obtained, number of anagrams solved correctly, and final score of Task 2 compared with Task 1. The current experiment therefore demonstrates that after a positive outcome in a performance-based task, counterfactual generation has no significant effect on quantifiable performance measures, such as those employed in the current research. However, the mean number of anagrams solved correctly in the first anagram task (Task 1) was high (total mean number of anagrams solved correctly was 8.83 out of 10), which may have produced a ceiling effect for the number of anagrams solved in the second unexpected anagram task (Task 2). However, the high mean number of anagrams solved correctly in Task 1 would have aided in the deception of a positive outcome for the participant. Further, final score was a more important dependent variable than the number of anagrams solved correctly, as it comprised the points awarded from the time taken to solve each anagram, and the points deducted from any anagrams that were skipped.

A significant difference was found in the proportion of time taken to complete Task 2 in relation to Task 1, with upward only and upward followed by downward

counterfactuals having the greatest increase. Hence, it appears that participants' initial reflections as to how their performance could have been better may have had a slight impact on their performance in the second anagram task, even though participants' self-reported preparedness ratings were lower than those in the downward only and downward/upward conditions. Although participants generating downward only or downward followed by upward counterfactuals reported more confidence and readiness to complete a second anagram task, this was not reflected in the quantifiable performance measures. This highlights the presence of a difference between perceived preparedness and actual preparedness in the current research. It may be that the consideration of upward counterfactuals, whether on their own or prior to considering downward counterfactuals, prepared participants for completing the second anagram task by way of being more cautious, thus giving rise to a longer performance time, resulting in their performance being worse, or appearing not improved within the anagram task parameters. This is highlighted by the significant increase in proportional change in trial time from Task 1 to Task 2, and also by the qualitative content of participants' upward counterfactual thoughts, with many indicating that their performance could have been better if they took more time, or did not rush.

As anticipated, participants' self-efficacy significantly increased after task completion and learning that their performance in the anagram task was better than average. However, in contrast to expectation and the findings of Tal-or et al. (2004), no significant difference among the counterfactual conditions was found in participants' self-rated feelings of self-efficacy post-counterfactual generation. This finding suggests that counterfactual generation has no significant effect on participants' self-efficacy in a performance oriented task with a positive outcome.

In summary, Experiment 2a was conducted to replicate the overall design of Experiments 1a and 1b utilising a performance-based task with a somewhat positive outcome, and to ascertain the ways in which counterfactual thinking affects self-efficacy. Overall, the results of Experiment 2a reflect those of Experiments 1a and 1b, such that upward counterfactuals had the most significant effect on mood, downward counterfactuals showed little change in mood, and a recency effect was apparent for the direction of the last counterfactuals generated. The lack of mood improvement occurring after downward generation and the deficiency of self-efficacy effects may be attributable to the positive outcome of the anagram task. As such, Experiment 2b employs a negative outcome in the same experimental task.

## **5.5 Experiment 2b**

Experiment 2b was conducted to replicate Experiment 2a utilising a negative outcome. The minimal change occurring in mood after downward counterfactuals and the absence of self-efficacy effects in Experiment 2a highlighted the necessity to conduct the anagram task utilising the same experimental design with a negative outcome as opposed to a positive outcome. Thus, the results of the current experiment can be directly compared with those that supported the established functions of counterfactual thinking (i.e. the decline of mood and greater preparedness after upward counterfactual generation, and improved mood and less preparedness after the generation of downward counterfactuals), of which the majority of research has typically involved negative outcomes (e.g., Mandel, 2003; Roese, 1994).

Therefore, it was predicted that: (i) the upward only condition would result in a decline in overall affect, and thus be comparable to Experiment 2a and the counterfactual literature, and also show increased preparedness to complete the anagram

task a second time, as the established function of upward counterfactuals suggests; (ii) downward only generation would result in mood improvement but reduced preparedness to complete Task 2, and thus be comparable to the somewhat established function of downward counterfactuals; and (iii) the dual direction counterfactual conditions would demonstrate a recency effect for the direction of the last counterfactuals generated and therefore replicate the findings of Experiment 2a.

## **5.6 Method**

### **5.6.1 Participants**

Participants consisted of 94 first year psychology students from the University of Wollongong, who received partial subject credit for their voluntary participation. Eleven participants were excluded from the initial sample for providing positive mood ratings greater than five on the 9-point mood rating scales (1 = “not at all” to 9 = “very”) at Time 1, and thus perceived the outcome as positive<sup>16</sup>; two were excluded for generating both directions of counterfactuals when not asked to do so; and two were excluded for not generating any counterfactuals in a specified direction. Thus, the final sample consisted of 79 participants with a mean age of 20.86 ( $SD = 7.22$ ), ranging from 17 to 72 years.

### **5.6.2 Design and Procedure**

This study fully replicated the design and procedure of Experiment 2a. However, the outcome of the first anagram task was portrayed as a negative outcome. This was

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<sup>16</sup> In contrast to Experiment 2a, the current experiment aimed to examine single and dual direction counterfactual generation in response to a somewhat negative performance outcome. Hence, all participants rating the outcome of their performance as being somewhat positive were excluded from the data set.

achieved through altering the line graph to illustrate that the participants' score was below average (approximately in the 25<sup>th</sup> percentile) in a normal distribution, compared to other participants who had supposedly already completed the task. All dependent measures used in Experiment 2a were used in the current experiment.

## **5.7 Results**

### **5.7.1 Rating of Counterfactuals**

Counterfactuals were rated according to the criteria outlined in Experiment 1a, and were included if they were in the specified direction and relevant to completion of the anagram task. Examples of upward counterfactuals included 'If I could re-scramble the words', 'Give myself more time to think about it and not worry about the points', and 'Use more clues'. Examples of downward counterfactuals included 'If there were more letters in the word', 'If I'd skipped the maximum number of words', 'If I'd used the whole two minutes to solve the word'.

### **5.7.2 Number of Counterfactuals Generated**

Two separate between groups ANOVAs were conducted on the number of upward and downward counterfactuals generated by participants, with counterfactual condition as the independent variable in each analysis, to determine if the number of counterfactuals varied according to counterfactual condition (see Table 5.5 for mean number of counterfactuals generated across conditions). No significant difference among the upward only, upward followed by downward, and downward followed by upward conditions was found in the number of upward counterfactuals generated [ $F(2,59) = 0.10, p = .91$ ]. However, a significant difference across experimental conditions in the number of downward counterfactuals generated by participants was

evident [ $F(2,54) = 5.84, p = .01, \eta^2 = .18$ ], with the downward only condition generating a greater number of counterfactuals than the two dual direction counterfactual conditions. Post hoc analyses with Tukey's HSD revealed that this difference was significant for the upward/downward condition [mean difference = 1.18,  $p = 0.00$ ] and approached significance for the downward/upward condition [mean difference = .83,  $p = .06$ ].

**Table 5.5**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Experiment 2b.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward Only	2.59 (1.18)	-
Downward Only	-	3.18 (1.29)
Upward/Downward	2.45 (1.05)	2.00 (0.73)
Downward/Upward	2.50 (0.89)	2.35 (1.14)

### 5.7.3 Preliminary Analyses of the Data Set

As in Experiment 2a, a between groups one-way ANOVA was performed on overall happiness ratings elicited immediately after Task 1 completion. This was to determine if participants viewed the outcome as being negative, and to ascertain if a significant variation among the counterfactual conditions was apparent in mean overall happiness ratings. With counterfactual condition as the independent variable, the one-way ANOVA revealed no significant difference among the four conditions in initial overall happiness ratings obtained after task completion [ $F(3,75) = 1.92, p = .13, \eta^2 = .07$ ; see Table 5.6 for descriptive statistics]. The low mean overall happiness ratings



ranging from 2.64 to 3.35 indicate that participants' feelings towards their performance in the anagram task in comparison to others was relatively negative. This was verified by a one-sample *t*-test conducted with a test value of 5 [ $t(78) = -18.02, p = .00, d = 2.03$ ], indicating that the manipulation of negative feedback on task performance was effective.

**Table 5.6**

*Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After Counterfactual Generation in Experiment 2b.*

Mood/Condition	Before	After
Overall happiness		
upward	2.64 (1.09)	4.42 (1.22)
downward	2.79 (0.92)	4.63 (1.46)
upward/downward	3.06 (0.87)	4.50 (1.76)
downward/upward	3.35 (1.04)	4.70 (1.38)
Glad		
upward	3.27 (1.20)	4.32 (1.36)
downward	3.11 (0.94)	4.42 (1.30)
upward/downward	3.17 (0.92)	4.22 (1.35)
downward/upward	3.50 (1.10)	4.30 (1.26)
Frustrated		
upward	5.05 (2.24)	4.64 (2.17)
downward	5.05 (1.81)	4.89 (2.13)
upward/downward	5.11 (1.64)	4.83 (1.34)
downward/upward	4.70 (1.72)	4.30 (1.84)
Satisfied		
upward	3.24 (1.31)	3.95 (1.05)
downward	3.47 (1.07)	3.84 (1.42)
upward/downward	3.28 (0.89)	4.11 (1.08)
downward/upward	3.35 (1.09)	4.15 (1.18)
Disappointed		
upward	5.27 (2.16)	4.90 (2.07)
downward	5.89 (1.66)	5.05 (1.99)
upward/downward	5.61 (1.61)	5.22 (1.35)
downward/upward	5.35 (1.81)	4.50(1.76)

#### 5.7.4 Change in Mood after Counterfactual Generation

Five separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on the overall happiness variable and each of the four emotion variables (*glad*, *frustrated*, *satisfied*, and *disappointed*) to examine the change in mood occurring after counterfactual generation (see Table 5.6 for descriptive statistics). Contrary to expectation, there were no significant effects or interaction for any of the five mood variables [overall happiness:  $F(1,75) = 0.00, p = .97$ ; *glad*:  $F(1,75) = 0.00, p = .98$ ; *frustrated*:  $F(1,75) = 0.05, p = .83$ ; *satisfied*:  $F(1,75) = 0.43, p = .51$ ; and *disappointed*:  $F(1,75) = 1.67, p = .20$ ]<sup>17</sup>. The means indicate that the positive mood ratings improved after counterfactual generation for all counterfactual conditions, and the negative variable ratings declined. This trend was to be expected for the downward only condition, however is in contrast to expectations and established findings for the upward only condition.<sup>18</sup>

#### 5.7.5 Self-Efficacy and Preparedness

To examine the effect of counterfactual generation on participants' self-efficacy, a 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) mixed design ANOVA was conducted using the self-efficacy ratings elicited at Time 1 (prior to task completion), Time 2 (after task completion), and Time 3 (after counterfactual generation). As in Experiment 2a, no

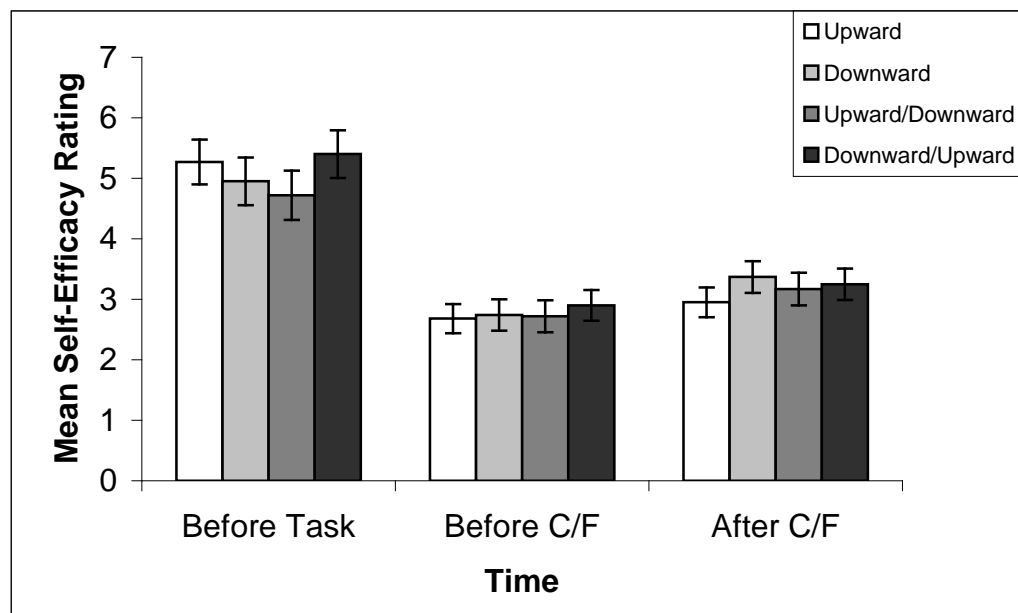
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<sup>17</sup> Three-way interaction between direction of last counterfactuals, the number of counterfactual opportunities, and the respective dependent variable is reported in Experiment 2b when no significant effects or interaction were found unless otherwise stated.

<sup>18</sup> Given that no main effects or interaction approached significance for the mixed design ANOVAs conducted to assess change in mood after counterfactual generation, the computation of a composite mood rating was not warranted.

significant interactions were present between the independent variables and self-efficacy ratings [ $F(2,74) = 0.21, p = .81$ ].

Synonymous with Experiment 2a, the main effect for self-efficacy assessment was significant [ $F(2,74) = 61.89, p = .00, \eta_p^2 = .63$ ]. As anticipated, participants' self-efficacy ratings significantly declined after completing the anagram task and learning that their performance was worse than others who had supposedly already completed the task, with a mean difference between Time 1 and Time 2 ratings of 2.33 ( $SE = .21, p = .00$ ). The main effect analyses also revealed that self-efficacy ratings averaged across the four counterfactual conditions increased after counterfactual generation with a mean difference between Time 2 and Time 3 of  $-0.43$  ( $SD = .10, p = .00$ ). As illustrated in Figure 5.4, the means indicate that participants' self-efficacy ratings increased after counterfactual generation in all conditions, with the greatest increase occurring after downward only counterfactual generation.



**Figure 5.4:** Changes in mean self-efficacy ratings in Experiment 2b.

As in Experiment 2a, two separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVAs were conducted on the preparedness ratings of confidence and readiness to complete a second anagram task (see Table 5.7 for descriptive statistics). No significant main effects or interaction between direction of last counterfactuals and number of counterfactual opportunities were found for either dependent measure [confidence:  $F(1,75) = 0.01, p = .94$ ; readiness:  $F(1,75) = .15, p = .70$ ]. Therefore, no preparedness effects were found in Experiment 2b.

**Table 5.7**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) in Experiment 2b.*

Condition	Confidence	Readiness
Upward	5.32 (1.73)	6.09 (1.69)
Downward	4.95 (1.31)	5.79 (1.58)
Upward/Downward	4.78 (1.23)	5.44 (1.10)
Downward/Upward	5.20 (1.77)	6.00 (1.38)

### 5.7.6 Performance Measures

To determine whether counterfactual generation had an effect on participants' performance measures of the number of skips made, number of clues bought, number of anagrams solved correctly, and final score from Task 1 compared with Task 2, four separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) mixed design ANOVAs were conducted (see Table 5.8 for descriptive statistics). Consistent with Experiment 2a, there were no

significant interactions or main effects for any of the performance measures [ $F < 1$  for skips, clues correct anagrams, and final score].

As in Experiment 2a, the proportion of average trial time taken to solve the anagrams in Task 1 compared to Task 2 was calculated. A 2 (direction of last counterfactuals: upward vs. downward)  $\times$  2 (number of counterfactual opportunities: one vs. two) factorial ANOVA was subsequently conducted on this variable. In contrast to Experiment 2a, no significant interactions or main effects were found [three-way interaction:  $F(1,75) = 1.10, p = .30$ ].

**Table 5.8**

*Performance Measure Means (with Standard Deviations in Parentheses) in Experiment 2b.*

Performance Measure/Condition	Task 1	Task 2
No. of Skips		
upward	1.09 (1.11)	1.09 (1.11)
downward	0.79 (1.13)	0.63 (0.83)
upward/downward	0.83 (1.10)	0.50 (1.04)
downward/upward	1.05 (1.23)	0.90 (1.45)
No. of Clues		
upward	3.73 (2.81)	3.36 (2.22)
downward	2.95 (1.54)	3.00 (2.19)
upward/downward	3.39 (2.89)	3.33 (2.50)
downward/upward	4.10 (2.36)	3.30 (2.08)
No. Anagrams Correct		
upward	8.82 (1.22)	8.77 (1.11)
downward	9.16 (1.26)	9.16 (0.90)
upward/downward	8.72 (1.56)	8.78 (1.56)
downward/upward	8.95 (1.23)	8.95 (1.73)
Final Score		
upward	852.64 (166.59)	875.82 (206.80)
downward	904.05 (182.81)	915.00 (164.82)
upward/downward	794.94 (233.60)	876.11 (218.96)
downward/upward	887.45 (176.20)	914.50 (266.95)

## 5.8 Discussion

The current experiment was conducted in order to replicate the findings of Experiment 2a using a negative outcome. It was hypothesised that upward only counterfactuals would result in a decline in overall mood and increased preparedness to complete the task a second time. Downward counterfactuals on the other hand, were hypothesised to lead to mood improvement and reduced preparedness. Finally, it was expected that dual direction counterfactuals would follow the same trend as in the scenario experiments (Chapter 4) and Experiment 2a, demonstrating a recency effect for the direction of the last counterfactuals generated. Contrary to predictions however, counterfactual generation did not result in a significant effect on mood across any of the counterfactual conditions. This finding is in contrast to expectation in regards to the findings of the previous three experiments and the well documented finding that upward counterfactuals result in a decline in affect (e.g., Mandel, 2003; Markman et al., 1993; Sanna et al., 2001).

Although no significant difference in mood change as a result of counterfactual generation was found among the four counterfactual conditions, there was a trend for improvement in affect post-counterfactual generation in all conditions, including the upward only condition. Notably, mean overall happiness and *glad* ratings improved post-upward counterfactual generation more than one point on the 9-point scales. The trend for mood improvement found in the upward only condition, especially after a negative outcome, is somewhat perplexing. It was predicted that both upward and downward counterfactual generation after the negative outcome portrayed in the current experiment would reflect the change in affect occurring throughout the literature, given that the majority of studies documented employed negative outcomes. Although the trend for mood improvement found for upward counterfactuals is contrary to the

established findings, it mirrors the results obtained in Task 1 of Experiment 1b whereby mean composite mood ratings also increased after counterfactual generation in all four conditions. The scenario used in Experiment 1b, Task 1 was the only one of the four scenario tasks conducted that was perceived by participants as being somewhat negative. Thus, it appears that the mental simulation of how an event or outcome could have been better in some instances may foster the feelings of affect experienced had the better alternative actually been the reality. As in Experiment 1b, participants considering worse alternatives to their negative anagram performance demonstrated the predicted contrast based affective response, and those generating upward counterfactuals ostensibly imagined rather than evaluated better alternatives to their task performance, thus displaying affective assimilation (c.f., McMullen, 1997; McMullen & Markman, 2000; Markman et al., 2008).

Alternatively and consistent with Boninger et al. (1994), mood may have improved after upward generation as participants could consider ways to improve their performance in the anagram task and thus feel hope for future betterment. However, as participants were led to believe they would only complete one anagram task which therefore rendered future improvement irrelevant, it seems that participants placed emphasis on affective enhancement in an attempt to make the best out of a negative outcome that possessed no future relevance. To further disrepute this second explanation, there were no preparedness effects in the current experiment. This result is also in contrast to the preparedness hypotheses as denoted by the counterfactual literature, whereby it was predicted that upward only counterfactuals would result in a greater sense of preparedness to complete the anagram task a second time. The findings of Experiment 2b suggests that the participants either did not place much importance on their performance in the anagram task, or placed a greater emphasis on their current

feelings of affect than on their sense of preparedness and aptness in completing the second anagram task, possibly a result of their initial belief in the anagram task being a single-time event (Markman et al., 1993). Alternatively, participants' counterfactual thoughts may have influenced their causal ascriptions to their performance in the anagram task (c.f. Wells & Gavanski, 1989), which thus assisted participants in explaining their performance to themselves. Hence, participants' may have rationalised their performance, rendering minimal change to their affective state.

To further augment the lack of preparedness effects occurring in the current experiment, there was no significant difference among the counterfactual conditions in any of the performance measures examined (number of skips made, number of clues obtained, number of anagrams solved correctly, and final score). This finding is consistent with Experiment 2a, denoting that counterfactual generation in either direction had no effect on participants' performance in the second anagram task as compared to their performance in the first anagram task. This lack of difference may be attributable to a ceiling effect resulting from the high mean number of counterfactuals solved correctly and reasonably high final scores, however there was still scope for improvement in the final score participants obtained for Task 2. The high mean number of anagrams solved correctly and the high scores in Experiment 2b may contribute to the overall lack of significant results in this experiment, which was manipulated to portray a negative outcome. Although the low initial overall happiness ratings indicate that participants perceived the outcome as negative, they may not have felt their performance was as bad as it was made out to be.

As anticipated, participants' self-efficacy ratings significantly declined after completing the anagram task and learning that their performance was below average as compared to other participants who had supposedly already completed the anagram



task. In contrast to Experiment 2a in which self-efficacy did not alter after counterfactual generation, participants' self-efficacy ratings in the current experiment significantly increased post-counterfactual generation in all conditions with the greatest increase occurring in the downward only condition. Although not expected, the increase occurring in self-efficacy ratings in all of the counterfactual conditions mirrors the trend for affective improvement after counterfactual generation in all four conditions, providing further testament to the notion that participants' primary goal was to improve their affect after experiencing a negative outcome believed to possess no future relevance.

Another intriguing finding of the current experiment was that participants in the downward only condition generated a significantly greater mean number of downward counterfactuals than participants in the dual direction counterfactual conditions. As the outcome of the first anagram task completed by participants was manipulated to portray a somewhat negative outcome, which is evident in the relatively low mean overall happiness ratings obtained immediately after Task 1 completion, one would expect participants to generate a greater number of upward counterfactuals. Theoretically, there is greater scope for upward generation after a negative outcome, which generally gives rise to upward counterfactuals being the default (Roesse & Hur, 1997; Roesse & Olson, 1997). This contention has been demonstrated in numerous experiments, showing that upward counterfactuals are considered more readily after a negative outcome than their downward counterparts (e.g., Mandel, 2003; Roesse & Hur, 1997; Roesse & Olson, 1997). This finding however, is consistent with White and Lehman (2005) who showed that more downward counterfactuals were generated in comparison to upward counterfactuals in response to negative life events when participants were focused upon self-enhancement. Although White and Lehman (2005) reasoned that performance

oriented tasks commonly evoke more upward counterfactuals for which self-improvement motives predominate, it seems that a negatively valenced performance task believed to be a single-time event as in the current experiment, can induce self-enhancement motives rather than self-improvement motives.

Overall, Experiment 2b did not replicate the findings of Experiment 2a or the general contentions in the literature regarding both the affective and preparative functions of upward counterfactuals. Experiment 2b suggests that counterfactual thinking is not a robust phenomenon with highly predictable effects, but rather is privy to many factors such as perceived repeatability, mental simulation of counterfactuals as evaluative or reflective based, the degree of importance the individual places on the outcome, and whether self-enhancement or self-improvement motives predominate. However, some consistency regarding the effects of counterfactual thinking in the current research has been observed, with Experiment 2a - which involved the same anagram task with a positive outcome - essentially replicating the findings for mood assessment in the scenario studies conducted in Experiment 1. The findings of the scenario tasks and anagram study involving neutral to somewhat positive outcomes, coupled with the limited research investigating the resulting consequences of children's counterfactual thinking, provided the impetus to extend the research on single and dual direction counterfactual generation to primary-school aged children.

## **Chapter 6 : Scenario and Anagram Tasks with Children**

As discussed in Chapter 3, little research has directly examined the ability of primary school-aged children to think counterfactually, and thus discern its effect on mood and preparedness. Therefore, the primary aim of the experiments reported in this chapter was to explore the effects of counterfactual thinking in children, and thus devise an effective paradigm for such assessment. Given the findings of the previous experiments conducted with adult participants involving neutral to somewhat positive outcomes (Chapters 4 & 5), Chapter 6 extends upon this research to examine the effect of single and dual direction counterfactual generation on mood and preparedness in primary school-aged children. The neutral to positive outcome scenario tasks in Experiments 1a and 1b and the positive outcome anagram task in Experiment 2a conveyed similar findings. Upward only counterfactuals led to a decline in mood, downward only counterfactuals evidenced little or no improvement in mood, and the dual direction counterfactual conditions demonstrated a recency effect for the direction of the last counterfactuals generated. No preparedness effects were found among any of the counterfactual conditions in the scenario tasks, however preparedness effects were present in the anagram task. Given the relative consistency of the findings for affect across scenario and performance-based tasks involving neutral to positive outcomes, the design of the experiments in Chapter 6 essentially replicated those employed with adult participants.

The effect of single and dual direction counterfactual generation on children's mood and preparedness was first explored in a scenario study adapted from those reported in Chapter 4. The research was then extended to incorporate a performance oriented task and employed a variation of the anagram task used with adult participants

in Chapter 5. As with the previous experiments reported in this thesis, both Experiments 3a and 3b employed the same mixed design in order to assess the potential differences between single and dual direction counterfactual generation. Thus, participants in both Experiments 3a and 3b were randomly assigned to one of the four counterfactual conditions of upward only, downward only, upward followed by downward, and downward followed by upward. This allowed for a direct comparison of the subsequent effect on mood and preparedness of both single directions of counterfactuals, as well as a comparison between single and dual direction counterfactual generation. Further, both Experiments 3a and 3b also utilised the same 9-point mood rating scales and preparedness scales used in the previous experiments so as to maintain methodological consistency and enable a comparison of the observed findings between adults and children.

## **6.1 Experiment 3a**

The primary objectives of Experiment 3a were three-fold. Firstly, it was aimed to demonstrate the ability of primary school-aged children of approximately 10 years of age to generate counterfactuals of a specified direction in the event of a somewhat positive outcome. The second aim was to examine the affective and preparative consequences arising from children's engagement in counterfactual thought. The third aim was to compare these consequences as a result of single versus dual direction counterfactual generation and discern the differences in these effects occurring with adult participants. As in the first set of experiments conducted for this thesis with adult participants, this was achieved through the employment of a scenario task. The scenario methodology used was adapted from those used in Experiments 1a and 1b (Chapter 4) and was modified for suitability of use with children. The design and dependent

measures replicated those used in the experiments conducted with adults; however, child participants were required to complete one hypothetical scenario task. This was to accommodate the shorter attention span of child participants and to eliminate the variability and high number of exclusions resulting from inappropriate and vague scenarios that was apparent with adult participants in Task 2 in both Experiments 1a and 1b. The hypothetical scenario was designed to illustrate a controllable and common occurrence to which primary school-aged children could easily relate. The outcome of the scenario was intended to be viewed by participants as being somewhat positive.

Overall, the purpose of this exploratory experiment was to provide a greater understanding of the ways in which counterfactual thinking affects children's mood and preparedness, and to discern the differences in these effects occurring with adult participants. It was anticipated that the results of Experiment 3a would essentially replicate those obtained in the scenario experiments containing a neutral to positive outcome that were conducted with adult participants in Chapter 4. Specifically, it was expected that upward counterfactuals would result in a significant decline in mood; downward counterfactuals would evidence little or no change in mood; the dual direction counterfactual conditions would illustrate a recency effect for the direction of the last counterfactuals generated; and although not significant for adult participants but in line with the literature (e.g., Markman et al., 1993; Roese, 1994; Roese & Olson, 1995b, Roese, 1997), it was expected that a significant difference in preparedness would be found across the four counterfactual conditions. Overall, it was predicted that like adults, children would be fluent in generating upward, downward, or both directions of counterfactuals when asked to do so, and that the resulting consequences of considering counterfactual alternatives experienced by children would reflect those experienced by adults. Thus, it was endeavoured to ascertain that the engagement in counterfactual

thought and the ensuing consequences for children approximately 10 years of age, would be comparable to the adult population.

## **6.2 Method**

### **6.2.1 Participants**

Participants consisted of 121 (70 female and 51 male) students from primary school grades four and five from three public and private schools in the Illawarra Region. Children were predominately white middle-class Anglo-Saxons with English as their primary language. Approval for the conduction of this research (Experiments 3a and 3b) was obtained from the University of Wollongong Human Research Ethics Committee, the New South Wales Department of Education and Training, and the Diocese of Wollongong Catholic Education Office. All participating students had parental consent and provided the researcher with verbal consent on the day of testing, and received a certificate of appreciation at the conclusion of their participation. Of the initial sample, 18 participants were excluded from data analysis for: (i) generating vague or inappropriate counterfactuals (10 participants), (ii) generating both directions of counterfactuals when not asked to do so (3 participants), (iii) generating counterfactuals in the wrong direction (3 participants), and (iv) failing to understand the task requirements (2 participants). Thus, a final sample of 103 participants was obtained with a mean age of 9.98 years ( $SD = 0.61$ , range = 9 – 11 years).

### **6.2.2 Design**

Participants were randomly assigned to one of the four counterfactual conditions, these being an upward counterfactual, downward counterfactual, upward followed by downward counterfactual, and downward followed by upward

counterfactual condition, with approximately 29 participants in each condition (range = 27 - 30). Thus, a 2 (direction of last counterfactuals: upward or downward) x 2 (number of counterfactual opportunities: one or two) x 2 (mood assessment: before and after counterfactual generation) mixed design was employed. The dependent measures included: (a) the number of appropriate counterfactuals generated<sup>19</sup>; (b) two mood assessment measures, one obtained after reading the scenario task and the other after generating counterfactuals; and (c) a preparatory rating scale.

### **6.2.3 Materials and Procedure**

Following Guttentag and Ferrell (2004), participants were administered a pen and paper test booklet containing the hypothetical scenario and subsequent dependent measures, in groups of approximately 20 students. Participants were instructed to complete all tasks in the booklet individually. To complete the task, the following instructions were presented in the booklets: ‘Read the story below and pretend that it is happening to you. When you have finished, turn to the next page’. The experimenter read the instructions and the scenario aloud while the participants followed along in their booklets. The scenario detailed the experience of staying up late reading a really good book, then sleeping in the following morning with the somewhat positive outcome of just making it to the school bus in time (see Appendix F for the text used in the scenario). Students were then asked, ‘How do you feel about making it to the school bus just in time? Answer on the scales below by circling a number on the line that best shows how you feel.’ (Time 1 mood assessment). The first scale assessed overall happiness with a happy and sad face as polar opposites. The remaining scales consisted of emotion adjectives taken from those used in Experiments 1a and 1b, these being

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<sup>19</sup> Refer to section 6.3.1 for counterfactual rating criteria.

*upset, glad, frustrated, relieved, and sad*, with each scale ranging from 1 = “not at all” to 9 = “very”. The experimenter asked the participants to complete the mood ratings on their own, and to continue working through the rest of the booklet at their own pace.

Depending upon their randomly assigned counterfactual condition, participants were instructed to consider how the experience could have been either (a) better, (b) worse, (c) better then worse, or (d) worse then better, thus generating upward only, downward only, or both upward and downward counterfactuals. To prompt counterfactual generation in a specific direction, participants read the following: ‘Sometimes after something happens, people think about how it could have been different. For example, ‘If I hadn’t eaten all my vegetables, I wouldn’t have gotten any dessert’. Can you think of as many ways as you can about how your experience in the story of nearly missing the bus could have been **better (worse)?**’ Five spaces were provided below for participants to write their responses. Participants in the dual direction counterfactual conditions were then asked: ‘Now can you think of as many ways as you can about how your experience in the story of nearly missing the bus could have been **worse (better)?**’. Again, five spaces were provided for participants to write their counterfactual thoughts.

After completing the counterfactual generation task, participants were required to complete the second mood assessment consisting of the same scales as Time 1, prompted by the question, ‘After thinking about how the ending of the story could have been different, how do you feel now about having made it to the bus just in time?’ Finally, participants were asked to rate their preparedness for a similar future experience by asking, ‘After thinking about how the ending of the story could have been different, next time you are reading a good book before bed, how likely do you think you would stay up late reading?’, answering on a 9-point scale ranging from 1 = “not at all likely”



to 9 = “very likely”. After all participants in the group had completed the test booklet, the children were debriefed about the purpose of the task in a manner they could understand and were provided the opportunity to ask any questions.

## **6.3 Results**

### **6.3.1 Rating of Counterfactuals**

The counterfactuals generated by participants were coded by the researcher as upward or downward, and relevant to the scenario. As in all previous experiments conducted for this thesis, counterfactuals were classified according to the criteria defined by Tsirios and Mittal (2000). Examples of upward counterfactuals generated by participants when considering the outcome of the hypothetical scenario were ‘I could have woken up early and went to sleep early’, ‘Got to the bus stop earlier’, and ‘If I put the book away when mum told me to’. Examples of downward counterfactuals included ‘If the bus driver hadn’t seen me’, ‘If I had slept in any later’, and ‘If I didn’t run to the school bus I would have missed it’.

### **6.3.2 Number of Counterfactuals Generated**

To determine the number of upward and downward counterfactuals generated across the counterfactual conditions, two separate between groups one-way ANOVAs were conducted with counterfactual condition as the independent variable. No significant difference among the downward only, downward followed by upward, and upward followed by downward conditions was found for the number of downward counterfactuals generated [ $F(2,75) = 1.58, p = .21$ ]<sup>20</sup>. Similarly, no significant

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<sup>20</sup> An alpha level of .05 was used for all statistical tests in Experiments 3a and 3b, unless otherwise stated.

difference among the upward only, upward followed by downward and downward followed by upward conditions was evident in the number of upward counterfactuals generated [ $F(2,73) = 2.00, p = .14$ ; see Table 6.1 for the mean number of counterfactuals generated across the four conditions]. Therefore, there was no systematic variation between the different experimental conditions in participants' readiness to generate counterfactuals in either the upward or downward direction.

**Table 6.1**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Experiment 3a.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward Only	3.00 (1.16)	-
Downward Only	-	3.19 (1.18)
Upward/Downward	2.92 (1.02)	2.96 (1.40)
Downward/Upward	2.40 (1.29)	2.56 (1.26)

### 6.3.3 Preliminary Analyses of the Data Set

Preliminary analyses were conducted on the data set prior to statistical analysis to ensure a consistent sample. As in the previous experiments conducted for this thesis, the four counterfactual conditions were treated as four levels of a single independent variable, rather than as parts of the 2 x 2 factorial design later employed to test the hypotheses in question. Several participants were found to have mood ratings at Time 1 (prior to counterfactual generation) more than 2.5 standard deviations outside the mean. As these participants' outlying values were not consistent across all of the Time 1 mood variables, the outlying values for the given variable were removed from the data set.

Thus, these participants' mood ratings, which were not outlying values, remained in the data set. The outlying mood values indicate that several of the participants may not have fully understood the mood adjective or direction of the respective rating scale, therefore providing cause for their deletion.

Participants' overall happiness ratings elicited at Time 1 were assessed to determine if initial overall happiness ratings varied across the four counterfactual conditions, and to ascertain whether participants viewed the outcome as positive, negative, or neutral. As the purpose of the preliminary analyses was to ensure a consistent sample, analyses were conducted on overall happiness ratings prior to counterfactual generation with the four counterfactual conditions as the independent variable. A between groups one-way ANOVA revealed that there was no significant difference among the four counterfactual conditions [ $F(3,98) = 2.19, p = .09, \eta^2 = .07$ ]. Mean overall happiness ratings ranged from 6.89 to 7.84 (see Table 6.2 for means and standard deviations of mood variables), indicating that participants viewed the outcome in the hypothetical scenario as being positive. A one-sample  $t$ -test conducted with a test value of 5 provided verification that the outcome was perceived as positive [ $t(101) = 16.94, p = .00, d = 1.68$ ].

**Table 6.2***Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After**Counterfactual Generation in Experiment 3a.*

Mood/Condition	Before	After
Overall Happiness		
upward	7.84 (1.11)	7.32 (1.73)
downward	6.89 (1.51)	6.79 (1.86)
upward/downward	7.39 (1.59)	7.93 (1.27)
downward/upward	7.57 (1.38)	7.61 (2.02)
Upset		
upward	2.00 (1.19)	3.06 (1.88)
downward	2.27 (1.61)	2.62 (1.86)
upward/downward	2.57 (1.77)	2.64 (1.70)
downward/upward	2.26 (1.48)	2.04 (1.77)
Glad		
upward	7.92 (1.29)	7.36 (1.73)
downward	6.98 (1.62)	7.34 (1.98)
upward/downward	7.79 (1.54)	7.36 (1.97)
downward/upward	6.87 (1.69)	7.57 (1.56)
Frustrated		
upward	2.48 (1.50)	2.84 (1.91)
downward	3.78 (2.22)	4.06 (2.55)
upward/downward	3.93 (2.42)	3.36 (1.77)
downward/upward	3.44 (2.35)	2.44 (1.73)
Relieved		
upward	8.00 (1.38)	7.66 (1.33)
downward	7.31 (2.00)	7.39 (2.21)
upward/downward	7.44 (1.83)	7.33 (2.22)
downward/upward	7.00 (1.88)	7.09 (2.17)
Sad		
upward	2.09 (1.38)	3.15 (1.89)
downward	1.98 (1.40)	2.73 (1.85)
upward/downward	2.35 (1.38)	2.04 (1.43)
downward/upward	1.78 (1.24)	2.04 (1.97)

#### 6.3.4 Change in Mood after Counterfactual Generation

To investigate whether children's mood changed after considering counterfactual alternatives to the hypothetical scenario, six separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on the overall happiness ratings and the emotion adjective ratings of *upset*, *glad*, *frustrated*, *relieved*, and *sad* before and after counterfactual generation. The three negative emotion adjectives of *upset*, *frustrated*, and *sad* all yielded two-way interaction between number of counterfactual opportunities and mood assessment [*upset*:  $F(1,98) = 4.17, p = .04, \eta_p^2 = .04$ ; *frustrated*:  $F(1,99) = 6.35, p = .01, \eta_p^2 = .06$ ; *sad*:  $F(1,94) = 6.00, p = .02, \eta_p^2 = .06$ ]; however, only reached significance with a Bonferonni adjustment with a .0125 per comparison error rate for *frustrated*. Means indicate that the negative emotion ratings increased after single direction counterfactual generation for each of the three variables, with minimal change occurring in the dual direction counterfactual conditions for the *sad* and *upset* variables (see Table 6.2 for descriptive statistics). Simple main effect analyses revealed the *frustrated* variable resulted in a significant decline in ratings of frustration in the dual direction counterfactual conditions [mean difference = 0.77,  $SE = .31, p = .02$ ] with no significant increase for the single counterfactual conditions [mean difference = - 0.32,  $SE = .31, p = .30$ ].

The three positive emotion variables of overall happiness, *glad*, and *relieved* did not follow the same trend as the negative mood variables. The only positive mood variable to evidence a significant post-counterfactual generation change in mood was *glad*. This variable produced a significant three-way interaction between number of counterfactual opportunities, direction of last counterfactuals, and mood assessment

[ $F(1,97) = 7.04, p = .01, \eta_p^2 = .07$ ]. However, as with the two-way interaction occurring for the *frustrated* variable, the effect size was small. The means indicate that *glad* ratings declined after upward only and upward followed by downward counterfactuals and increased after downward only and downward followed by upward counterfactuals. This is indicative of a primacy effect for the direction of the first counterfactuals generated. However, simple main effect analyses illustrated that these differences were not statistically significant for any of the counterfactual conditions. No further interaction or effects were found for any of the mood change analyses<sup>21</sup>.

### 6.3.5 Preparedness

A 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVA was conducted on the preparedness ratings to assess children's feelings of preparedness after counterfactual generation. A significant main effect for the number of counterfactual opportunities was found [ $F(1,99) = 4.65, p = .03, \eta_p^2 = .05$ ], with the single counterfactual conditions of upward only and downward only producing higher ratings of preparedness for a similar future event (see Table 6.3 for descriptive statistics). No other analyses yielded statistically significant findings.

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<sup>21</sup> Due to the deletion of several outliers across the mood variables and the variability present between the results of mood change analyses on the emotion adjective ratings (e.g. two-way interaction was found for each of the three negative mood variables, while three-way interaction was found for one of the positive mood variables), and thus provided no consistency in mood change post-counterfactual generation, a composite mood variable was not calculated as in the scenario experiments conducted with adult participants (Chapter 4).

**Table 6.3**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) Across Conditions in Experiment 3a.*

Condition	Mean Preparedness Ratings
Upward	4.84 (2.30)
Downward	4.69 (2.89)
Upward/Downward	3.25 (2.15)
Downward/Upward	4.13 (2.67)

## **6.4 Discussion**

Experiment 3a set out to explore the effects of counterfactual thinking on affect and preparedness in primary school-aged children. This was achieved through adapting the design of the scenario experiments conducted with adult participants in Chapter 4 for suitability of use with children. Overall, it was found that the most change occurring in mood post-counterfactual generation was for the negative emotion adjectives of *upset*, *frustrated*, and *sad*, with the number of counterfactual opportunities having the greatest effect. The only positive emotion variable to yield a significant change in mood after counterfactual generation was *glad*, with both the number of counterfactual opportunities and the direction of the last counterfactuals generated having an effect. A preparedness effect was also evident for the number of counterfactual opportunities.

As expected, there was no significant difference among the four counterfactual conditions in the number of upward or downward counterfactuals generated. Child participants were just as readily able to generate one or both directions of counterfactual when asked to do so, with approximately three counterfactuals being generated for each direction regardless of counterfactual condition. This is consistent with the findings of Guajardo and Turley-Ames (2004) who found that preschool children from as young as

3 years of age were able to generate both directions of counterfactuals equally well when prompted. Note, however, that in the current experiment, 16 participants were excluded from the initial sample of 121 for generating vague or inappropriate counterfactuals, the wrong direction of counterfactual according to their allocated condition, or both directions of counterfactual when not asked to do so, thus indicating that some children may not have fully understand the counterfactual generation task. Although 13 percent of child participants did not complete this task appropriately, it is comparable to the adult participants partaking in the scenario experiments (e.g. 15% of adult participants did not appropriately complete the counterfactual generation task in Experiment 1b, Task 2).

Overall happiness ratings obtained immediately after participants read the hypothetical scenario indicate that the outcome was viewed as being relatively positive (see Table 6.2 for mean mood ratings). Subsequently, it was anticipated that counterfactual generation would result in a similar effect on mood as in the positive outcome scenario tasks conducted with adult participants in Experiments 1a and 1b (Chapter 4). However, the changes occurring in mood post-counterfactual generation for the child participants did not reflect the changes occurring with adult participants. In the current experiment, the number of counterfactual opportunities had a greater effect on children's mood than did the direction of the last counterfactuals generated. This is denoted by the two-way interaction occurring between the number of counterfactual opportunities and mood assessment for each of the three negative emotion adjectives. Thus, the effect of counterfactual generation on children's mood depended upon whether they considered one or both directions of counterfactuals, rather than the direction of the counterfactuals generated. The means indicate that the negative emotions of *upset*, *frustrated*, and *sad* all increased after upward only and downward



only generation and declined or evidenced minimal change in the dual direction counterfactual conditions. The findings on the upward only condition are consistent with the literature on adults' counterfactual thinking. However, the findings on the downward only condition are in contrast to the results obtained with adult participants and the established affective function of counterfactual thinking, whereby downward counterfactuals generally result in an improvement in mood (e.g., Markman et al., 1993; Roese, 1994; Sanna, 1996; 1997).

As for the effect of dual direction counterfactual generation on the negative mood variables, there was no significant difference in *upset* and *sad* ratings post-counterfactual generation. The *frustrated* variable however, evidenced a significant decline in self-reported feelings of frustration after dual direction counterfactual generation. Again, this is in contrast to the findings with adult participants in Experiments 1 and 2, whose dual direction counterfactual generation resulted in a recency effect for the direction of the last counterfactuals generated. Therefore, the current experiment suggests that in regards to negative emotions, counterfactual generation may not result in the same mood effects for children as it does for adults.

The positive mood variables did not reflect the same trends in mood change occurring for the negative emotion adjectives. The overall happiness and *relieved* variables evidenced no significant change in mood post-counterfactual generation. The only positive emotion adjective to result in a significant change in mood was *glad*, in which a significant three-way interaction between the number of counterfactual opportunities, the direction of last counterfactuals generated and mood assessment was obtained. The means indicate a primacy effect for the direction of first counterfactuals generated, with self-reported *glad* ratings declining after upward only and upward followed by downward counterfactual generation, and increasing after downward only

and downward followed by upward generation. These differences however, did not reach statistical significance. These results share reasonable consistency with Guttentag and Ferrell (2004) who found that 7-year-olds' judgement of regret was comparable to adults' judgements, however children's judgements of relief and elation did not match those of the adult participants, which indicates that counterfactual alternatives had no effect on children's judgement of positive emotions. However, Weisberg and Beck (2010) found that children experience relief from approximately 7 years of age but are unable to accurately judge others' feelings of relief. Note however, that Guttentag and Ferrell (2004) asked participants to judge which of two story characters would feel worse, while in Weisberg and Beck (2010), participants indicated their own or another's emotion on a scale consisting of five faces ranging from very sad to very happy. This methodological difference may explain the significant three-way interaction occurring for the *glad* variable in the present experiment, such that participants rated their own emotions and thus substantiates Weisberg and Beck's (2010) finding that children do experience relief and associated emotions. However, the overall happiness and *relief* variables did not share this consistency.

One explanation of the current findings may be that children's counterfactual thinking did not evoke a strong emotional response in the event of the positively valenced outcomes, with children accepting the actual state of affairs for what it was. As children were required to rate several emotion adjectives regarding the outcome of the given task, an alternative explanation is that children's emotional understanding may not be as well developed as adults. The literature however, does not firmly support this explanation. Research has demonstrated that by 5 years of age, children are competent in appraising others' spontaneous emotional reactions for basic emotions such as happy and scared (e.g., Fabes, Eisenberg, Nyman, & Michealieu, 1991), while more complex

emotions such as guilt are understood by approximately 8 years of age (e.g., Nunner-Winkler & Sodian, 1988). Further, Thompson (1987) found that 10- to 11-year-old children's inferences of others' emotions were comparable to adults. And in a longitudinal study, Pons and Harris (2005) found little improvement in 11-year-old children's emotional understanding in comparison to 7- and 9-year-old children. Pons and Harris (2005) also found considerable individual differences for each age group, with emotion comprehension assessment level being predicted by assessment thirteen months prior. Given the literature on children's emotional understanding, by approximately 10 years of age, children's understanding of emotion in both themselves and others is comparable to adults. It therefore seems that generalised emotion understanding of the age cohort in the current research is not a contributing factor to the ambiguous affect results, but may rather be the result of individual differences in emotion understanding (Pons & Harris, 2005). Alternatively, a likely explanation is that children's consideration of counterfactual alternatives may not affect their emotional responses in the significant or predictable ways that are typically observed in adults.

In disparity to the findings of the adult scenario studies conducted for this thesis (see Chapter 4), there was a significant difference in preparedness ratings between conditions in the current experiment. A main effect for the number of counterfactual opportunities was found, with the single counterfactual conditions having the highest mean preparedness ratings in comparison to the dual direction counterfactual conditions. Thus, participants considering upward only or downward only counterfactuals as opposed to both directions of counterfactuals reported significantly higher preparedness ratings. This finding is in contrast to previous research demonstrating that upward counterfactuals result in a greater sense of preparedness than

do downward counterfactuals, and to the findings of Experiments 1a and 1b (Chapter 4) in which no significant preparedness effects were found.

It is possible that the apparent differences observed between the single and dual direction conditions for both mood and preparedness may be attributable to the differing cognitive demands of the two types of task: the single direction and dual direction counterfactual generation tasks. Although there were no differences in the number of counterfactuals generated among the four counterfactual conditions, asking child participants to complete two counterfactual generation tasks may have been taxing on their cognitive capacities, tiring them to complete the remainder of the task, and consequently, resulting in the significant main effect for the number of counterfactual opportunities. This speculation should be examined in future research.

The current experiment sought to examine the effect of single and dual direction counterfactual generation on mood and preparedness in primary school-aged children. Although there are potential issues regarding differences in emotional understanding of this age cohort, and possible differences in cognitive demands resulting from the two types of counterfactual tasks, this experiment has demonstrated that the number of counterfactual opportunities appears to have a greater effect on both preparedness and affect than the direction of counterfactuals generated. It seems that the mere process of considering how an outcome could have been better or worse results in an increase in children's negative emotions and sense of preparedness for a similar future event. Further clarification is thus sought in Experiment 3b, which utilises an adaptation of the anagram task conducted with adult participants in Experiment 2a.

## 6.5 Experiment 3b

Experiment 3b was conducted to assess the ways in which counterfactual thinking affects children's mood and preparedness in a performance oriented task after a somewhat positive outcome. By utilising the same experimental design, it was aimed to clarify the findings of the scenario experiment conducted with children in Experiment 3a in a performance oriented task. The findings of Experiment 3a did not replicate those obtained with adult participants in Experiments 1a and 1b as was expected. The studies conducted with adult participants tended to convey a direction of last counterfactuals effect on mood and no direct preparedness effects. The scenario study conducted with primary school-aged children on the other hand showed that the number of counterfactual opportunities had the most influential effect on the negative emotions that were assessed, and preparedness effects were also observed. Mixed results however, were found for the positive emotions. Given these findings, Experiment 3b sought to further examine the effect of counterfactual thinking on children's affect and sense of preparedness for a similar future event. This was achieved through modifying the positive outcome anagram task conducted with adult participants in Experiment 2a. The essential features of the task remained the same; however, slight alterations were made in order for the task to be within the capabilities of primary-school aged children to complete. Specifically, the two blended categories of words each containing 10 anagrams that were employed with adult participants were replaced with two single categories of words, each containing seven anagrams. This made it easier for children to solve the anagrams, as pilot testing revealed that children had immense difficulty solving the anagrams from blended categories, even when the words were re-scrambled to be less difficult. Further pilot testing with the new categories of words demonstrated that the task was within the capabilities of 9- and 10-year-old children to complete.

Given the findings of Experiment 3a, it was predicted that the number of counterfactual opportunities would result in significant mood and preparedness effects. Specifically, it was expected that the consideration of upward only and downward only counterfactuals would result in an increase in the negative mood ratings with the dual direction counterfactual conditions evidencing no significant change, and that upward only and downward only counterfactuals would result in a greater sense of preparedness to complete the second anagram task compared to participants in the dual direction counterfactual conditions.

## **6.6 Method**

### **6.6.1 Participants**

Participants consisted of 81 primary school-aged children from three public and private schools in the Illawarra Region. Participants were predominately white Anglo-Saxon middle-class children with English as their primary language. All of the participants involved in the current experiment constituted an independent sample and had no involvement in Experiment 3a. Written parental consent and verbal consent from each participant was obtained prior to task completion. All participants received a certificate of appreciation at the conclusion of their participation. Of the initial sample, three participants were excluded for not generating the required counterfactuals when asked to do so, and one participant chose not to continue after completing Task 1. The final sample consisted of 77 participants, 9 to 11 years of age (mean age = 10.25, SD = 0.61).

### **6.6.2 Design**

The design of the anagram task conducted with children essentially replicated that of the study conducted with adult participants in Experiment 2a. The design employed was a mixed design consisting of four counterfactual conditions based on the number of counterfactual opportunities (one or two), and the direction of last counterfactuals generated (upward or downward), and several mood assessment, self-efficacy and preparedness measures. The counterfactual conditions employed were the same as those used in Experiments 1a, 1b, 2a, and 2b, these being upward, downward, upward followed by downward, and downward followed by upward, to which participants were randomly assigned. Each condition comprised approximately 19 participants with a range of 18-20. The dependent measures for the study included: (a) the number of relevant counterfactuals generated by participants according to their allocated condition, (b) a positive and negative mood assessment measure conducted before and after counterfactual generation, (c) a self-efficacy measure conducted before and after completing the task and again after counterfactual generation, (d) a preparedness measure before completing a second anagram task of which participants were initially unaware of having to complete, and (e) the performance measures of task score, number of correct anagrams, number of skips made and clues bought.

### **6.6.3 Materials and Procedure**

The computer-based anagram task employed in Experiment 2a was adapted for suitability of use with child participants, and was administered in individual sessions lasting for approximately 20 minutes. In the task, participants were required to unscramble seven words from one of two categories of their choosing – either “Animals” or “Body Parts” and each word consisted of five letters (e.g., tiger – ertig,

mouth – outh; see Appendix G for full list of anagrams used). The seven words from each category were taken from the original list generated from the MRC Psycholinguistic Database (1987) for Experiment 2a. Single categories of words (i.e. “Animals” and “Body Parts”) were employed rather than the blended categories of “Animals and Nature”, and “Body Parts and Food” that were used with adult participants as pilot testing revealed that blended categories of anagrams were beyond children’s ability to solve.

As in Experiments 2a and 2b, anagrams were presented in a random order on a computer screen and participants were given two minutes to solve each item. A countdown timer was visible in the bottom right-hand corner of the screen. Points were awarded for each anagram solved correctly, based upon the amount of time remaining of the two minutes (one point per second). Thus, the quicker an anagram was solved, the greater the number of points received. If an anagram was not solved, one point was deducted for each second spent trying to solve it. Participants could choose to skip an item by pressing the letter <S> on the keyboard if they were having difficulty to minimise the number of points lost, as one point was deducted for each second spent trying to solve the anagram. Participants could also choose to buy a clue to help them solve an anagram by pressing the letter <C> on the keyboard. The clue given was the first letter of the solution and cost participants 30 points from their total score. After the last anagram was solved, participants were shown their total true score and were presented with a graph illustrating that in comparison to other participants, their score was better than average (approximately in the 75<sup>th</sup> percentile in a normal distribution). The information presented in the graph was explained to children to facilitate their understanding of how well they performed in comparison to other child participants.



After completing the initial anagram task (Task 1), participants were asked to rate on 9-point scales presented on the computer screen ‘How do you feel about your performance in the task?’. The mood scales included overall happiness and the four emotion adjectives of *pleased*<sup>22</sup>, *frustrated*, *glad*, and *disappointed*, ranging from 1 = “not at all” to 9 = “very”. Depending on their randomly allocated counterfactual condition, participants were then asked to generate counterfactuals. For example, participants in the upward followed by downward condition were asked, ‘Can you think of as many ways as you can as to how your performance in the task could have been better?’ The experimenter wrote down the participants’ responses verbatim, and then asked, ‘Now can you think of as many ways as you can as to how your performance in the task could have been worse?’. Participants were then asked to complete the mood ratings a second time, ‘After thinking about how your performance in the task could have been different, now how do you feel about your performance?’. Participants’ self-efficacy was also measured on 9-point rating scales ranging from 1 = “not very good” to 9 = “really good” at Time 1 (before completing the anagram task) by asking ‘How good do you think you will be at this task?’, after the first mood assessment: ‘How good do you think you are at this task?’ (Time 2); and again after the second mood assessment: ‘Now how good do you think you are at the task?’ (Time 3). This measure was adapted from Tal-or, et al. (2004). Consistent with Sanna (1997), participants’ preparedness to complete the anagram task a second time was also assessed on 9-point scales ranging from 1 = “not at all” to 9 = “very”, by asking ‘How confident would you feel if you had to do the task a second time’, and ‘If you had to complete the task a second time, how ready would you feel?’ Participants were then asked to complete the anagram task a

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<sup>22</sup> Note that in the current experiment, the emotion adjective *pleased* replaced the adjective of *satisfied* that was used in the anagram tasks conducted with adult participants as pilot testing revealed that a number of children were uncertain of the meaning of feeling satisfied.

second time with the other category of words. At the completion of the task, they were shown their final true score for Task 2 along with the number of correct anagrams, and number of skips and clues. Participants were thoroughly debriefed then thanked for their participation (see Appendix H for script)<sup>23</sup>.

## **6.7 Results**

### **6.7.1 Rating of Counterfactuals**

Counterfactuals generated by participants were coded as being upward or downward according to the criteria outlined by Tsiros and Mittal (2000) and relevant to the anagram task. Examples of upward counterfactuals included ‘Could have bought more clues’, ‘Solve the words quicker to get more points’, and ‘Took it a little bit slower and not rushed as much’. Examples of downward counterfactuals included ‘If I didn’t use any clues, I wouldn’t have gotten as many right’, ‘If I didn’t know some of the animals’, and ‘Kept skipping them’.

### **6.7.2 Number of Counterfactuals Generated**

To determine if a difference was present among the counterfactual conditions in the number of upward and downward counterfactuals generated, two separate between groups one-way ANOVAs were conducted with the number of upward and downward counterfactuals as the respective dependent variables. No significant difference among the upward only, upward followed by downward and downward followed by upward conditions was evident in the number of upward counterfactuals generated [ $F(2,55) = 0.64, p = .53$ ]. Similarly, no significant difference among the downward only,

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<sup>23</sup> For further details on the anagram task methodology, please refer to Experiment 2a (Section 5.2).

downward followed by upward, and upward followed by downward conditions was found for the number of downward counterfactuals generated [ $F(2,54) = 1.07, p = .35$ ]. Thus, participants in different experimental conditions did not vary systematically in their readiness to generate counterfactuals in either the upward or downward direction. However, the means indicate that child participants were able to generate an average of 2.76 downward counterfactuals as opposed to 1.94 upward counterfactuals (see Table 6.4 for the mean number of counterfactuals generated across conditions).

**Table 6.4**

*Mean Number of Counterfactuals Generated Across Conditions (with Standard Deviations in Parentheses) in Experiment 3b.*

Condition	Upward Counterfactuals	Downward Counterfactuals
Upward Only	1.80 (0.52)	-
Downward Only	-	2.84 (1.26)
Upward/Downward	1.95 (0.69)	2.95 (0.89)
Downward/Upward	2.06 (0.87)	2.50 (0.71)

A paired samples  $t$ -test was subsequently conducted on the number of upward and downward counterfactuals generated by participants in the two dual direction counterfactual conditions. The analysis revealed that this difference was statistically significant [ $t(37) = 3.65, p = .00$ ] with a large effect size of  $d = .93$ . This finding is consistent with the positive outcome anagram task conducted with adult participants in Experiment 2a (Chapter 4), and is also consistent with what would be expected of somewhat positive outcomes.

### 6.7.3 Preliminary Analyses of the Data Set

Preliminary analyses were conducted on the data to ensure a consistent sample and as in Experiment 3a, the screening of the mood variables prior to counterfactual generation revealed that several participants had mood ratings more than 2.5 standard deviations outside the mean. The outlying values for the given variables were removed from the data, as the outlying values for each participant were not consistent across all the mood variables prior to counterfactual generation. As discussed in Experiment 3a, this suggests that several of the participants may not have understood the meaning of all of the emotion adjectives or direction of the respective rating scale.

As in the previous experiments conducted for this thesis, the overall happiness ratings obtained immediately after task completion and prior to counterfactual generation (Time 1) were assessed. This was to determine whether participants viewed their performance in the anagram task as positive, negative, or neutral, and to ascertain if there were any differences among the counterfactual conditions that would give rise to the need of a general mood covariate. A between groups one-way ANOVA was conducted on the overall happiness ratings at Time 1 with counterfactual condition as the independent variable. No significant difference among the four counterfactual conditions was found [ $F(3,71) = 0.06, p = .98$ ]. Participants viewed their performance in the anagram task as being positive with means ranging from 7.39 to 7.58 across conditions (see Table 6.5 for means and standard deviations of mood variables). A one-sample  $t$ -test conducted against the midpoint of 5 provided validation that participants viewed their performance in the task as positive [ $t(74) = 15.44, p = .00, d = 1.78$ ].

**Table 6.5**

*Mean Mood Ratings (with Standard Deviations in Parentheses) Before and After  
Counterfactual Generation in Experiment 3b.*

Mood/Condition	Before	After
Overall Happiness		
upward	7.50 (1.28)	6.90 (1.77)
downward	7.42 (1.30)	7.37 (1.77)
upward/downward	7.56 (1.54)	7.72 (1.07)
downward/upward	7.50 (1.58)	7.17 (1.76)
Glad		
upward	7.70 (1.08)	7.30 (1.38)
downward	7.89 (1.02)	6.67 (1.41)
upward/downward	7.74 (1.37)	7.21 (1.75)
downward/upward	7.88 (0.99)	7.47 (1.55)
Frustrated		
upward	2.40 (1.88)	2.70 (1.89)
downward	3.20 (2.26)	3.00 (1.78)
upward/downward	2.44 (1.69)	2.22 (1.35)
downward/upward	2.39 (1.42)	2.89 (1.68)
Pleased		
upward	7.85 (0.88)	7.10 (1.68)
downward	7.76 (1.20)	7.53 (1.37)
upward/downward	8.00 (0.82)	7.68 (1.29)
downward/upward	8.00 (1.28)	7.67 (1.37)
Disappointed		
upward	1.75 (0.85)	2.85 (1.39)
downward	2.40 (1.54)	2.75 (1.62)
upward/downward	1.89 (1.33)	2.11 (0.99)
downward/upward	1.61 (1.04)	2.33 (1.53)

To verify that the two word categories were equivalent in regards to the degree of difficulty in solving the anagrams, two separate between groups one-way ANOVAs were conducted on the number of anagrams solved correctly and final scores with the first chosen word category as the independent variable. As expected, the ANOVAs

revealed that there was no significant difference in the number of anagrams solved correctly [ $F(1,75) = 0.03, p = .86$ ] or final score [ $F(1,75) = 0.05, p = .83$ ] in terms of the word category chosen. Sixty-seven participants chose the “animal” category first and solved a mean number of 5.84 ( $SD = 1.10$ ) anagrams to obtain a final mean score of 604.18 ( $SD = 162.99$ ), and the 10 participants who chose the “body parts” category solved a mean number of 5.90 ( $SD = 0.88$ ) anagrams and obtained a final mean score of 592.30 ( $SD = 160.93$ ).

#### 6.7.4 Change in Mood after Counterfactual Generation

To determine if counterfactual generation resulted in a change in participants’ self-reported mood ratings, five separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 2 (mood assessment: before and after counterfactual generation) mixed design ANOVAs were conducted on the overall happiness, *glad*, *frustrated*, *pleased* and *disappointed* mood variables. Contrary to expectation, these analyses did not yield any significant results. Thus, none of the affect variables was found to evidence a difference in mood among the counterfactual conditions post-counterfactual generation. The three-way interaction for each of these variables was  $F(1,71) = 0.00, p = .96$ ;  $F(1,70) = 1.20, p = .28$ ;  $F(1,72) = 0.06, p = .81$ ; and  $F(1,70) = 0.55, p = .46$ ,  $F(1,73) = 0.15, p = .70$  respectively.<sup>24</sup> The means show that ratings for *glad* and *pleased* declined after counterfactual generation in the four counterfactual conditions, and ratings for the *disappointed* variable escalated in all conditions. As expected, ratings for the *frustrated* variable increased after upward only and upward last generation and declined after downward only and downward last

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<sup>24</sup> As in the previous experiments conducted for this thesis, in the absence of significant effects or interaction, three-way interaction between direction of last counterfactuals, number of counterfactual opportunities and the respective dependent variable is reported unless otherwise stated.

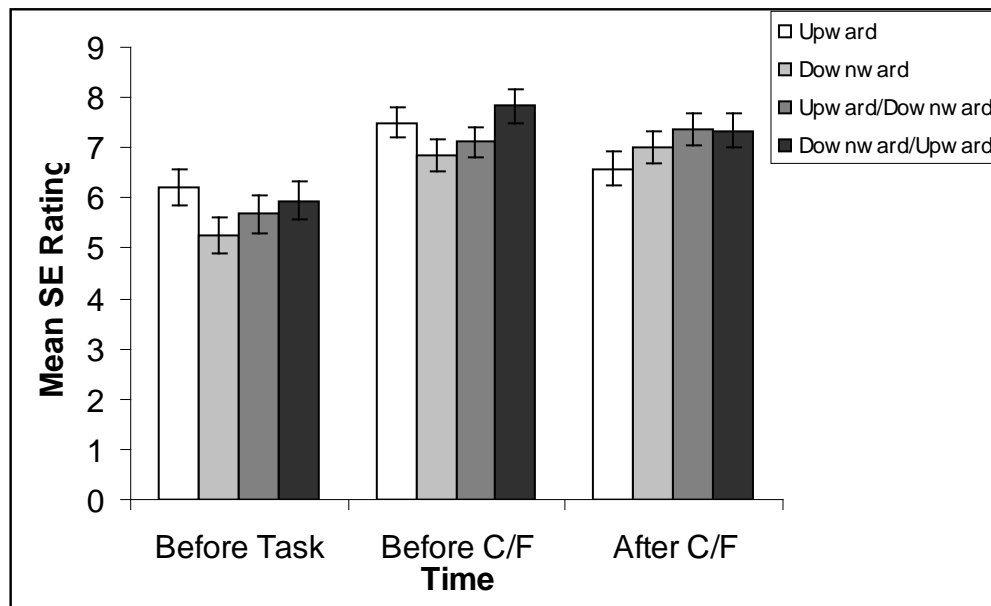
generation, and overall happiness ratings declined in the upward only and upward last conditions, and improved in the downward last condition with virtually no change occurring after the generation of downward only counterfactuals (see Table 6.5 for mean mood ratings).

### **6.7.5 Self-Efficacy and Preparedness**

The effect of counterfactual generation on participants' self-efficacy was examined by conducting a 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) x 3 (self-efficacy ratings: Time 1 (prior to task completion) vs. Time 2 (after task completion) vs. Time 3 (after counterfactual generation)) mixed design ANOVA. Figure 6.1 illustrates that participants in the upward only and upward last conditions evidenced a decline in their self-reported ratings of self-efficacy after counterfactual generation, and those considering downward only or upward followed by downward counterfactuals reported a slight increase in their self-efficacy ratings, which thus suggests a recency effect for the direction of the last counterfactuals generated. Although the mixed design ANOVA reflected the recency effect for the direction of last counterfactuals generated, the two-way interaction for direction of last counterfactuals and self-efficacy did not reach statistical significance [ $F(2,72) = 2.86, p = .06, \eta_p^2 = .07$ ]. No other effects were present.

As expected and consistent with the positive outcome anagram experiment conducted with adult participants (Experiment 2a, Chapter 4), the main effect for self-efficacy assessment was significant [ $F(2,72) = 29.69, p = .00, \eta_p^2 = .45$ ]. Self-efficacy ratings significantly increased after anagram task completion in all four counterfactual conditions with a Time 1 and Time 2 mean difference of -1.55 ( $SD = .21, p = .00$ ; see

Figure 6.1). There was no significant difference between self-efficacy ratings elicited before and after counterfactual generation with the mean difference averaged across conditions between Time 2 and Time 3 being 0.16 ( $SD = .16, p = .98$ ).



**Figure 6.1:** Changes in mean self-efficacy ratings across conditions in Experiment 3b.

To determine children's feelings of preparedness across counterfactual conditions, two separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) factorial ANOVAs were conducted on the preparedness measures of confidence and readiness to complete a second anagram task. No significant main effects or interactions were found for either of the preparedness measures [confidence:  $F(1,73) = 0.02, p = .93$ ; readiness:  $F(1,73) = 0.01, p = .95$ ]. Therefore, counterfactual generation did not result in any significant effects among the four counterfactual conditions in children's feelings of preparedness to complete a second anagram task (see Table 6.6 for descriptive statistics).



**Table 6.6**

*Mean Preparedness Ratings (with Standard Deviations in Parentheses) of Confidence and Readiness to Complete a Second Anagram Task Across Conditions in Experiment 3b.*

Condition	Confidence	Readiness
Upward Only	8.05 (1.32)	8.15 (1.04)
Downward Only	7.80 (1.88)	7.75 (1.55)
Upward/Downward	7.74 (1.76)	7.95 (1.43)
Downward/Upward	8.06 (1.55)	8.39 (1.29)

#### **6.7.6 Performance Measures**

To examine if any differences were present among the four counterfactual conditions in the performance measures from Task 1 to Task 2, four separate 2 (direction of last counterfactuals: upward vs. downward) x 2 (number of counterfactual opportunities: one vs. two) mixed design ANOVAS were conducted on each of the performance measures (number of skips made, number of clues bought, total number of anagrams solved correctly, and final score) for Task 1 and Task 2 (see Table 6.7 for descriptive statistics). No significant interactions or effects among the counterfactual conditions were found for any of the performance measures [skips:  $F(1,73) = 1.26, p = .27$ ; clues:  $F(1,73) = 0.72, p = .40$ ; correct anagrams:  $F(1,73) = 1.87, p = .18$ ; final score:  $F(1,73) = 2.01, p = .16$ ]. Thus, counterfactual generation had no significant effect on the quantifiable performance measures employed in the current experiment.

**Table 6.7***Performance Measure Means (with Standard Deviations in Parentheses) in Experiment**3b.*

Performance Measure/Condition	Task 1	Task 2
No. of Skips		
upward	0.90 (0.97)	1.25 (1.21)
downward	1.30 (1.26)	1.35 (1.18)
upward/downward	0.95 (0.97)	1.21 (1.13)
downward/upward	1.28 (0.96)	1.17 (1.58)
No. of Clues		
upward	1.30 (1.63)	1.70 (1.95)
downward	1.80 (1.61)	1.95 (1.54)
upward/downward	1.74 (1.41)	2.21 (1.58)
downward/upward	1.94 (1.86)	2.17 (1.58)
No. Anagrams Correct		
upward	6.10 (0.97)	5.75 (1.21)
downward	5.70 (1.26)	5.65 (1.09)
upward/downward	6.05 (0.97)	5.79 (1.13)
downward/upward	5.50 (0.99)	5.78 (1.66)
Final Score		
upward	637.30 (116.74)	605.10 (197.63)
downward	570.00 (168.42)	570.20 (188.15)
upward/downward	647.00 (160.92)	590.95 (182.07)
downward/upward	553.56 (187.47)	608.56 (203.79)

## 6.8 Discussion

The current experiment examined the effect of counterfactual thinking on children's mood, preparedness and self-efficacy in a performance oriented task adapted from the positive outcome anagram task conducted with adult participants in Experiment 2a (Chapter 5). By employing the anagram task, it was aimed to clarify the findings of the scenario experiment conducted with children in Experiment 3a. It was

hypothesised that the number of counterfactual opportunities would have a significant effect on children's mood and preparedness, with the upward only and downward only conditions having a significant increase in the negative mood adjectives, and a greater sense of preparedness than the dual direction counterfactual conditions. The results of the current experiment however, did not conform to expectation nor reflect the findings of Experiment 3a for the resulting consequences of counterfactual thinking. The findings did, however, provide further demonstration that children are competent in generating upward and downward counterfactuals in the event of a positive outcome.

As predicted, children were readily able to generate one or both directions of counterfactuals when prompted, signified by the absence of a difference between the four counterfactual conditions<sup>25</sup>. Although no difference was found between conditions, children generated significantly more downward counterfactuals in comparison to upward counterfactuals. This is consistent with the results obtained for the adult participants partaking in the positive outcome anagram task. As one would expect, the greater frequency of downward counterfactuals in the event of a positive outcome contrasts to the literature employing negative outcomes which typically evoke more upward counterfactuals (e.g., Chan et al., 2002; Roese, 1994; Roese & Hur, 1997). Thus, for adults and children alike, the frequency of a particular direction of counterfactual was largely dependent on outcome valence.

In terms of the affective consequences of counterfactual thinking, the overall happiness variable and the four emotion adjective variables, namely *glad*, *frustrated*, *pleased*, and *disappointed* evidenced no significant change in mood across conditions

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<sup>25</sup> Also note that only three participants of the initial sample of 81 in the current experiment were excluded for not generating the required counterfactuals, which is in contrast to Experiment 3a, in which 16 of the 121 participants were excluded for being unable to generate the required counterfactuals. This may be a result of the self-relevant nature of the anagram task, as opposed to the imaginary nature of the hypothetical scenario in Experiment 3a.

post-counterfactual generation. The means indicate that ratings for the *disappointed* variable escalated post-counterfactual generation in the four counterfactual conditions and the positive adjectives of *glad* and *pleased* declined after counterfactual generation in all conditions. This is in contrast to Experiment 3a in which the means for the positive emotion adjectives of *glad* and *relieved* showed a primacy effect for the direction of the first counterfactuals generated with ratings increasing after downward counterfactuals and decreasing after upward counterfactuals. The mean mood ratings for overall happiness and frustration reflected the general trend occurring in the previous experiments conducted with adult participants, whereby a recency effect was found for the direction of the last counterfactuals generated. In the current experiment, the trend in mood change post-counterfactual generation did not follow that of Experiment 3a in which ratings of frustration significantly declined in the dual direction counterfactual conditions.

The trends occurring in the mean mood ratings after upward only counterfactual generation in both Experiments 3a and 3b, follow the established findings in the adult population of positive mood declining and negative mood increasing after upward generation (e.g., Boninger et al., 1994; Mandel, 2003; Sanna et al., 2001). Downward counterfactuals however, resulted in no consistent effect on mood after their generation in both the scenario and anagram experiments conducted with child participants. It seems that downward counterfactuals affect children's mood differently in different tasks and for different emotions, with Experiments 3a and 3b providing no clear pattern of change occurring in mood after downward only generation. This finding contrasts to Chan et al., (2002; 2003) in which children's generation of downward counterfactuals was seen to assist in mood improvement, and was thus comparable to the adult literature (e.g., Markman et al., 1993; Roese, 1994; Sanna, 1996).

The dual direction counterfactual conditions also reflected this inconsistency in effect on mood ratings, which is likely to be a result of the consideration of downward counterfactuals. This is clearly seen when comparing the means for the variables of *frustrated* and *glad*, both assessed in Experiments 3a and 3b. In the scenario task, *glad* ratings increased in the downward only and downward/upward conditions, however in the anagram task, *glad* ratings declined in all conditions. Ratings of frustration for the outcome of the scenario task evidenced a number of counterfactual opportunities effect, with mean ratings increasing in the upward only and downward only conditions, and declining in the dual direction counterfactual conditions. And in the anagram task, there was a trend for a recency effect for the direction of last counterfactuals generated with mean frustration ratings declining in the downward only and downward last conditions and increasing in the upward only and upward last conditions. As there is no consistent pattern of change in mean mood ratings after downward counterfactuals when considered solely or in conjunction with upward counterfactuals, the current set of experiments therefore demonstrates that the effect of downward counterfactuals on children's mood varies with the experience and emotion in question.

As in the anagram experiments conducted with adult participants in Chapter 5, the effect of counterfactual thinking on self-efficacy was explored in the current experiment. In contrast to the results obtained with adult participants, an interaction was found between the direction of last counterfactuals generated and children's self-efficacy ratings, however the result did not reach statistical significance. Children reported a decline in their self-efficacy ratings after generating upward only and downward followed by upward counterfactuals. Those in the downward only and upward/downward conditions reported marginally higher feelings of self-efficacy. Thus, a recency effect for children's feelings of self-efficacy was apparent for the direction of

last counterfactuals generated. This however, did not extend to participants' self-rated feelings of preparedness to complete a second and unexpected anagram task. There was no difference among the four counterfactual conditions in children's ratings of how confident or how ready they would feel if asked to complete the task a second time. Mean preparedness ratings however, were high, with confidence ratings having an average of 7.91 and readiness 8.06, on the 9-point rating scales. The high preparedness ratings may be due to familiarity with the task after having completed it the first time, however adult participants' preparedness ratings were lower after completing the same task also with a positive outcome. The possibility exists that the same degree of preparedness was not observed with adult participants because they may possess some prior familiarity with an anagram task, whereas many children are likely to be unfamiliar with this type of task until it is introduced during their research participation. Children's greater sense of preparedness may also be attributable to the mere process of considering how their performance in the task may have been different, thus facilitating their ability to learn from past experiences. Further, the lack of difference between the counterfactual conditions in children's ratings of preparatory feelings extended to the quantifiable performance measures, as children's performance in the anagram task did not vary from Task 1 to Task 2 among conditions. Thus, the direction of counterfactuals generated by children did not result in any observable effect on their preparedness to complete a second anagram task.

The primary aim of Experiment 3b was to clarify the findings of Experiment 3a in a performance oriented task, and therefore ascertain the effect of single and dual direction counterfactual thinking on children's mood and preparedness. The results of the current experiment however, did not provide the clarification that was sought. Employing a performance oriented activity of which children are familiar, rather than

utilising the laboratory based anagram task, may have provided the greater clarification that was sought (see Section 7.8 for suggestions for future research). However, both Experiments 3a and 3b demonstrated the established notion of upward counterfactuals resulting in a decline in positive emotions and an exacerbation in negative emotions, although downward counterfactual generation resulted in no consistent effect on mood. Subsequently, the dual direction counterfactual conditions reflected this inconsistency. The scenario experiment demonstrated that children generating upward only or downward only counterfactuals had significantly higher preparedness ratings than the dual direction counterfactual conditions, however no difference in self-rated or observable preparedness was found in the anagram experiment. The anagram experiment however, revealed a recency effect for the direction of last counterfactuals generated for children's ratings of self-efficacy, with upward only and downward followed by upward counterfactuals leading to a decline in self-efficacy ratings. In comparison to the findings obtained with adult participants, it appears that children may place a greater emphasis on their preparatory feelings in the event of a self-relevant experience than on their affective state, given the near ceiling preparatory ratings for completing a second anagram task. This highlights a potential benefit in teaching children to consciously consider their experiences and reflect upon how the outcomes could have been different and therefore assisting them in their future betterment. Although the consequences of children's counterfactual thinking in the event of positive outcomes were ambiguous in the present research, the ability of 9- to 11-year-old children to consider both better and worse alternatives to reality whether pertaining to a hypothetical scenario or their own performance was clearly demonstrated.

## **Chapter 7 : General Discussion**

The present research primarily investigated the affective and preparatory consequences resulting from adults' and primary school-aged children's single and dual direction counterfactual generation. In this chapter, the main findings of the six experiments conducted for this research thesis are described and integrated to portray the resulting trends pertaining to the central aims of the current investigation. The findings for the core research components are presented separately for adults and children, with comparisons drawn between the two populations in the sections regarding children's findings. Tables are also provided to assist in the amalgamation of the primary results obtained from the eight experimental tasks contained within the six research experiments. Specifically, this chapter is segregated into the following sections according to the factors under current investigation: (i) upward and downward counterfactual generation, (ii) affective and (iii) preparatory consequences arising from the engagement in counterfactual thought, (iv) the influence of counterfactual thinking on self-efficacy, and (v) spontaneous reflective and evaluative processing. In each section, the trends in findings occurring among the experimental tasks are discussed, primarily in light of outcome valence and situational context, with implications of findings also presented. The chapter concludes with the central findings highlighted, a consideration for the potential limitations of the current series of experiments, and recommendations for future research are offered.



## **7.1 Counterfactual Generation**

### **7.1.1 Adults' Counterfactual Generation**

Counterfactuals in both the upward and downward direction were readily generated by adult participants when prompted, regardless of outcome valence. Approximately three to four counterfactuals of each direction of comparison were generated in each of the four scenario tasks with positive, negative, and neutral outcomes (see Table 7.1 for mean number of upward and downward counterfactuals generated across conditions in each of the experimental tasks). This finding contrasts to the majority of the literature in which upward counterfactuals are more frequently generated, whether spontaneously (e.g., Roese & Hur, 1997) or with a specified directional prompt (e.g., Mandel, 2003), and typically in response to negative outcomes (e.g., Mandel, 2003; Markman et al., 1993; Roese, 1994; Roese & Hur, 1997). The demonstrated readiness of participants to generate counterfactuals in either direction indicates that both better and worse alternatives to a given outcome come to mind with apparent ease when prompted. This finding may have resulted from the nature of the scenario tasks, in that individuals may have had greater scope to consider or create alternatives to the given outcome. Firstly, the given scenario tasks were based upon everyday events, with outcomes considered to be somewhat positive, somewhat negative, or neutral, rather than clearly positive or negative outcomes typically associated with more dramatic scenarios that are frequently used in the literature (e.g., Kahneman & Tversky, 1982; Wells & Gavanski, 1989; Davis et al., 1995). Secondly, there is theoretically more scope for creating alternatives to a hypothetical or actual scenario in which an array of alternative events could have transpired, compared to a laboratory task in which certain and specific potential alternatives could or could not have realistically occurred.

**Table 7.1**

*Mean Number of Upward and Downward Counterfactuals (CFs) Generated Across Conditions in the Eight Experimental Tasks.*

Experimental Task & CF Condition	No. Upward CFs	No. Downward CFs
Adults - Neutral Hypothetical Scenario 1a		
upward	3.89	-
downward	-	3.79
upward/downward	4.08	3.81
downward/upward	3.56	3.81
Adults - Positive Self-Described Scenario 1a		
upward	3.07	-
downward	-	4.03
upward/downward	2.96	3.64
downward/upward	2.76	3.88
Adults - Negative Hypothetical Scenario 1b		
upward	3.58	-
downward	-	3.96
upward/downward	3.72	4.03
downward/upward	3.67	4.11
Adults - Positive Self-Described Scenario 1b		
upward	3.15	-
downward	-	2.84
upward/downward	3.14	3.09
downward/upward	2.90	3.45
Adults - Positive Anagram Task 2a		
upward	2.35	-
downward	-	3.60
upward/downward	2.38	3.00
downward/upward	2.00	3.17
Adults - Negative Anagram Task 2b		
upward	2.59	-
downward	-	3.18
upward/downward	2.45	2.00
downward/upward	2.50	2.35
Children - Positive Hypothetical Scenario 3a		
upward	3.00	-
downward	-	3.19
upward/downward	2.92	2.96
downward/upward	2.40	2.56
Children - Positive Anagram Task 3b		
upward	1.80	-
downward	-	2.84
upward/downward	1.95	2.95
downward/upward	2.06	2.50

The anagram experiments conducted with adult participants provide some evidence for the above premise regarding the nature of the task. In comparison to the scenario-based experiments, an average of two to three counterfactual alternatives of either direction was generated by participants regardless of outcome framing (see Table 7.1). Given the controlled nature of the anagram task, a seemingly more limited number of counterfactual alternatives were available to participants, as compared to a hypothetical or real-life experience in which a vast array of alternatives to a given state of affairs abounds. The findings of the present scenario and anagram experiments of mixed outcome valence, suggest that it may not be outcome valence per se that influences the number of counterfactuals generated (c.f., Roese & Olson, 1993a; White & Lehman, 2005), but rather the nature of the event for which counterfactual alternatives are considered.

Although the above argument is contradicted by significantly more downward counterfactuals being generated in comparison to upward counterfactuals in the positive outcome anagram task, participants who undertook the negative outcome anagram task and were instructed to only consider downward counterfactual alternatives, generated significantly more downward counterfactuals in comparison to participants also generating upward counterfactuals. Overall, the means indicate that downward counterfactuals generated by participants in the downward only condition, evidenced the greatest frequency of counterfactuals generated. Given the negative valence of participants' anagram task performance, one would expect upward counterfactuals to be generated in a greater frequency than downward counterfactuals as there is more scope for better alternatives. This finding is consistent with White and Lehman (2005) in which more downward counterfactuals were generated in response to negative life events when participants were focused upon self-enhancement. The negative anagram

task may thus have evoked self-enhancement motives within participants rather than self-improvement motives as a result of believing the task to be a single-time event of no future relevance. The present findings indeed suggest that as well as outcome valence, several other factors such as the nature of the event, future relevance, and self-motives, also exert an influence on the directions of counterfactual comparison that are readily available.

### **7.1.2 Children's Counterfactual Generation**

As for children's counterfactual generation, Experiments 3a and 3b demonstrated that children of approximately 10 years of age are competent in generating upward and downward counterfactuals when asked to do so (see Table 7.1 for mean number of upward and downward counterfactuals generated across conditions in each of the experimental tasks). When considering counterfactual alternatives to the hypothetical scenario, children were readily able to generate upward, downward or both directions of counterfactuals, with an average of three counterfactuals of a specified direction being generated. This is somewhat comparable to the adult participants who generated approximately three to four counterfactuals of a specified direction in each of the four scenario tasks. Children's counterfactual generation in the anagram task was also comparable to that of adult participants partaking in the equivalent adult experiment. In the positive outcome anagram experiments, both adults and children generated an average of two upward counterfactuals and three downward counterfactuals, with the greater frequency of downward counterfactuals reaching statistical significance for both age cohorts. These results provide further support for preadolescent children's fluency in generating counterfactuals being similar to adults' in direction-specific counterfactual generation tasks. This finding is consistent with Chan

et al. (2002; 2003) in which children 10 to 12 years of age demonstrated competence in generating both upward and downward counterfactuals that was equivalent to adult participants. However, with the absence of a prompt to consider counterfactual alternatives, such as in everyday life, pre-adolescent children may be less fluent than adults in their counterfactual generation. Clearly, further research is required.

Given the demonstrated ability of children from as young as 3 years of age to consider counterfactual alternatives to negative outcomes (e.g., Harris et al., 1996; German, 1999) and the lack of support for their capacity to consider counterfactual alternatives in the event of neutral and positive outcomes (e.g., German, 1999; Guttentag & Ferrell, 2004; Riggs et al., 1998), both the scenario and anagram experiments in the present research utilised somewhat positive outcomes. Children aged 9 to 11 years of age demonstrated an adult-like fluency in generating counterfactuals regarding a positive outcome. Seven-year-old children, in contrast, have demonstrated difficulty in considering others' counterfactual alternatives to positive outcomes (e.g., Guttentag & Ferrell, 2004) and also exhibit less fluency in counterfactual generation after a negative outcome compared to adults and 11- to 12-year-old children (Chan et al., 2003). Overall, the present findings demonstrate 9- to 11-year-old children's aptness in generating upward and downward counterfactuals in the event of somewhat positive outcomes. The consequences arising from children's engagement in counterfactual thought, however, differ somewhat to adult participants, and are discussed in the following sections of this chapter.

## 7.2 Affective Consequences of Single and Dual Direction

### Counterfactual Generation

As a primary aim of the present research was to examine the affective consequences of single versus dual direction counterfactual generation, participants' mood was measured in each of the six empirical investigations. It was hypothesised that upward counterfactuals would result in a decline in global mood, downward counterfactuals would show mood improvement, and the consideration of both directions of counterfactuals would result in mood neutralisation. Although this hypothesis was also expected for child participants, due to the lack of research on the consequences of children's counterfactual thinking as discussed in Section 3.7, mood assessment for this age group was largely exploratory. The findings of the affective consequences resulting from single and dual direction counterfactual generation for the respective age groups are discussed in the following sections. Table 7.2 is provided to aid in the comparison of affect ratings across the four counterfactual conditions in the eight experimental tasks. The three affect variables that were consistently employed in each of the eight experimental tasks, namely overall happiness, *glad*, and *frustrated*, are included in Table 7.2.

**Table 7.2**

*Mean Mood Ratings of Overall Happiness, Glad, and Frustrated Before and After Counterfactual (CF) Generation across Conditions in the Eight Experimental Tasks.*

Experimental Task & CF Condition	Overall Happiness		Glad		Frustrated	
	Before CF	After CF	Before CF	After CF	Before CF	After CF
Adults - Neutral Hypothetical Scenario 1a						
upward	5.85	4.82	5.36	4.44	5.56	6.25
downward	5.50	6.47	4.92	6.00	5.29	4.68
upward/downward	5.60	6.03	5.00	5.36	5.39	4.89
downward/upward	6.03	5.24	5.53	4.83	5.69	5.78
Adults - Positive Self-Described Scenario 1a						
upward	7.81	6.71	7.59	6.83	3.41	4.38
downward	8.21	8.17	8.00	8.21	3.34	2.14
upward/downward	7.64	7.76	7.56	7.74	4.20	3.72
downward/upward	8.00	7.35	8.00	6.92	3.80	3.60
Adults - Negative Hypothetical Scenario 1b						
upward	2.69	3.81	4.65	5.04	5.12	5.38
downward	4.69	6.34	6.00	6.86	5.00	4.38
upward/downward	3.66	5.97	3.90	5.90	5.14	4.59
downward/upward	3.67	4.89	4.52	5.07	5.07	4.70

(continued)

Adults - Positive Self-Described Scenario 1b						
upward	8.70	7.26	8.59	7.15	2.41	4.00
downward	8.48	8.24	8.40	8.48	2.36	2.08
upward/downward	8.36	7.32	8.14	7.45	2.41	3.45
downward/upward	8.65	7.50	8.40	7.55	2.75	3.50
Adults - Positive Anagram Task 2a						
upward	6.94	6.24	7.18	6.59	2.88	3.59
downward	7.73	7.53	7.33	7.40	3.13	2.13
upward/downward	6.56	6.63	6.81	6.81	3.75	3.38
downward/upward	7.61	7.17	7.50	6.94	2.39	3.11
Adults - Negative Anagram Task 2b						
upward	2.64	4.42	3.27	4.32	5.05	4.64
downward	2.79	4.63	3.11	4.42	5.05	4.89
upward/downward	3.06	4.50	3.17	4.22	5.11	4.83
downward/upward	3.35	4.70	3.50	4.30	4.70	4.30
Children - Positive Hypothetical Scenario 3a						
upward	7.84	7.32	7.92	7.36	2.48	2.84
downward	6.89	6.79	6.98	7.34	3.78	4.06
upward/downward	7.39	7.93	7.79	7.36	3.93	3.36
downward/upward	7.57	7.61	6.87	7.57	3.44	2.44
Children - Positive Anagram Task 3b						
upward	7.50	6.90	7.70	7.30	2.40	2.70
downward	7.42	7.37	7.89	6.67	3.20	3.00
upward/downward	7.56	7.72	7.74	7.21	2.44	2.22
downward/upward	7.50	7.17	7.88	7.47	2.39	2.89



### **7.2.1 Observed Affective Consequences of Adults' Counterfactual Generation**

Moderate consistency in mood change among the counterfactual conditions was found for the neutral to positive outcome tasks of the scenario and anagram experiments (Experiment 1a, Tasks 1 & 2; Experiment 1b, Task 2; Experiment 2a). Of primary note, upward counterfactuals resulted in the most significant alteration of participants' self-reported mood ratings: global mood significantly declined after upward only counterfactual generation, thus resulting in a mood-depressing consequence. This finding is in contrast to Roese (1994) in which upward counterfactuals did not significantly depress mood after the consideration of a negative outcome. Further, no significant difference in mood change post-counterfactual generation was present between those generating upward counterfactuals and the counterfactual control group, therefore demonstrating the lack of a mood-depressing effect of upward counterfactuals in Roese's (1994) experiments. The difference in findings may be explained by outcome valence in that theoretically, there is more scope for a decline in mood after a positive as compared to a negative outcome after the consideration of better alternatives to reality.

Also in contrast to Roese's (1994) findings regarding affect and much of the literature providing support for the affective contrast effect of downward counterfactuals (e.g., Markman et al., 1993; Medvec et al., 1995; Sanna, 1996; Sanna et al., 1999), a significant improvement in overall happiness ratings after the consideration of worse alternatives to reality was found only in the neutral outcome hypothetical scenario task (Experiment 1a, Task 1). The lack of change as indicated by the mean mood ratings of participants considering only downward counterfactuals in the two positively valenced scenarios may likely be due to a ceiling effect, as there was somewhat limited scope for mood improvement with participants' initial overall happiness ratings averaging 7.92 (Experiment 1a, Task 2) and 8.55 (Experiment 1b,

Task 2) on the 9-point scales. The positive outcome anagram task however (Experiment 2a), evidenced significant mood change for downward counterfactuals in the expected direction for the *satisfied* and *frustrated* variables: satisfaction increased while frustration declined. The outcome of the anagram tasks was rated by participants as being somewhat positive, indicated by an average overall happiness rating of 7.21 on the 9-point scale. This, therefore, provided more room on the rating scales for significant mood improvement to appear.

It was expected that the consideration of downward counterfactuals would result in the affective contrast effect (i.e., mood improvement after considering worse alternatives) for the negative outcome scenario task and anagram task (Experiment 1b, Task 1; & Experiment 2b). However, mood ratings did not improve after the generation of downward counterfactuals, with only one mood variable in the scenario task displaying the expected effect of mood improvement: *glad* ratings significantly increased after downward counterfactual generation. Taken together, the findings of the present research demonstrate that downward counterfactuals do not result in a clear or consistent effect on mood, as do upward counterfactuals. It may be that the majority of people are predisposed to strive for improvement, thus rendering upward counterfactuals the default direction of comparison<sup>26</sup> (e.g., Roese & Hur, 1997; Roese & Olson, 1997). In the event of positive outcomes, the majority of people may be less inclined to consider alternatives to reality and accept positive outcomes for what they are, enabling them to revel in the positive affect that they are likely to experience (Markman et al., 1993). This however, is only likely to occur in the absence of highly

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<sup>26</sup> Note, however, that other factors such as mood state (e.g., Sanna, Meier, & Turley-Ames, 1998; Sanna et al. 2001) and individual differences (e.g., Sanna, 1996; Sanna et al. 1998; Roese & Olson, 1993b) also exert an effect on counterfactual thinking. For example, Sanna (1996) found that optimists, in comparison to defensive pessimists, generated significantly more downward than upward counterfactuals, regardless of outcome valence.

salient counterfactual alternatives to the given state of affairs, such as outright wins compared to close-wins (e.g., Markman & Tetlock, 2000; McMullen & Markman, 2002).

Another prominent finding was the presence of a recency effect for the direction of the last counterfactuals generated in the dual direction counterfactual conditions in the positively valenced anagram and scenario tasks (Experiment 1a, Task 2; Experiment 1b, Task 2; & Experiment 2a). The change in mood post-counterfactual generation occurring in the two dual direction conditions reflected the change occurring in the single direction conditions, for the last counterfactuals generated. Consistently, the downward/upward condition mirrored the significant decline in composite mood resulting from upward only counterfactual generation. Downward only and downward-last counterfactual generation also tended to result in similar mood change or lack of mood change, within tasks (Experiment 1a, Task 2; & Experiment 2a). In terms of the affective consequences of counterfactual thinking, there seems to be no apparent advantage in considering both upward and downward counterfactuals sequentially in the event of a positive outcome. This finding contrasts with the initial expectation that the sequential consideration of both upward and downward counterfactuals would result in a neutralisation of global affect.

However, the recency effect for dual direction counterfactual generation was not evident for the hypothetical scenario task perceived by participants as having a neutral valenced outcome. Participants' mood ratings regarding the outcome of the forgotten class quiz (Experiment 1a, Task 1) produced the hypothesised effects for the change in composite mood post-counterfactual generation. Consistent with expectation and the majority of the counterfactual literature (e.g., Mandel, 2003; Markman et al., 1993), upward only counterfactuals resulted in mood depression, while downward

counterfactuals evidenced mood improvement. Support for the notion of a neutralisation of mood from the sequential consideration of upward and downward counterfactuals was also obtained. A likely explanation for this finding is that participants perceived the outcome of the scenario as having a neutral valence with no exceptionally salient counterfactual alternatives. Take any given chain of events of a reasonably mundane state of affairs that culminates in a neutral outcome, and does not possess highly salient counterfactual alternatives, such as average performance in a laboratory administered anagram task. Generally, both better and worse alternatives to the given state of affairs could be easily considered which therefore, attributes better and worse counterfactual alternatives as having reasonably equal salience. As such, the expected effects resulting from considering a single direction of counterfactual occur, and when both directions of counterfactuals are sequentially considered, mood neutralisation occurs due to the equal salience of both directions of comparison. In contrast, in the event of a positive or a negative outcome, one direction of counterfactual comparison is generally more salient, for example, the generation of upward counterfactuals in the event of a negative outcome. When both upward and downward counterfactuals are sequentially considered, the more salient direction of comparison is likely to exert a greater influence on mood, especially when the more salient direction is generated last, and thus explains the recency effect observed for the positive outcome scenarios. It may therefore be that dual direction counterfactual generation may only result in mood neutralisation when the outcome of the event considered is neutral.

The findings of the negatively valenced scenario and anagram tasks were not consistent with expectation or the findings of the neutral to positively valenced tasks. In these two tasks (Experiment 1b, Task 1; & Experiment 2b), minimal change in mood was reported by participants across the four counterfactual conditions. The only affect

variable to evidence a significant change in mood post-counterfactual generation was *glad* in response to the outcome of the traffic incident scenario (Experiment 1b, Task 1). As predicted, ratings for this variable increased after downward only generation, and consistent with the recency effect apparent in the other scenario tasks, also increased in the upward followed by downward condition. This finding demonstrates that downward counterfactuals can assist in improving mood in the event of a negative outcome, and is consistent with findings of Markman et al. (1993), Medvec et al. (1995), Roese (1994), Sanna (1996), and Sanna et al. (1999).

However, the means indicate that *glad* and overall happiness increased in all of the counterfactual conditions, including the upward only condition, which is in contrast to the majority of the functional counterfactual literature (e.g., Mandel, 2003; Markman, et al., 1993; Roese, 1994; Sanna, et al., 2001). This also occurred in the anagram task (Experiment 2b) for which positive mood adjective ratings improved post-counterfactual generation and negative mood adjective ratings declined in all four counterfactual conditions. As discussed in Sections 4.8 and 5.8, it seems that participants were concerned with the improvement of their affective state after imagining the experience of the close-call or near-miss outcome of the scenario and after learning that their anagram performance was below average. Placing their emphasis on affective enhancement in the given tasks is likely a result of participants attempting to make the most of a negative outcome with little perceived future relevance. In order for participants in all conditions to improve their mood and thus display affective contrast for downward counterfactuals and affective assimilation for upward counterfactuals, according to Markman and McMullen's (2003) Reflection and Evaluation Model (REM) of counterfactual thinking, participants generating upward counterfactuals are likely to have engaged in reflective processing, imagining a better

alternative occurring, whereas those generating downward counterfactuals evaluated the actual outcome compared to a worse counterfactual outcome. This provides further testament to the strong influence of situational context on counterfactual thinking and the resulting affective consequences.

In sum, the most prominent finding regarding the affective consequences of counterfactual thinking ascertained from the current research was the robust influence of upward counterfactuals. After a neutral to positive outcome, the consideration of better alternatives to reality, whether considered solely or after downward counterfactuals, resulted in a mood-depressing effect. Consistent with functionalist counterfactual literature (e.g., Mandel, 2003; Markman et al., 1993; Sanna et al., 2001) the affective contrast effect was thus displayed for upward counterfactuals generated after a neutral to positive outcome. Downward counterfactuals, in contrast, evidenced minimal change in mood ratings regardless of outcome valence. Therefore, the current research did not provide clarity for the affective consequences of engaging in downward counterfactual thought as was anticipated. In exploration of the affective consequences of the sequential consideration of better and worse alternatives to reality, no affective benefit was apparent in the event of positive outcomes. However, mood neutralisation occurred when both directions of counterfactuals were considered sequentially after a neutral outcome. The six experimental tasks conducted with adult participants also demonstrate the significant influence of situational context on counterfactual thinking and the resulting consequences. This finding, consistent with Boninger et al. (1994), Mandel (2003), Sanna (1997), and White and Lehman (2005), suggests that counterfactual thinking is not a mental process that functions in a highly predictable and systematic way, but rather varies according to many factors such as situational context, future relevance (e.g., Boninger et al., 1994), mood state (e.g., Sanna et al., 1998; 2001),

individual differences (e.g., Sanna, 1996; Sanna et al., 1998; Roese & Olson, 1993b), and motivational factors (e.g., McMullen & Markman, 2000; White & Lehman, 2005; Epstude & Roese, 2008).

### **7.2.2 Affective Consequences of Children's Counterfactual Thinking**

Children's engagement in counterfactual thought did not appear to result in the same affective consequences as adult participants. The direction of counterfactuals that adult participants generated in their respective tasks evidenced the most influential effect on mood, whereas for child participants, the number of counterfactual opportunities had the greatest effect on negative mood adjectives after considering alternatives to the imagined scenario. Specifically, the consideration of upward only or downward only counterfactuals resulted in an increase in negative mood. Overall, this trend was found for eight of the eleven self-reported affect variables measured in the two experiments. This suggests that the mere realisation that the given state of affairs could have been contrary to reality evokes an emotional response in children. Perhaps children may have a tendency to accept an occurrence for what it is; however, the prompt to consider alternatives to reality may highlight the awareness that not everything 'just is' and could quite easily have turned out differently, for better or for worse. Such awareness is therefore likely to spark an emotional response, particularly for negative affect, and may explain the current findings of upward only and downward only counterfactuals leading to an escalation in negative mood.

The only positive affect variable to evidence interaction among the counterfactual conditions across the two experimental tasks was *glad* in the scenario experiment, with ratings declining in the upward only and upward-first conditions and improving in the downward only and downward-first conditions. The mean ratings for

the *relieved* variable also in the scenario task followed a similar trend in mood change post-counterfactual generation. The finding of only one of six positive mood variables to show a significant change in mood ratings is consistent with the findings of Guttentag and Ferrell (2004) in which counterfactual alternatives did not have a significant effect on children's judgements of relief and elation.

In contrast, the anagram task did not yield any effects or interaction among conditions for the affect variables. This is likely to be a result of three of the five mood variables showing the same trend in mood change among conditions: ratings of *glad* and *pleased* declined while *disappointed* ratings were exacerbated in each of the four conditions. Thus, all counterfactual conditions displayed the expected affective contrast effect for upward only counterfactual generation. Children's awareness that their performance in the anagram task could have been different, gained from the prompt to consider counterfactual alternatives, was associated with a decline in their overall affective state.

Children's consideration of upward counterfactuals in regard to the somewhat positive outcomes of the scenario and anagram tasks evoked the same trend in affective response that was demonstrated by adult participants: negative emotions escalated and positive emotions declined post-upward counterfactual generation. This further highlights the highly influential effect that the consideration of better alternatives to reality has on one's mood, for children and adults alike. Given the apparent ease for which upward counterfactuals were shown to unbalance one's emotional response to the status quo in the present research project, the notion that people may be predisposed to strive for improvement is further supported.

In disparity, downward counterfactual generation did not yield a consistent nor predictable effect on children's emotional state. In response to the outcome of the



hypothetical scenario, both positive and negative affect escalated after participants considered worse alternatives to the given state of affairs. And in the anagram task, ratings for four of the five mood variables displayed the affective contrast effect of upward counterfactuals. Thus, a consistent overall trend for the affective consequences of children's downward counterfactual generation cannot be ascertained from the current research. The influence of children's downward counterfactual generation on their self-reported mood across the two experimental tasks is somewhat difficult to explain. Children may have had difficulty with emotion comprehension and understanding. However, research has demonstrated that this is not a strong possibility for this age group (e.g., Thompson, 1987; Pons & Harris, 2005). Further, mean mood ratings for children in the upward only counterfactual condition displayed the expected effects of positive mood declining and negative mood escalating post-upward counterfactual generation, and were consistent with the findings obtained with adult participants, thus negating the possibility of a difficulty with emotion comprehension. It may be that children's consideration of worse alternatives to a somewhat positive outcome of an everyday type of event may evoke both affective contrast and assimilation effects. Specifically, a child may feel even better about the somewhat positive outcome after considering ways in which it could have been worse, and may also simultaneously feel exacerbated negative emotions after realising that a worse alternative could have been a reality, thus serving as a wake-up call (e.g., McMullen & Markman, 2000). As Larsen et al. (2004) demonstrated, both positive and negative affect can be experienced simultaneously. Individual differences may also account for the combined affective contrast and assimilation affects of downward counterfactual generation, with some children predisposed to engage in a reflective style of mental simulation, while others evaluated the actual with counterfactual alternatives (Markman

& McMullen, 2003). This may have occurred for downward counterfactual generation as children may not be inclined to spontaneously consider worse alternatives to a positive event. Thus, when prompted to consider how a positive outcome could have been worse, a mixed emotional response was evoked among participants. As an extensive test of the REM (Markman & McMullen, 2003, 2005) is beyond the scope of the present thesis, a systematic examination of this issue in future research would prove beneficial.

For achievement oriented tasks on the other hand, it seems that the consideration of counterfactual alternatives to a somewhat positive outcome tends to result in a decline in children's affective state, regardless of the direction of comparison considered. As previously suggested, this may result from the mere awareness that the outcome could have been contrary to reality. The influence of downward counterfactual generation on children's mood in the anagram task however, is in disparity to Chan et al. (2002; 2003) in which downward counterfactuals were demonstrated to assist in mood improvement, a finding comparable to the adult literature (e.g., Markman et al., 1993; Roese, 1994; Sanna, 1996). However, such findings were typically in response to negative outcomes for which negative affect is a likely result. As such, one may strive to improve their affective state, thus rendering downward counterfactuals to evoke an improvement in mood. In comparison, in the event of a positive outcome for which one's mood state is likely to be high, the consideration that the outcome could have been different was shown to produce a decline in affect in the present study. Such an effect is especially likely for children who are constantly learning about the world and striving to enhance their performance in it. Future research should examine children's affective responses after engaging in counterfactual thought in the event of positive and negative outcomes.

As for dual direction counterfactual generation across the scenario and anagram experiments, children's change in self-reported mood ratings after considering both better and worse alternatives to reality did not show any discernable trends. Overall, the means indicate that the change in children's mood post-counterfactual generation was the same in both dual direction counterfactual conditions for half of the affect variables and differed for the other half, with an equal distribution between the positive and negative affect variables. This finding suggests that the consideration of both better and worse alternatives to a positive outcome evokes a mixed emotional response in primary school-aged children, thus rendering no apparent affective advantage for children to sequentially consider both directions of counterfactual comparison.

Consistent with the results obtained with adult participants, children's consideration of better alternatives to somewhat positive outcomes resulted in a trend for the expected affective contrast effect. Unexpectedly, children's mood tended to decline after generating downward counterfactuals in the performance oriented anagram task. This suggests that children's realisation that the positive outcome of their performance could have been different resulted in a decline in their affective state. Overall however, a clear trend in mood change resulting from children's downward counterfactuals was not apparent across the two experimental tasks. Thus, the affective consequences of children's downward counterfactual generation cannot be ascertained from the present research. Given the general trend of mood decline post-counterfactual generation, it seems that children's awareness that a positive outcome could have been different may signal that they had some control over the outcome and thus, can strive for future improvement. Children's preparedness ratings provided support for this contention, and are discussed in the preparatory consequences section that follows (Section 7.3.2).

### **7.3 Preparatory Consequences of Single and Dual Direction**

#### **Counterfactual Generation**

The present research also examined the preparatory consequences arising from adults' and children's single and dual direction counterfactual thinking. This was achieved through obtaining participants' self-reported feelings of preparedness in each of the experimental tasks and by measuring observable preparedness in the performance oriented anagram tasks in the form of task improvement. In line with the literature (e.g., Markman et al., 1993; Roese, 1994; 1997; Roese & Olson, 1995b), it was expected that participants generating upward only counterfactuals would evidence greater preparedness than those generating downward counterfactuals, while participants sequentially considering better and worse alternatives would indicate greater levels of preparedness than those only considering downward counterfactuals. The findings regarding the preparatory consequences of adults' and children's counterfactual thinking observed in the present research are discussed in the following subsections (N.B. see Table 7.3 for mean self-reported preparedness ratings across conditions in the eight experimental tasks).

**Table 7.3**

*Mean Self-Reported Preparedness Ratings across Conditions in the Eight Experimental Tasks.*

Experimental Task & CF Condition	Self-Reported Preparedness	
Adults - Neutral Hypothetical Scenario 1a		
upward	4.14	
downward	3.92	
upward/downward	3.35	
downward/upward	4.08	
Adults - Positive Self-Described Scenario 1a		
upward	5.14	
downward	5.17	
upward/downward	4.28	
downward/upward	4.88	
Adults - Negative Hypothetical Scenario 1b		
upward	6.58	
downward	5.86	
upward/downward	6.10	
downward/upward	5.96	
Adults - Positive Self-Described Scenario 1b		
upward	7.07	
downward	6.68	
upward/downward	6.95	
downward/upward	6.90	
Adults - Positive Anagram Task 2a	Confidence	Readiness
upward	6.35	6.94
downward	7.20	7.87
upward/downward	6.50	7.25
downward/upward	7.11	7.61
Adults - Negative Anagram Task 2b	Confidence	Readiness
upward	5.32	6.09
downward	4.95	5.79
upward/downward	4.78	5.44
downward/upward	5.20	6.00
Children - Positive Hypothetical Scenario 3a		
upward	4.84	
downward	4.69	
upward/downward	3.25	
downward/upward	4.13	
Children - Positive Anagram Task 3b	Confidence	Readiness
upward	8.05	8.15
downward	7.80	7.75
upward/downward	7.74	7.95
downward/upward	8.06	8.39

### **7.3.1 Preparatory Consequences of Adults' Counterfactual Thinking**

Research has consistently demonstrated the preparatory consequence of adults' engagement in upward counterfactual thinking (e.g., Markman et al., 1993; Morris & Moore, 2000; Roese, 1994; Sanna, 1996) in an array of methodological tasks. The preparatory results of the scenario and anagram experimental tasks of the present research were inconsistent with established findings. The two hypothetical and two self-reported scenario tasks did not yield any preparedness effects across the four counterfactual conditions. Thus, participants considering either direction of counterfactual singularly or both directions of counterfactuals sequentially, did not differ in their self-reported feelings of preparedness for a similar future event. For three of the four scenario tasks, the null preparatory findings may be a result of the neutral to positive outcomes. For the majority of instances, counterfactual thinking in the event of a positive outcome is not likely to instantiate a striving for future improvement, as the status quo has not been violated (c.f., Gleicher et al., 1990; Roese, 1997). Thus, the consideration of upward counterfactual alternatives to a positive outcome as demonstrated in the present research, does not evoke the heightened sense of preparedness that has been observed for negative outcomes (e.g., Boninger et al., 1994; Roese, 1994; Sanna, 1996).

Initially, it was thought that the null preparatory findings of the scenario tasks may be attributable to the scenario style methodology. A performance oriented anagram task was subsequently conducted with performance feedback manipulated to be somewhat positive (Experiment 2a). Again, upward counterfactuals did not evoke greater feelings of confidence or readiness to complete a second and unexpected anagram task. Contrarily, the results indicated that participants' self-reported feelings of confidence and readiness to complete the second task were greatest after considering

downward counterfactuals solely or before considering upward counterfactuals. This finding indicates that participants' stable to improved mood resulting from downward counterfactual generation regarding their positive anagram performance, boosted their confidence to successfully complete a second anagram task. The generation of upward counterfactuals after learning of their positive performance in the anagram task significantly worsened participants' mood, and also thwarted participants' confidence in their future performance. Therefore, in regards to positive outcomes arising from performance in achievement tasks, the stable to improved affective state evoked by downward counterfactuals seems to bestow a sense of preparedness for similar future events.

In contrast to the overall finding of a recency effect for the direction of last counterfactuals generated for mood change, a primacy effect was found for preparedness ratings in the positive outcome anagram task: the downward/upward condition mirrored the heightened preparatory measure ratings of the downward only condition, while participants generating upward only or upward followed by downward counterfactuals reported lower preparatory feelings. A significant primacy effect also occurred for the proportional change in participants' average time taken to complete the first and second anagram tasks. The means indicate those participants generating upward counterfactuals first or solely spent more time completing the second anagram task compared to participants in the downward only or downward first conditions. However, no other measures of change in task performance differed among the four counterfactual conditions, indicating that the task measures were not sensitive to preparedness effects, or that counterfactual thinking did not result in task improvement, possibly as a result of participants experiencing a positive outcome.

It was expected that the scenario task and anagram task that were perceived by participants as having a negatively valenced outcome would replicate the established preparatory function of upward counterfactuals (e.g., Markman et al., 1993; Morris & Moore, 2000; Roese, 1994; 1997; Roese & Olson, 1995b). However, support was again not obtained. Participants' self-reported ratings of preparedness and quantifiable preparedness, as indicated by participants' performance in the first and second anagram tasks, did not differ according to the direction of counterfactuals that they considered. As participants' affect ratings in response to the negative outcome of the scenario and anagram task also did not conform to expectation and shared the trend of mood improving post-counterfactual generation regardless of counterfactual condition (see Section 7.2.1), two points are of note. Firstly, participants seemed to have placed a greater emphasis on their affective state than on their sense of preparedness for a similar future event. This is indicated particularly by participants considering better alternatives to reality, whose mood state improved post-counterfactual generation and self-reported preparedness was equivalent to participants generating downward counterfactuals, a finding in stark contrast to the functional counterfactual literature involving negative outcomes (e.g., Markman et al., 1993; Roese, 1994; Sanna, 1996). This may be explained by participants' perception of the negative event considered. Specifically, in the close-call outcome of the traffic incident scenario (Experiment 1b, Task 1), participants may have viewed the event as a once-off unlucky incident for which they had limited control (participants' controllability ratings were at chance level) and did not see as having future relevance. However, participants did indicate a reasonable level of preparedness for a similar future event, indicating that although they could not prevent a kangaroo from jumping on to the road in future, they would be more prepared by altering their actions (e.g., driving cautiously in high-risk areas). As for the anagram



task (Experiment 2b), participants are likely to have perceived the task and their performance in it as having low future relevance, given that they were not aware of having to complete a second anagram task prior to rating their feelings of preparedness. Thus, participants may have rendered preparedness as largely irrelevant and so placed their emphasis on improving their affective state. Although the equivalent preparedness ratings among the counterfactual conditions in the negatively valenced scenario and anagram tasks is in disparity to the literature (e.g., Markman et al., 1993; Roese, 1994; Roese & Olson, 1995b), it is in accord with the trends observed for participants' self-reported affect, and therefore, further attests to the strong influence of situational context (e.g., Boninger et al., 1994; Mandel, 2003; White & Lehman, 2005), controllability (e.g., Girotto et al., 1991; Markman et al., 1995; Roese & Olson, 1995c), and future relevance (e.g., Boninger et al., 1994) on counterfactual thinking and its resulting consequences.

The second point of note is that the findings of the present research may suggest an intrinsic link between mood and preparedness. This is evident in the negatively valenced scenario and anagram tasks in which mean affect ratings improved post-counterfactual generation and preparedness ratings were equivalent and of a moderate level for each of the four counterfactual conditions. This indicates that stable or improved mood after considering counterfactual alternatives to a negative outcome is associated with a degree of preparedness. The positive outcome anagram task also provides support for this contention: engagement in downward counterfactual thinking resulted in a stable to improved affective state and greater confidence and readiness to complete a second unknown anagram task, while those generating upward counterfactuals reported a decline in their mood state and less preparatory feelings to complete the second task. Preliminary support was provided for this contention by Chan

et al. (2003), who found that for adults and children aged 7 to 8 years and 10 to 11 years that generated upward counterfactuals, the more their mood improved post-counterfactual generation, the greater their improvement in trial completion time. Further, research in the field of goal-attainment has shown that positive affect is an implicit motivator of non-conscious goal pursuit (Custers & Aarts, 2005). These researchers demonstrated that mental representations of a specific behavioural goal or state that are associated with positive affect, automatically evokes the motivation to achieve these desired goals or states. It therefore seems that in some instances, positive affect fosters the desire for improvement.

To summarise, the present research conducted with adult participants demonstrated that in the event of positive outcomes, upward counterfactual generation did not evoke a greater sense of preparedness than downward counterfactuals as has commonly occurred in the event of negative outcomes throughout the functional counterfactual literature (e.g., Markman et al., 1993; Roese, 1994; Sanna, 1996). Instead, downward counterfactual generation was found to boost participants' confidence for their performance in a similar future achievement task. In the negative outcome tasks, upward counterfactuals still did not lead to greater feelings of preparedness in comparison to downward counterfactuals. Coupled with the unexpected trend for mood improvement in all counterfactual conditions, it was concluded that participants' perception of the nature of the event determines their implicit motivation to improve their affective state or prepare for the future, and a possible link between mood state and preparatory feelings was also suggested.

### **7.3.2 Preparatory Consequences of Children's Counterfactual Thinking**

Given the lack of published research on the preparatory consequences of children's counterfactual thinking, the investigation in the current research was largely exploratory. Following the trend of self-reported affect in the scenario experiment, children's ratings of preparedness were also influenced by whether they considered one or both directions of counterfactuals. Children considering upward only or downward only counterfactuals reported a decline in affect and significantly greater preparedness ratings than those considering both directions of counterfactuals sequentially. The finding that downward counterfactuals resulted in an equivalent degree of preparedness as upward counterfactuals is in disparity to the adult counterfactual literature (e.g., Markman et al., 1993; Roese, 1994; Sanna, 1996). However, this finding is consistent with the observed trend in children's post-counterfactual mood change and the contention raised in Section 7.2.2 that children's mere awareness that a positive outcome could have been different highlights to the child that not everything 'just is' and that they can thus strive for improvement in the future. This finding draws attention to two important points. Firstly, children are predisposed to learn from their experiences and strive for future betterment (Davidson Films, 1997; Wood, 1998), and secondly, further support for the notion of an intrinsic link between affect and preparedness is provided.

These points are further augmented by the high preparedness ratings observed in the anagram task. Just as no differences were observed in affect ratings among the four counterfactual conditions, no differences were observed in preparedness ratings, whether self-reported or quantifiable. The means indicate that children's affect had a tendency for decline post-counterfactual generation, while self-reported preparedness was close to ceiling. This finding is consistent with the adult literature regarding upward

counterfactuals generated in response to negative outcomes, whereby negative affect and high preparedness are commonly reported by participants (e.g., Markman et al., 1993; Roese, 1994). Children's high preparedness ratings to complete a second and unexpected anagram task may be a result of task familiarity; however, adults' preparedness ratings in the equivalent positive outcome anagram task were substantially lower. It therefore seems that the process of considering counterfactual alternatives to a given state of affairs facilitates children's learning from past experiences, and thus enables them to feel more prepared for a similar future event.

#### **7.4 The influence of Counterfactual Thinking on Self-Efficacy**

To extend upon the work of Tal-or et al. (2004) and thus further elucidate the influence of counterfactual thinking on self-efficacy, a self-efficacy measure was also included in the performance oriented anagram experiments conducted with both adult and child participants (see Table 7.4 for mean self-efficacy ratings across conditions in the three anagram tasks). Although the findings did not conform to expectation or those obtained by Tal-or et al. (2004), some consistency was found among the three experiments involving anagram tasks. Specifically, participants generating downward only counterfactuals in each of the three anagram experiments reported the greatest increase in mean self-efficacy ratings in comparison to participants in the other three counterfactual conditions. This finding contrasts to Tal-or et al. (2004) who found that upward counterfactuals evidenced significantly greater feelings of self-efficacy compared to downward counterfactuals.

**Table 7.4***Mean Self-Efficacy (SE) Ratings across Conditions in the Three Anagram Experiments.*

Experimental Task & CF Condition	SE Before Task	SE Before CFs	SE After CFs
Adults - Positive Anagram Task 2a			
upward	4.82	6.53	6.59
downward	4.93	6.33	6.80
upward/downward	5.39	6.44	6.44
downward/upward	4.69	6.89	6.89
Adults - Negative Anagram Task 2b			
upward	5.27	2.68	2.95
downward	4.95	2.74	3.37
upward/downward	4.72	2.72	3.17
downward/upward	5.40	2.90	3.25
Children - Positive Anagram Task 3b			
upward	6.20	7.50	6.59
downward	5.25	6.85	7.00
upward/downward	5.68	7.11	7.37
downward/upward	5.94	7.83	7.33

Participants experiencing a positive outcome from their performance in the anagram task reported no significant change in their feelings of self-efficacy post-counterfactual generation, indicating that counterfactual thinking has no significant effect on self-efficacy in performance tasks resulting in a positive outcome. Participants in the negative outcome anagram experiment however, reported significantly greater feelings of self-efficacy post-counterfactual generation, regardless of counterfactual condition. The increase in self-efficacy ratings post-counterfactual generation for all conditions mirrors the mood improvement also observed in the four counterfactual conditions, and is indicative of participants' motivation to improve their affective state after experiencing the negative outcome. Although children's mean self-efficacy ratings evidenced a slight increase after the generation of downward counterfactuals, a finding comparable with that obtained with the adult participants in both the positive and

negative anagram tasks, a recency effect for the direction of last counterfactuals generated approached significance. While self-efficacy ratings in the downward only and upward followed by downward counterfactual conditions slightly increased after counterfactual generation, children generating upward only and downward followed by upward counterfactuals reported a reasonable decline in their feelings of self-efficacy.

The opposing findings of the current research to those of Tal-or et al. (2004) may be a result of motivational factors. Given Roese's (1997) assertion that counterfactual thinking in a performance context can be influential over self-perceptions of one's ability for future success, Tal-or et al. (2004) contends that motivational factors are likely to exert a role in whether one engages in the process of drawing inferences from counterfactual comparisons in performance settings. Thus, counterfactual thinking may be more likely to exert an influence over self-efficacy when an individual's motivation to engage in inferential processing is high. This contention may explain the current findings: in the event of positive anagram task performance, motivation to infer the reasons behind the success is likely to have been low, and thus, counterfactual generation did not significantly influence self-efficacy. In contrast, the motivation for participants to learn the reasons for their apparent failure is likely to have been substantially higher. If alternatives that are deemed to be beyond personal control may have resulted in better performance and/or factors that are within personal control are considered that may have led to worse performance, one is likely to feel better about their performance ability, as was observed in the group trend occurring in the negative outcome anagram task (c.f., Bandura, 1986).

## **7.5 Spontaneous Reflective and Evaluative Processing**

A secondary aim of Experiment 1a was to assess the frequency of which reflective and evaluative counterfactuals spontaneously occur in the two directions of counterfactual comparison. This was achieved by coding participants' specified upward and/or downward counterfactuals as reflective or evaluative, according to the criteria outlined by Markman et al. (2008; see Section 4.3.2.6). Consistent with the initial hypothesis, the vast majority of upward counterfactuals generated by participants were constructed through evaluative processing, while reflective processing was frequently employed by participants in their construction of downward counterfactuals. This finding suggests that the evaluative mode of mental simulation is the default mode of processing for upward counterfactuals, and the reflective mode is the default for downward counterfactuals. However, as suggested by the affective consequences of counterfactual thinking observed in the negative outcome anagram task (Experiment 2b) and scenario task regarding the traffic incident (Experiment 1b, Task 1), it appears that the processing mode adopted during counterfactual generation is dependent on situational context and motivational factors. As previously discussed, participants considering counterfactual alternatives to these negative outcomes demonstrated mood improvement regardless of the direction of counterfactual considered. In order for this to occur, participants generating downward counterfactuals are likely to have engaged in evaluative processing, and consequently displayed the affective contrast effect, while participants thinking counterfactually in the upward direction displayed the affective assimilation effect, and thus seemed to have engaged in reflective processing. Therefore, it is apparent that there are circumstances in which one mode of mental simulation occurs more naturally than the other. Thus, specifying the mode of mental simulation one is to employ when constructing counterfactuals (e.g., Markman et al.,

2008), may require more effortful processing for the individual if the specified mode does not occur naturally in the given circumstances. For example, the instruction to engage in evaluative upward counterfactual generation is likely to require more effort for a participant when he or she does not see any future relevance for the given event, and is naturally inclined to want to improve his or her affective state. In such an instance, an individual is likely to automatically consider counterfactuals in the processing mode that would occur naturally in the given circumstances, and attempt to block those thoughts in order to engage in the mode that was specified. The individual's affect, preparedness or other construct under investigation, is liable to be affected by: (a) the engagement in both processing modes, (b) the cognitive effort or distress experienced from having to engage in a thought process unnatural to the individual for the given circumstances, or (c) adjustment of self-reports by the individual to compensate for having automatically engaged in the 'wrong' type of thinking. Caution must therefore be exerted when devising methodologies that require participants to engage in a particular mode of mental simulation.

## **7.6 Summary of Core Insights Gleaned from the Present Research**

The current research project set out to empirically investigate several aspects associated with the field of counterfactual thinking. Firstly, the need to explicitly compare the resulting consequences of engaging in one or both directions of counterfactual comparison sequentially was ascertained, and subsequently investigated. Secondly, the limited research on the fluency and subsequent consequences of primary school-aged children's counterfactual thinking provided the impetus for further investigation, and thus comprised a primary focus of the current thesis. Thirdly, the somewhat limited functional counterfactual research employing positive outcomes,



particularly with child participants, facilitated the aim in this thesis to more closely examine the consequences of counterfactual thought in response to somewhat positive outcomes. Fourthly, the somewhat mixed findings reported in the literature of the consequences (in particular, affective consequences) arising from downward counterfactual thoughts, necessitated clarification. Fifthly, the very limited research on the ways in which counterfactual thinking affects self-efficacy was extended upon, and finally, the frequency with which people simultaneously engage in reflective and evaluative processing was explored in one of the experiments conducted for this thesis. The key findings and insights garnered from this research investigation are described below.

The findings of the present research project demonstrate the mood-depressing influence of upward counterfactuals generated in response to neutral and positive outcomes without the benefit of greater feelings of preparedness. Thus, there appears to be no apparent affective or preparatory advantage in considering better alternatives to a positive outcome. The consideration of worse alternatives to reality yielded the expected mood improvement effect when the outcome was framed as neutral, but generally did not further improve when the outcome was perceived as positive (likely due to a ceiling effect). Although significant mood improvement was not observed in the positive outcome tasks, individuals' affective state remained stable, which may have allowed the individual to bask in their positive affective state resulting from the experience of a positive outcome. Such feelings appeared to foster a greater sense of preparedness for a similar future achievement task, suggesting an intrinsic link between mood and preparedness.

The findings of the negative outcome tasks indicate that the consequences arising from upward counterfactual generation vary according to situational context and

motivational factors, such that when a negative outcome was perceived to be a once-off event with little future relevance, or was not within a reasonable degree of control, participants focused on improving their affective state. This finding contributes to those of Boninger et al. (1994), Mandel (2003), Sanna (1997) and White and Lehman (2005) demonstrating that counterfactual thinking and its resulting consequences do not operate in a completely predictable and systematic way, being privy to circumstantial and individual dispositions.

The present research investigation was the first to explicitly and empirically examine the consequences of sequentially engaging in both directions of counterfactual comparison. The findings revealed that considering both better and worse alternatives to an outcome perceived as neutral has the advantage of neutralising one's affective state. Thus, when better or worse alternative outcomes are equally likely to have occurred, it is advantageous for an individual to consider both upward and downward counterfactual alternatives to reality in order to provide a 'reality check' to his or her affective state. The sequential consideration of better and worse alternatives to a positive or negative outcome was not shown to possess any consequential advantage, as a recency effect for the direction of last counterfactuals was observed for affective consequences. Specifically, the direction of counterfactual that was considered last, influenced affect in the same way as when counterfactuals of the same direction were considered solely.

The frequency of reflective and evaluative counterfactuals that was ascertained in Experiment 1a, and the observed affective contrast and assimilation effects in the negative outcome tasks, indicates that people have a natural inclination to engage in a certain mode of mental simulation according to situational and motivational factors. Thus, research asking participants to engage in a processing mode that goes against their natural disposition for the given circumstances, may yield artificial results.

Therefore, caution should be taken in such research before a greater understanding regarding people's natural engagement in the different types of processing modes is ascertained.

Primary school-aged children's aptitude in generating counterfactuals of a specified direction was clearly demonstrated in the present research. Consistent with the findings obtained with adult participants, children's consideration of better alternatives to reality in the event of positive outcomes resulted in a decline in their affective state, thus demonstrating the significant influence of upward counterfactual generation on affect in the event of positive outcomes for adults and children alike. Although children's generation of downward counterfactuals did not yield consistent results, it was found that children's consideration of better or worse alternatives to reality had a tendency to result in the same affective and preparatory consequences. This indicates that children's awareness that the positive outcome of the given state of affairs could have been different, whether better or worse, signals to the child that they had some control over the outcome and thus, can strive for improvement. This finding is indicative of a predisposition of children to learn from their experiences, and therefore, highlights the advantage of encouraging them to mentally consider counterfactual alternatives to a given state of affairs.

The current research project has thus extended upon previous research in the field of counterfactual thinking by: (i) explicitly investigating the consequences arising from single versus dual direction counterfactual generation, (ii) establishing the aptitude of preadolescent children to generate counterfactuals of a specified direction, (iii) ascertaining the affective and preparatory consequences of children's counterfactual thinking, (iv) discerning the influence of positively valenced outcomes on counterfactual consequences, (v) clarifying the function of downward counterfactuals,

(vi) examining the frequency in which people spontaneously consider counterfactuals in a reflective or evaluative mode, and (vii) investigating the influence of counterfactual thinking on self-efficacy. The current research has therefore made an original contribution to the body of knowledge pertaining to the field of counterfactual thinking.

## **7.7 Limitations of the Present Research**

Although the current research project has garnered insights into the consequences arising from adults' and children's counterfactual thinking, like most empirical investigations, several potential limitations of the present research investigation can be identified. One limitation concerns the methodological design of the present research. Although the methodology extends upon the literature by asking half of the participants to consider both upward and downward counterfactuals in a sequential (and counterbalanced) order rather than solely focus on generating a single direction of counterfactual, the present design does not incorporate a spontaneous counterfactual direction condition (i.e. asking participants to consider counterfactual alternatives without specifying the direction of comparison). In real life, people are likely to consider both upward and downward counterfactuals in a simultaneous fashion, such that they may generate a downward counterfactual immediately followed by an upward counterfactual. Although the sequential dual direction counterfactual conditions have provided further insight into the field of counterfactual thinking, they may not entirely reflect real life counterfactual thought in the event of everyday affairs. Further, the dual direction conditions would have also placed extra processing demands on participants, particularly the child population, having to think of as many ways as they could as to how the outcome could have been better (worse), and then complete the task again in the opposite direction. This is likely to have been cognitively taxing on

participants, and especially on the children, and may have contributed to differences in performance between the single and dual direction counterfactual conditions. For example, Sanna, Schwarz, and Stocker (2002) found that the generation of ten as opposed to two counterfactuals was experienced as being more difficult and increased the hindsight bias.

Another substantive limitation is that although the methodological design of the experiments necessitated only slight modifications for use with both adults and children, a direct comparison between the two sample populations was unable to be made as a result of the slightly different task requirements for adults and children. The research however, was largely exploratory, and provides a basis for future research to extend upon (see Section 7.8 for suggestions for future research).

Other potential limitations include the following: first, the emotion adjectives employed in each of the experimental tasks may not have captured participants' true, or 'anticipated' affect. The findings resulting from participants' mood ratings may therefore, not be entirely reflective of reality, or have led to otherwise null or significant change post-counterfactual generation. Second, given the demand characteristics of the mood assessment task, participants may have felt obliged within the experimental setting to alter their mood ratings from the first set to the second set, thus resulting in a change in their mood post-counterfactual generation when there ordinarily may not have been a change. Third, some participants may have potentially found it difficult to relate to the nature of the experience outlined in the hypothetical scenario tasks (e.g. a person who has never had a driver's licence, or a child who does not enjoy reading). Pre-testing of scenarios for individual differences in experience may thus have been useful. This also may have affected participant's self-reported mood ratings. Fourth, although the situational context varied, three of the four adult scenario tasks centred on attending

university, rendering reasonable future relevance and desire for future achievement. This may have contributed to upward counterfactuals exerting a significant influence on participants' mood. Fifth, participants' actual feelings of preparedness for a similar future event may not have been accurately represented in the ratings scales, thus contributing to the null preparatory effects observed throughout the present experimental investigations. Sixth, the laboratory nature of the anagram methodology may not wholly equate to participants' performance and subsequent reflections on events occurring in real life. The findings should thus be considered with this in mind. A final consideration regards the uncontrollable factor of participants' non-verbalised counterfactual thoughts. Although participants were explicitly asked to generate counterfactuals in a particular direction, they may have also considered the other direction of counterfactual automatically, as is likely to occur in everyday life. As there is no way to combat the limitation of participants' non-verbalised thoughts, participants' responses to the mood, preparedness, and self-efficacy measures may therefore have been affected. Several of these potential limitations, namely the generalisability of findings based on hypothetical scenarios and laboratory tasks to the real world, capturing participants' actual affect via the use of rating scales, and participants' non-verbalised counterfactuals, are shared by other research investigations in the counterfactual literature (c.f., Mandel, 2003; Roese, 1994; Roese & Hur, 1997; Sanna, 1997). As such, the findings garnered from this research should be considered in a somewhat positive light, advancing current knowledge on adults' and children's counterfactual thinking and providing the impetus for continued research.

## **7.8 Suggestions for Future Research**

As the research conducted for this thesis was largely exploratory, several recommendations for future research are offered. The first suggestion to extend upon the current research is to incorporate a spontaneous counterfactual direction condition into the methodological design (i.e. direct participants to consider counterfactual alternatives by asking how the outcome could have been different, thus, the direction of counterfactuals participants considered would be spontaneous) and would provide a clear comparison of the consequences arising from spontaneous direction and specified single and dual direction counterfactual generation. This would aid in providing further insight into the consequences experienced from dual direction counterfactual generation, as well as provide a more substantive reflection of counterfactual thinking in real life.

As discussed in Section 7.5, the present research indicated that a specific mode of mental simulation (i.e., reflective or evaluative) engaged in during counterfactual thinking appears to occur more naturally in some circumstances than others. As such, future research utilising various methodologies and outcomes is necessary to ascertain the frequency of each processing mode during counterfactual generation in specific circumstances. Further, an investigation of the possible influence of individual differences in processing mode is also warranted. It is likely that some people would be more inclined to evaluate counterfactual alternatives to reality while others may engage in reflection. For example, an academic scholar compared to an artist, would potentially be more prone to engage in evaluation. This, however, is liable to vary according to circumstance. Clearly, further research is required.

Future research could also examine the suggestion made in Section 7.3.1 of the possibility of an intrinsic link between affect state and preparedness induced by

counterfactual thinking. The present research findings indicate that stable or improved mood resulting from counterfactual generation may be associated with preparatory feelings. This contention, however, requires explicit empirical validation. Although the present research project sought to further elucidate the influence of counterfactual thinking on self-efficacy, the disparity in findings to Tal-or et al. (2004) necessitates further investigation. One suggestion is to examine counterfactual thinking and self-efficacy in students' actual university exam performance, which would thus provide a real world context in which self-efficacy is a prominent factor.

As research has ascertained that young children are able to consider counterfactual alternatives to reality and that such thought is associated with other cognitive developments such as language competence (e.g., Beck et al., 2006; Chan & Warner, 2007; Guajardo & Turley-Ames, 2004), causal reasoning (e.g., Harris et al., 1996; Riggs et al., 1998), and theory of mind (e.g., Guajardo & Turley-Ames, 2004; Chan & Warner, 2007), counterfactual thinking may be implicated in school-aged children's continued cognitive development and social functioning. Specifically, counterfactual thinking is likely to assist children in explaining why an outcome occurred and how it may have been prevented (Harris & Leivers, 2000), build competence in social interaction (e.g., Riggs & Peterson, 2000; Chan & Warner, 2007), and foster a sense of striving for future improvement, as was seen in the current research. As limited research has investigated the consequences of primary school-aged children's counterfactual thinking, much future research is needed. Several suggestions for future research that expand on the findings ascertained from the present investigation follow: future research would do well to examine preadolescent children's counterfactual thinking and resulting consequences in the event of negative, positive, and neutral outcomes and thus, examine the influence of outcome valence on children's



counterfactual thought. Second, to rule out the possibility of difficulty with emotion comprehension and understanding of this age cohort, future research should incorporate an emotion comprehension measure, such as Pons, Harris and de Rosnay's (2004) *Test of Emotion Comprehension*. Third, implement a methodology that enables a direct comparison of the effects of counterfactual thinking occurring for primary school-aged children and other age groups, such as younger children, adolescents, and adults. A final suggestion is to assess primary school-aged children's spontaneous counterfactual thought in an activity that is somewhat familiar to them, such as a school activity or game. Such research would significantly contribute to the understanding of children's counterfactual thinking and resulting consequences.

## **7.9 Conclusion**

The present research project endeavoured to explicitly examine the affective and preparatory consequences arising from single compared to dual direction counterfactual generation primarily in response to somewhat positive outcomes, and to investigate primary school-aged children's aptness in considering counterfactual alternatives of a specified direction and assess the resulting consequences. Overall, it was found that upward counterfactuals had the most influential effect on adults' and children's affective state in the event of positive outcomes. Downward counterfactuals provided a stable to improved affective state for adult participants, while children's affect tended to decline as with upward counterfactual comparisons. The sequential consideration of both upward and downward counterfactuals demonstrated the advantage of neutralising mood in the event of a neutral outcome, but was not demonstrated to be advantageous in the event of positive or negative outcomes. In terms of the preparatory consequences of the engagement in counterfactual thought, stable to improved mood commonly resulting

from downward counterfactual generation appeared to be associated with greater feelings of preparedness. The present research also highlighted the substantial effect of situational and dispositional factors on counterfactual thinking and its resulting consequences. Overall, the present research demonstrated the advantage of considering downward counterfactuals compared to upward counterfactuals in the event of positive outcomes for adult participants, and indicates that encouraging preadolescent children to consider counterfactual alternatives to reality in the event of somewhat positive outcomes may be advantageous in assisting them in learning from their experiences and striving for future improvement.

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## **Appendix A**

### **Scenario Text used in Experiment 1a**

It's Thursday afternoon and you've just submitted an assessment that you've spent every spare moment over the past week completing. You feel so relieved and decide to go out for the night with your friends. During dinner, one of your friends asks if you have studied for the class quiz tomorrow. You were so focused on doing the other assessment that you forgot all about the quiz. As you have had a few drinks and planned to stay the night at your friend's place, you decide to do some study in the morning before your afternoon class.

It's Friday morning and after breakfast, you get your books out of the car and realise that you have left the textbook you need at home. As your friend's place is only five minutes from uni, you decide to go to the library reserve collection and ask to borrow the textbook. Luckily, another student returns a copy of the textbook as the librarian says that all copies are on loan. You borrow the textbook for two hours and study for the quiz. You do the quiz and get 14/20.





## Appendix B

### Mood Rating Scales used in Experiment 1a

How do you feel about your performance in the quiz? Please answer on each of the five scales below by circling a number on the line that reflects how you feel.

Example      1-----2-----3-----4-----5-----6-----7-----8-----9

1.            1-----2-----3-----4-----5-----6-----7-----8-----9      
2.    not at all      1-----2-----3-----4-----5-----6-----7-----8-----9      very glad  
      glad
3.    not at all      1-----2-----3-----4-----5-----6-----7-----8-----9      very frustrated  
      frustrated
4.    not at all      1-----2-----3-----4-----5-----6-----7-----8-----9      very satisfied  
      satisfied
5.    not at all      1-----2-----3-----4-----5-----6-----7-----8-----9      very  
      disappointed      disappointed

## **Appendix C**

### **Scenario Text used in Experiment 1b**

You and a few of your friends have decided to go away for the weekend. You leave on Friday afternoon in your friend's new car. After a couple of hours, your friend asks you to drive for the remainder of the trip, to which you happily agree. It is near dusk as you drive along the highway surrounded by bush. As you drive along, with the radio blaring and chatting with your friends, excited about the weekend, you vaguely notice a kangaroo warning sign. You reach down to change radio stations and as you look up, a kangaroo hops out onto the road. You slam on the brakes and try and swerve to miss the kangaroo. You hear the car behind you braking also, and wait to be hit from behind. The kangaroo hops off the road in just enough time for you to accelerate away from the car behind you.

## Appendix D

### List of Anagrams used in Experiments 2a and 2b

#### Animals and Nature

camel	lcmea
eagle	geael
mouse	uemso
snake	eskan
whale	lhewa
cloud	odcul
plant	tpnal
river	vreri
stone	eotsn
storm	tmsro

#### Body Parts and Food

cream	lcmea
honey	oyhne
peach	hecpa
steak	asetk
toast	otsta
ankle	lnake
chest	hsetc
heart	etahr
liver	eirlv
thumb	btmuh

## **Appendix E**

### **Anagram Task Script for Experiments 2a and 2b**

In this experiment, you will be asked to complete a task on the computer. This will involve unscrambling ten words from one of two categories. After you have completed the task, you will be shown your score and a graph showing how you performed compared to other participants. You will then be asked to answer a few questions about the task on several rating scales.

In the task, you will be presented with an anagram, which is a word with the letters all mixed up, and you have to work out what the word is. Each anagram will be a 5-letter word. When you have solved it, say what you think the word is, and I will tell you if it's correct. When you have worked it out, the correct solution will be presented beneath the anagram, then the next one will appear on the screen. First I will give you two practice anagrams which are both colours. Now, do you have any questions before you do the practice trial?

#### **Practice Trial**

How did you find that? Not too hard was it? Now in the real task, you will be given two minutes to solve each anagram. There will be a count-down timer in the bottom right – hand corner of the screen. If you don't solve an anagram in the two minutes, the next anagram will be presented.

For each anagram that you solve correctly, you will be awarded one point per second of the time remaining of the two minutes. For example, if you solve an anagram in 30 seconds, you will get 90 points. If you solve an anagram in 1 minute 30 seconds, you will get 30 points. So the quicker you solve an anagram, the more points you get. Does that make sense?

Now, there are two options that you will have while doing the task. One is that you can choose to buy a clue by pressing the letter 'C' on the keyboard. The clue will be the first letter of the correct solution and will be displayed beneath the anagram. You can only buy one clue for each anagram. Now if you choose to buy a clue, 30 points will be deducted from your total score. For example, say you get a score of 350, if you bought one clue, your score would then be 320. Does that make sense?

The second option is that you can choose to skip an item if you find it too difficult, by pressing the letter 'S' on the keyboard. The next anagram will then be displayed. You will not be able to go back to any items that you decide to skip. If you choose to skip an item, one point for each second trying to solve the anagram will be deducted from your score. So, for example, if you spend 1 minute 30 seconds trying to solve an anagram and then decide to skip it, 90 points will be deducted from your total score. But if you decide to skip an item after 30 seconds, only 30 points will be deducted from your total score. Does that make sense? Do you have any questions?

### **Choice of Word Category for Second Anagram Task**

What category of words would you like? Animals or things you can eat?

Now before we start, I'd like you to rate how good you think you will be at this task by moving the bar on the scale between the 'Not very good' end and the 'Really good' end.

### **Self-Efficacy Rating Scale (Time 1)**

Do you have any questions before you do the task? When you're ready, click start.

### **Anagram Task (Task 1)**

### **Presentation of Results**

### **Mood Assessment (Time 1)**

### **Self-Efficacy Rating Scale (Time 2)**

### **Counterfactual Generation Task:**

Now I'd like to ask you to think of as many ways as you can as to how your performance in the task could have been better/worse?

Now can you think of as many ways as you can as to how your performance could have been better/worse?

### **Mood Assessment (Time 2)**

### **Self-Efficacy Rating Scale (Time 3)**

## **Preparedness Ratings for Potential Second Anagram Task**

Now I would like to ask you to do the task a second time, this time using the other category of words. Is that okay?

## **Choice of Word Category for Second Anagram Task**

## **Anagram Task (Task 2)**

## **Presentation of Results**

### **Debrief:**

How did you find the task overall? Basically, what we are looking at is how people's mood changes after thinking about how their performance in the task could have been different. The anagram task is the method we use to provide participants with a personally experienced event from which they can think about how their performance could have been either better or worse. The anagram task also provides the opportunity for us to see if these thoughts also influence how prepared you feel to do the task a second time and to then compare performance between Task 1 and Task 2. We are also interested in looking at how thoughts about how the outcome could have been different affect self-efficacy and self-perceptions. That's why you were asked at three different times how good you think you would be or how good you were, at this task. Now, remember after completing the task the first time, you were shown your score and a graph showing your score in comparison to other participants? The score you were shown was your actual true score, but the graph was designed to show that in

comparison to other participants, your score was above average. This was so we could provide a somewhat positive outcome for you to think about how the outcome could have been different, as most studies in this area have used negative outcomes. In the future, we hope to adapt this study to use with children, and eventually devise an intervention program to help them utilise their ability to think about how a given outcome could have been different with a positive effect on both their mood and future performance.

(N.B. Script for debriefing modified accordingly for the negative outcome valence of Experiment 2b)



## **Appendix F**

### **Scenario Text used in Experiment 3a**

It's a school night and you stay up late reading a really good book. Your mum tells you to go to sleep, but you really want to know what happens next, so you stay awake and finish reading to the end of the chapter.

The next morning, you sleep in and have to run to the school bus so you don't miss it. As you get up to the corner, you see your bus at the bus stop. You keep running and luckily the bus driver sees you and waits for you. Phew! You made it!

## Appendix G

### List of Anagrams used in Experiment 3b

#### Animals

camel	elmca
horse	ehros
mouse	oumse
shark	akshr
snake	keasn
tiger	ertig
whale	laewh

#### Body Parts

ankle	kanle
brain	naibr
chest	escht
heart	rteah
mouth	oumth
thumb	umbth
waist	stwai

# **Appendix H**

## **Anagram Script for Experiment 3b**

Hello. How are you today? My name is Rebecca and I'd like to ask you to do a task on the computer for me. Is that ok with you?

First I will explain the task to you and if you really don't want to do it or find that it is too hard, you can stop at any time, and that's ok.

In the task, a word will be shown on the screen with the letters all mixed up and you will need to work out what the word is. Each word will have five letters and will be from one of two categories which you will get to choose. For example, items of clothing. There will be seven words that you will need to unscramble.

When you have unscrambled the word, say what you think it is, and I will tell you if it's right or not. When you have worked it out, the correct word will be presented on the screen, and then the next scrambled word will appear on the screen. First I will give you two scrambled words to practice and these are both colours. Now, do you have any questions before you do the practice ones?

### **Practice Trial**

How did you find that? Not too hard was it? Now in the real task, you will be given two minutes to solve each anagram. There will be a count-down timer in the bottom right –

hand corner of the screen to let you know how much time you have left. If you don't unscramble a word in the two minutes, the next one will be presented.

For each word that you unscramble correctly, you will get one point per second of the time remaining of the two minutes. For example, if you unscramble a word in 30 seconds, you will get 90 points. If you unscramble a word in 1 minute 30 seconds, you will get 30 points. So the quicker you unscramble the word, the more points you get. Does that make sense?

Now, there are two options that you will have to help you unscramble the words. One is that you can choose to buy a clue by pressing the letter 'C' on the keyboard. The clue will be the first letter of the unscrambled word. For example, for the practise word, black, the clue would be the letter 'b'. You can only buy one clue for each word. Now if you choose to buy a clue, you will lose 30 points from your total score. Does that make sense?

The second option is that you can choose to skip an item if you find it too hard, by pressing the letter 'S' on the keyboard. The next scrambled word will then be displayed. You will not be able to go back to any words that you have skipped. If you choose to skip a word, one point for each second trying to solve the anagram will be deducted from your score. So, for example, if you spend 1 minute 30 seconds trying to solve an anagram and then decide to skip it, 90 points will be deducted from your total score. But if you decide to skip an item after 30 seconds, only 30 points will be deducted from your total score. Does that make sense?

After you have finished the task, you will be shown your score and a graph showing how you did compared to other children who have done the task already. You will then be asked to answer a few questions about the task on some rating scales, like the one at the beginning. Do you have any questions?

### **Choice of Word Category for First Anagram Task**

What category of words would you like? Animals or Body Parts?

Now before we start, I'd like you to rate how good you think you will be at this task by moving the bar on the scale between the 'Not very good' end and the 'Really good' end.

### **Self-Efficacy Rating Scale (Time 1)**

Do you have any questions before you do the task? When you're ready, click start.

### **Anagram Task (Task 1)**

#### **Presentation of Results:**

Now let's have a look at how you did. You got a final score of ... which is pretty good. Now you skipped ...of the words and bought ...clues, so you lost some points for that, but it may have saved you some time in solving the words to get more points. The graph shows how well your performance in the task was compared to other children who have done the task already. The computer shows that your score is about here on the graph, which means that you did better than most of the other people who have also done the

task. This line on the graph goes from the worst score to the highest score, and this line shows how many people have got each score. So the graph is showing that most people got a score somewhere around the middle, and your score is towards the higher end of the scale, so you actually did quite well.

### **Mood Assessment (Time 1)**

### **Self-Efficacy Rating Scale (Time 2)**

### **Counterfactual Generation Task**

Now I'd like to ask you to think of as many ways as you can as to how your performance in the task could have been better/worse?

Now can you think of as many ways as you can as to how your performance could have been better/worse?

Okay, so you thought you could have done better/worse by ... and done better/worse by...

### **Mood Assessment (Time 2)**

### **Self-Efficacy Rating Scale (Time 3)**

### **Preparedness Ratings for Potential Second Anagram Task**

Now I would like to ask you to do the task a second time, this time using the other category of words. Is that okay?

### **Choice of Word Category for Second Anagram Task**

### **Anagram Task (Task 2)**

### **Presentation of Results**

#### **Debrief:**

How did you find the task overall? Basically, what we are looking at is how children's mood changes after they think about how their performance in the task could have been different. By getting children to do computer task, we can see if these thoughts affect how prepared you feel to do the task a second time and to then compare performance between Task 1 and Task 2. We are also interested in looking at how thoughts about how the outcome could have been different affect how you feel about yourself. That's why you were asked at three different times how good you think you would be or how good you were, at this task. Now, remember after completing the task the first time, you were shown your score and a graph showing your score compared to other children? The score you were shown was your actual true score, but the graph was designed to show that compared to other children, your score was above average. This was so we could provide a somewhat positive outcome for you to think about how the outcome could have been different. In the future, we hope to design a program to help children use their ability to think about how an outcome could have been different with a positive effect on both their mood and future performance.