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# Investigating the Role of Counterfactual Thinking in the Excess Choice Effect

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# Investigating the Role of Counterfactual Thinking in the Excess Choice Effect

*by Rebecca Jayne Hafner*

School of Psychology

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2013

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## Declaration

I declare that this thesis was composed by myself. All data were collected solely by myself. The conceptual design and analysis of the studies contained in this thesis are my own, and this work has not been submitted for any other degree or professional qualification. Data from this thesis are published in the following paper:

Hafner, R. J., White, M. P., & Handley, S. J. (2012). Spoilt for Choice: The Role of Counterfactual Thinking in the Excess Choice and Reversibility Paradoxes. *Journal of Experimental Social Psychology*, 48(1), 28 – 36.

A copy of this paper is attached to the appendix of this thesis (Section 1.0).

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Signed.....

Date.....

## **Abstract**

Investigating the Role of Counterfactual Thinking in the Excess Choice Effect

Rebecca Jayne Hafner

According to economic rational choice theory greater choice will deliver well-being by increasing the likelihood that individuals satisfy personal preferences (Mas-Colell, Whinston, & Green, 1995). Consequently, extensive choice has become a fundamental aspect of both consumer markets and public policy (Schwartz, 2000; 2004; Botti & Iyengar, 2006). Crucially however, recent psychological research has begun to challenge the assumption that more choice leads to greater well-being. In several instances evidence has been found that whilst some choice is good, more choice can lead to reduced post-decisional satisfaction (e.g. Iyengar & Lepper, 2000; Shar & Wolford, 2007; Reutskaja & Hogarth, 2009). This is referred to as the Excess Choice Effect (ECE). If widespread, this ECE may mean that policies aimed at increasing well-being via choice actually deliver the opposite of their objectives.

Although subject to much theoretical speculation, surprisingly little is known about the underlying cause of this effect. In light of this lacuna, the main aim of the current thesis was to investigate an alternative explanation for the ECE – namely, increased counterfactual thought. Across 7 experiments various factors known to influence the availability of counterfactual thoughts were manipulated, and the impact upon the prevalence of the ECE was explored, whilst another experiment (Experiment 7) aimed to determine individuals' predicted affective responses to extensive choice. Overall, evidence was found that counterfactual

thinking appears to play an important role in driving the dissatisfaction often associated with extensive choice. Specifically, the ECE was found to be most prevalent where counterfactual alternatives were made readily available, for example when under low cognitive load, when reflecting upon a recent, real-life decision, and when choice outcomes were negative. Further, in Experiment's 1, 5, 6, and 8 these ECE's were found to be significantly mediated by increased counterfactual thought, or the heightened experience of counterfactual emotion, following extensive choice. No evidence for any impact of choice level upon (psychological) satisfaction levels was found when the capacity to think counterfactually was reduced, i.e. via high cognitive load, over time, when reflecting upon a hypothetical scenario, or following a positive choice outcome. Ideas for future research are considered, and the potential implications of these findings for our theoretical understanding of the ECE, for the psychology of choice, for consumer well-being, retailers and the construction of public policy are discussed.

# Chapter 1 – Introduction to Economic Theory, the Excess Choice Effect, and Counterfactual Thinking

## *1.1 Overview*

Contrary to economic rational choice theory, recent psychological research has shown that increased choice may be associated with decreased chooser satisfaction and well-being (Iyengar & Lepper, 2000; Iyengar, Jiang & Huberman, 2004; Shar & Wolford, 2007; Reutskaja & Hogarth, 2009; Schwartz, 2004; Botti & Iyengar, 2006). This is referred to as the ‘excess choice effect’ (ECE). However empirical evidence for the underlying cause of this effect is limited. The main purpose of this thesis is to explore the role of counterfactual thinking (CFT) as a potential driving force behind the ECE. Based upon the counterfactual literature I attempt to manipulate factors in order to influence the availability of counterfactual thoughts across different choice tasks. I then examine the impact of these manipulations upon subsequent satisfaction levels and the prevalence of the ECE. From this I aim to a) further theoretical understanding of the ECE in terms of the underlying cause and long term implications of the effect, and b) determine the applied implications within the field of the psychology of choice, particularly with regard to the construction of choice architectures and public policy.

Section 1.2 introduces economic rational choice theory, which has largely driven the trend towards ever-increasing choice within modern society. Section 1.3 reviews evidence from psychological research which has demonstrated the ways in which people systematically violate these principles of rational decision making. Section 1.4 introduces the economic perspective of increased choice, and also considers evidence for the psychological benefits of the provision of

some choice. Then Section 1.5 provides a review of psychological evidence for and against the ECE, and existing explanations for the effect are also detailed. Section 1.6 describes how the rationale for the current thesis follows from evidence demonstrating a link between increased choice and increased regret, and the role of regret as a counterfactual emotion is considered. Section 1.7 provides a general introduction into the topic of counterfactual thinking. Section 1.8 considers numerous factors which have been shown to make counterfactual alternatives more or less readily available. Section 1.9 considers existing links between the choice and counterfactual literatures. Then Section 1.10 considers a number of possible ways of manipulating counterfactual availability. Section 1.11 describes research on the temporal pattern to the experience of the counterfactual emotion of regret, and how this links to the ECE. Finally, section 1.12 provides the broad motivation for my research, and it also gives an outline of the subsequent experimental chapters.

### *1.2 Economic Rational Choice Theory*

Classic economic theory has a distinctive core, which emerges from the assumption that all decisions are made upon the basis of ‘constrained maximization’ (Watson, 2007). Agents are considered to be ‘constrained’ because they will not have a limitless supply of time or money, yet within this context individuals will strive to allocate their resources to the best available outcome, i.e. the outcome with the greatest reward at the lowest possible cost. To illustrate, consider a scenario in which the protagonist is deciding which car to purchase from a selection available at a second hand car-dealers. The chooser will ‘weigh-up’ each option’s potential benefits, in terms of appearance, performance, age, and any other relevant dimensions, and will then contrast or

'trade-off' these benefits against comparative costs. On the basis of these comparative judgements, the chooser will strive to pick the option which provides the greatest maximization of value, at the lowest possible cost (Mas-Colell et al., 1995). The chooser may also factor in time as an additional cost if he chooses to continue his search elsewhere. However, making these trade-offs between the costs and benefits associated with different alternatives may be difficult, and can often lead the chooser to experience some degree of cognitive conflict (Dhar, 1997). This is further accentuated by the fact that the chooser can only predict or imagine the potential benefits of the different options. In this regard decision making is often said to be subject to a degree of uncertainty, as the chooser cannot know for sure the extent to which each option will match his expectations (Savage, 1954; Shafir, Simonson & Tversky, 1993; Zeelenberg, van Dijk, Manstead & van der Pligt, 2000a).

In order to explain how people resolve such cognitive conflicts, economic rational decision making theorists have developed normative models, such as expected utility theory (von Neumann & Morgenstern, 1944), in which individuals assign probabilities to the possible outcomes, and calibrate utilities to value the outcomes accordingly. On the basis of this formal modelling approach, economists have subsequently long assumed people to have stable and well established preferences, which are simply called upon at the moment of choice, allowing the chooser to make their decision based upon the alternative with the highest value, or expected utility (Savage, 1954; von Neumann & Morgenstern, 1944; Perloff, 2010).

Following this, the four basic underlying assumptions of economic rational choice theory are as follows: 1) completeness (that all outcomes can be rank-

ordered in an order of preference); 2) transitivity (if option A is preferred to option B, and option B is preferred to option C, then option A is preferred to option C); 3) unlimited cognitive capacity (to comparatively weigh up each option against each other); and 4) perfect information (that an individual will always make fully informed decisions) (Watson, 2007). Indeed, as Perloff (2010) states, “as economists we assume that decision makers are aware of all the relevant information, know their own income, their own tastes, the relevant prices, and hence they make informed decisions” (pp. 126). On the basis of this economic theory then, if we know the decision-makers’ preference ranking, we can predict his or her choice infallibly. It is assumed, for example, that preferences will not be affected by variations of irrelevant features of options or outcomes (Payne, Bettman & Johnson, 1993). This has been referred to as ‘invariance’ (Tversky & Kahneman, 1986). For example, the choice should not be affected by the presence or absence of different lower-ranking alternatives, or by the way in which the alternatives are presented, or framed.

### *1.3 Violations of the Economic Perspective of Rational Decision Making*

However, as psychological research has shown, human beings frequently violate the principles of invariance and the basic assumptions of rational choice (Simon, 1955; 1956; Tversky & Kahneman, 1974; 1986; Shafir et al., 1993; Schwartz, 2004). Indeed, according to Simon (1955; 1956), people are not always rational decision makers, and the choices we make are more often the result of limited cognitive capacities, and environmental and situational influences (in terms of satisfying individual needs, or drives), rather than the rational processing of each alternative. Further, decision making theorists have proposed that people often rely on non-compensatory heuristics, or ‘rules of thumb’, rather

than appropriate statistical information during decision making (Tversky & Kahneman, 1974; Gilovich, Griffin & Kahneman, 2002), particularly in complex decision scenarios, or when the consumer is uncertain about their goals (Hogarth, 1987). These have been shown to lead to systematic biases in response, and according to Kahn and Baron (1995), may also “lead people away from considering options that may have greater {holistic} value” (pp. 325).

### *1.3.1 Framing Effects*

The first way in which the assumption of invariance has been shown to be violated relates to framing effects, in terms of the way in which options are described (Tversky & Kahneman, 1986). For example, in Tversky and Kahneman’s (1981) experiment, participants were presented with two versions of the Asian disease problem, which they are informed is expected to kill 600 people. Participants are informed that two alternative methods of combating the disease have been proposed. In the first scenario, participants were told that if they choose Option A, 200 people will be saved, and if they choose Option B, there is a one-third probability that 600 will be saved, and a two-thirds probability that no-one will be saved. When presented with this scenario the majority of participants were found to opt for Option A. However, in the second scenario, participants were told if they chose Option A then 400 people would die, or if they chose Option B, then there is a one-third probability that no-one would die, and a two-thirds probability that 600 people would die. In this instance the vast majority of participants were found to opt for Option B. Thus participants were found to judge the same outcomes very differently depending upon the way in which the problem was framed.

Similarly, in Shafir's (1993) experiment, participants were presented with a scenario in which they had to select which parent should be given custody of a child. The description of one parent was richer than the other: containing both more positive and more negative attributes. Participants were either asked to decide who should be granted custody, or who should be denied custody. Shafir (1993) found that the parent with the richer description was favoured under both instructions, presumably because the participants used the many positive attributes as reasons to accept when the question was framed this way, and yet focused on using the negative attributes as reasons to reject when the question was framed differently. Thus participants were found to reach different decisions based upon the same information, depending on how the information was framed. This goes against the economic assumption of invariance by showing that participants were influenced by the objectively 'irrelevant' feature of the wording of the question.

### *1.3.2 Anchoring*

Tversky and Kahneman (1974) identified three additional cognitive biases – anchoring, availability and representativeness. Each of these has been shown to influence the way people intuitively assess probabilities, thus potentially biasing judgements of expected utility, and leading to violations of the basic assumptions of rational choice theory. The first of these, 'anchoring', refers to the common tendency to rely too heavily, or 'anchor' to an implicitly suggested reference point when making judgements. This then leads to a bias towards adjusting the interpretation of subsequent information in light of the original anchor, or reference point. For example, in Tversky and Kahneman's (1974) experiment, participants were asked to guess the percentage of African nations

which were part of the United Nations. Participants were presented with one of two different anchors. In the first condition they were asked whether the percentage was more or less than 10%, whilst in the second condition they were asked whether the figure was more or less than 65%. The authors found that participants in the first condition guessed significantly lower amounts (an average of 25%) in comparison to participants in the second condition, who guessed an average of 45%. Thus the initial information presented to participants is seen to act as an anchor on which participants based their subsequent judgements.

Simonson and Tversky (1992) found similar effects using choices amongst consumer goods. In this experiment, the presence of a more expensive microwave oven was found to significantly increase the number of participants opting to choose a cheaper model of the same brand. Shafir et al., (1993) describe how these anchoring effects are often exploited in real-life sales tactics. The authors provide an example of a mail order business ('Williams-Sonoma') selling bread-baking appliances, who found that sales of a cheaper model were found to almost double when the business started selling another more expensive model. In each of these instances participants' judgements of the same objective outcomes were shown to be influenced by the presence of different anchors, or reference points. In addition, both Simonson and Tversky's (1992) experiment, and the case described by Shafir et al., (1993) also relate directly to the choice literature (discussed in section 1.4.1 below), in terms of demonstrating the motivational benefits that the provision of some choice can have over no choice.

### *1.3.3 Availability*

The second bias described by Tversky and Kahneman (1974) is that of 'availability'. This refers to the common tendency for people to predict an outcome based upon how easily an example can be brought to mind. For example, in their original experiment, Tversky and Kahneman (1973) asked participants to estimate the relative frequencies of letters in different positions in English words. For example participants were asked to estimate whether the letter 'R' was more likely to appear in the first or third position. The authors used five consonants (K, L, V, R and N) which in reality were each more frequently used in the third position. However, results demonstrated that the vast majority of participants judged each letter to be more frequently used in the first than third position. The authors interpret this bias as being due to the fact that people could easily think of examples of words that began with any of the letters, making this their immediate response. By contrast it is much more difficult to think of examples containing these letters as the third letter, and this lack of readily available alternatives leads to another systematic bias in judgement.

In addition, Slovic, Kunreuther and White (1974) describe how decisions to buy insurance for natural disasters are greatly affected by recent experiences. For example, the authors describe how in the aftermath of earthquakes or floods, sales of respective insurance policies rise sharply, but then steadily decrease from that point as vivid memories fade, thus providing a real-life example of the availability bias. People were found to judge the threat of specific natural disasters as more likely the more readily they could bring an example to mind. Similarly, Slovic, Fischhoff and Lichtenstein (1982), asked participants to estimate the number of deaths per year caused by disease, accident, natural disasters,

and homicide. The authors found participants frequently overestimated the number of deaths caused by dramatic means (such as accident, homicide, floods and tornados) and underestimated the number of deaths due to perhaps less vivid causes (such as diabetes, stroke, and asthma). The authors claim this is due to the fact that deaths by more dramatic means were more likely to be reported in the media, leading people to overestimate the frequency with which these events were likely to occur. Once again, this demonstrates an availability bias – where judgments of probability were found to be significantly influenced by the extent to which an example could readily be brought to mind.

#### *1.3.4 Representativeness*

The third heuristic discussed by Tversky and Kahneman (1974) is that of 'representativeness'. This is defined as a subjective judgement of the extent to which the event in question is "similar in properties to its parent population" (pp. 431, Kahneman & Tversky, 1972). In other words, the tendency people have of making judgements based upon their mental representations of what more closely fits a particular stereotype. For example, in Kahneman and Tversky's (1973) experiment, participants were asked to estimate the probability that 'Tom W' specialized in different University subjects. The authors found that participants' judgments were largely influenced by a description of Tom W's personality, and less on the base rate probability of Tom being that kind of student in the first place. Participants' judgments were based upon how representative they believed Tom was of a typical person interested in each of the subjects. In a similar study, Tversky and Kahneman (1983) found that the vast majority of participants judged it more likely that 'Linda' was a bank teller active in the feminist movement than just a bank teller. The subjects' based their

judgements upon a description of Linda's personality, and this led them to be biased in their judgements towards what they believed was representative of this description, thus ignoring base rates and the fact that the probability of two events occurring together (i.e. in "conjunction") is always less than or equal to the probability of either one occurring alone. Accordingly this effect has also been referred to as the 'conjunction fallacy' (Tversky & Kahneman, 1983).

Therefore to summarise so far, one important element of economic decision making theory relates to our ability to judge probabilities accurately. However, as this research demonstrates, limited cognitive capacities mean people often fall short of this (Simon, 1955; 1956), leading to frequent violations of the principles of rational choice and invariance. The use of these heuristics is perhaps particularly relevant within the context of extensive choice, as previous research has shown that whilst limited-choice contexts may invite people to engage in a process of rational optimization, in order to find the option that is best suited to them, in cases where the chooser is presented with extensive choice, they may try to balance the trade-off between accuracy and effort by adopting these potentially maladaptive simplifying judgement strategies (Payne, Bettman & Johnson, 1988).

#### *1.4 Economic Theory and Increased Choice*

Another key contention of economic theory is that "more choice is always preferred to less" (Perloff, 2010, pp. 121). To put it another way, if people are rational decision makers then expanding the choice set can never make people worse off, as it equates to fewer constraints (Botti & Iyengar, 2006). Indeed, increased choice is assumed to deliver greater satisfaction and chooser well-being on the basis that it increases the likelihood that individuals can satisfy their

personal preferences (Mas-Colell et al., 1995; Perloff, 2010), and on the basis of this assumption, increased choice has become the dominant focus of policy makers over the last 20 years (Schwartz, 2000; 2004; Botti & Iyengar, 2006). As Iyengar et al., (2004) state, 'the assumption that choice is both desirable and powerful is inherent to consumerism' (pp.85). Indeed, modern consumers are now offered vastly increased choice across a range of life domains in which choice was previously limited, including consumer goods (Iyengar, 2010; Iyengar & Lepper, 2000; Schwartz, 2004), health care (Schneider, 1998; Botti & McGill 2006; Botti & Iyengar, 2006; Luce 1998; Propper, Wilson & Burgess, 2005), pensions (Benartzi & Thaler, 2002; Iyengar et al., 2004; Iyengar & Kamenica, 2010; Thaler & Benartzi, 2004), education (Schwartz, 2004; Cullen, Jacob, & Levitt, 2006), entertainment (Iyengar, 2010; Schwartz, 2004), religion (Wolfe, 2001), and even personal identity (Schwartz, 2004). Indeed, the notion that this provision of choice is advantageous is widely accepted in modern society (Schwartz, 2000; 2004). However, recent psychological research has begun to question the extent to which this presumption holds true.

#### *1.4.1 The Benefits of Some Choice*

There is little doubt that some choice can improve individual welfare. For example, in Zuckerman, Porac, Lathin, Smith and Deci's (1978) experiment it was found that participants who were asked which of six puzzles they would like to complete experienced increased intrinsic motivation and overall task performance, compared to a control group who were told which tasks to undertake. Further, Deci and Ryan (1985) showed that by increasing intrinsic motivation, choice was associated with greater satisfaction and greater experience of positive affect. Indeed, the removal of choice has been shown to

be highly detrimental to individual well-being, often leading to feelings of helplessness and hopelessness (Seligman, 1975; Taylor & Brown, 1988). By giving people even seemingly trivial choices, life satisfaction and health has been shown to improve. For example, Langer and Rodin (1976) conducted an experiment in a nursing home, and found that residents who were offered greater choice and personal responsibility over simple matters such as how to arrange the furniture in their room, experienced significantly greater well-being, in terms of health and happiness and activity levels, in comparison to a control group who were not allowed the freedom to make these seemingly inconsequential decisions. In addition, as previously mentioned, both Simonson & Tversky (1992) and Shafir et al., (1993) found that participants experienced increased motivation to purchase a product when they were provided with limited choice over no choice. As such this research provides support for economic theories' contention that choice is beneficial to the individual. By providing greater intrinsic motivation and greater perceived control research has shown that some choice can be associated with greater well-being than situations in which choice is removed altogether.

However, notably, this early research into the benefits of choice concerns a comparison between the provision of some choice with no choice whatsoever, in situations involving relatively simple decisions. On the other hand, the vastly increased choice available in modern society often presents the individual with an extensive number of options, involving more complex decision scenarios (e.g. pensions, employment, education etc.). As such this has led more recent psychological research to challenge the basic assumption that more choice is always beneficial, by investigating the boundaries and limitations of this effect.

### *1.5 The Excess Choice Effect*

One avenue of research has aimed to directly investigate the impact of increased choice on consumer satisfaction and well-being. A number of researchers have shown that whilst some choice is good, more choice can be detrimental to satisfaction, and may a) lower the utility experienced from consumption of the chosen good, and b) dampen overall product demand. This negative impact of increased choice has been variously referred to as the “the problem of too much choice” (Fasolo, McClelland & Todd, 2007), the “choice overload hypothesis” (Iyengar & Lepper, 2000; Mogilner, Rudnick & Iyengar, 2008), the “overchoice effect” (Gourville & Soman, 2005), the “tyranny of choice” (Schwartz, 2000), the “too-much-choice effect” (Lenton, Fasolo & Todd, 2008; Scheibehenne, Greifeneder & Todd, 2009), and the excess-choice effect (Arunachalam, Henneberry, Lusk, & Norwood, 2009). Throughout this thesis I now refer to this effect as the ‘Excess Choice Effect’, or ‘ECE’. This phrase is selected for continued use as it is relatively neutral, and simply describes the effect being considered, where the other listed terms, such as ‘tyranny’, ‘problem’, ‘overload’, and ‘too much’ are comparatively more value laden.

Although subject to some debate (see, for example, Cardozo, 1965; Fornell, 1992; Gardial, Clemons, Woodruff, Schumann & Burns, 1994; Halstead, Hartman & Schmidt 1994; Oliver, 1997; Peterson & Wilson, 1992; Yi, 1990), based upon commonalities in the literature, Giese and Cote (2002) recently defined ‘satisfaction’ as ‘a summary affective response of varying intensity, with a time specific point of determination, which is directed towards focal aspects of product acquisition and/or consumption’ (pp. 2). As noted above, economic theory states that increased choice should, all else equal, increase satisfaction

with the chosen option (Dolan & White, 2007), in terms of eliciting a more intense positive affective response to the chosen item. However it now appears this is bounded and that in reality there appears to be an optimal threshold beyond which satisfaction with chosen options decreases as the option set increases (Shah & Wolford, 2007; Reutskaja & Hogarth, 2009). For instance, Iyengar and Lepper (2000), found that whilst large choice set sizes were initially more attractive, participants were more likely to purchase gourmet jams or chocolates or to undertake optional class essay assignments when offered a limited (6) rather than an extensive (24) array of choices. Moreover, participants reported greater subsequent satisfaction and reduced regret with their selections, and wrote objectively better essays, when their original set of options had been limited. The initial attractiveness of large choice set sizes and its' subsequently detrimental consequences has been referred to as the '*Paradox of Choice*' (Schwartz, 2000; 2004).

Similar findings have been found for more important choices. For example, Iyengar, Wells and Schwartz (2006) found that the presence of more choice is associated with lower chooser confidence and greater experiences of negative affect. Specifically, job seekers who pursued more job opportunities were found to achieve higher starting salaries, and yet were also less satisfied with their accepted job offer and reported less commitment to their position, than job seekers who pursued fewer job opportunities. This seems to indicate that even when more choices lead to seemingly objectively better outcomes, they may be perceived as worse subjectively.

Further, Iyengar et al., (2004) examined the ECE within the context of financial decision making, specifically with regard to pension investment

opportunities. The authors examined participation rates in the 401(k) pension plans (a contribution-based retirement plan that became popular in the USA in the 1980s) of approximately 800,000 employees in an investment management company. The number of different plans offered to employees ranged from 2 – 59. Results indicated that employees were most likely to participate in the pension plan if they were offered fewer than 10 options, and that increases in choice beyond this were associated with a decline in participation. As such, participants offered ‘too much’ choice (in this case, anything more than 10 options) were likely to ultimately forego considerable financial benefits, with potentially highly consequential implications for their (later) life circumstances.

Shar and Wolford (2007) investigated the influence of intermediate choice set sizes upon satisfaction. In their experiment, participants were presented with a selection of pens, in assortment sizes ranging from 2 – 20. Participants were informed that each of the pens was worth around \$2, and asked whether they would like to purchase one at a special rate of \$1. The number of participants choosing to purchase pens according to the number of options available formed the primary dependent measure. Consistent with the findings of Iyengar et al., (2004), the authors found that the likelihood of participants choosing to purchase a pen increased until an optimum of ten options. After this point as choice increased, the likelihood of participants choosing to purchase a pen decreased. The authors’ state this demonstrates that satisfaction is a curvilinear function of the number of options available, and that when choice sets were small, satisfaction (i.e. buying behaviour) was high as consumers were able to find an option that satisfied their needs. Conversely, as choice levels continued to increase participants found their decisions systematically more difficult, leading to

reduced satisfaction. This provides further evidence for the ECE, by identifying 10 options as being optimal for satisfaction, after which point further increases in choice set size lead to systematic decreases in satisfaction with decision outcome.

Reutskaja and Hogarth (2009) found a similar pattern of results. In their experiment, participants were asked to select a gift-box for a friend from a selection of either 5, 10, 15 or 30 options. The authors found that satisfaction with both decision outcome and decision process was highest for the medium sized (10 and 15) option sets, providing support for Shar and Wolford's (2007) suggestion that satisfaction is an inverted U-shaped function of the number of alternatives available.

Lee and Lee (2004) also found evidence of the ECE in their on-line experiment. Participants were asked to select which CD player they would want to buy for a friend's birthday, where the number of alternatives available ranged from 18 – 27. Results indicated that participants felt more confused and less satisfied with their choices in the 27-alternative condition, than in the 18-alternative condition. Similarly, In Mogilner et al.'s (2008) experiment, participants were shown a menu of either a limited (5) or an extensive (50) number of coffee options. These options were either grouped into informative categories such as 'spicy', 'nutty', 'mild', 'earthy' and so on; uninformative categories based upon letters of the alphabet e.g. 'category A', 'category B' and so on; or were simply not categorized at all. After choosing which coffee they would like to sample all participants were then given a small amount of the same coffee to try, allowing for a controlled examination of the effects of categorization and assortment size upon satisfaction. The authors found that satisfaction in the

extensive choice, uncategorized group was significantly lower than satisfaction in the limited choice groups, and either of the extensive choice, categorized groups. This provides evidence for the ECE. The presence of categories was found to simplify the extensive choice set, and subsequently participants were better able to cope with making a decision from a large number of options; something which was otherwise associated with decreased satisfaction.

Chernev (2003a; 2003b) also found evidence for an ECE. In his (2003a) experiment, participants in an 'articulated preference' condition were asked to think about their ideal chocolate, and to then rank order a list of attributes (for example, nuts versus no nuts) in terms of their desirability. Participants were then presented with either a large (16 options) or a small (4 options) assortment of chocolates, and were asked to select the option which was most attractive to them. Chernev (2003a) found that for large assortments, participants without a strong pre-articulated 'ideal point' were significantly more likely to switch to a selection of the most popular chocolates as a thank-you for participating, as opposed to sticking with the chocolate they had identified as most attractive, with a greater likelihood of switching indicating lower satisfaction with initial choice. For choices made using the small assortment no significant effects of ideal point availability were found. Chernev (2003a) suggests this demonstrates that selections from large assortments can lead to weaker preferences and reduced satisfaction (as shown by a greater likelihood of switching to a default 'most popular' option), in cases where participants do not have a clear, articulated starting ideal point.

Chernev found similar results in his (2003b) experiment, which also involved satisfaction with chocolate choice. In this case participants were asked

whether they would like to select from the extensive (20) or the limited (8) selection, and were also asked to evaluate the attractiveness of their chosen option, as well as their confidence that they had picked the best option available. Results indicated that participants who were asked to articulate their preferences were more likely to make their selection from the extensive, rather than the limited choice set. However subsequent confidence levels were found to vary as a function of assortment size – with participants being generally more confident that they had picked the best option from the selection when choosing from the limited choice set, thus demonstrating that extensive choice led to reduced confidence in the quality of decision outcomes.

Greifeneder, Scheibehenne and Kleber (2010) found evidence for an ECE, and also found evidence that the presence of the ECE was dependent on choice complexity, and the number of attributes that alternatives are differentiated on. In their experiment, Greifeneder et al., (2010) asked participants to choose the coloured pen they liked the most from a limited (6), medium (15), or extensive (30) selection, wherein the number of attributes that the alternatives differentiated on was also manipulated (1 versus 6 in experiment one, and 4 versus 9 in experiment two). Results indicated that when the alternatives were differentiated on the maximum number of attributes (i.e. 6 in experiment one, 9 in experiment two), satisfaction decreased with increased choice. The authors' state this demonstrates that the ECE may be more likely when choosing is complex. Finally, a real-life example of the ECE stems from Proctor and Gamble, who found that sales of their 'Head and Shoulders' shampoo increased by 10% when they reduced the number of varieties of the brand on sale (see Goldstein, 2001). Thus, in numerous instances, it has been demonstrated that increased choice

can be associated with decreased satisfaction and confidence in the chosen outcome, decreased product demand, and greater experience of negative affect.

### *1.5.1 Evidence Against the ECE*

However, the universality of the ECE has been challenged. Some researchers have found no evidence of the ECE. For example, in Arunachalam et al.'s (2009) experiment, participants were found to be significantly more likely to opt for a soda over cash as payment for participation in a study if they were shown an extensive selection of 24 different flavours, rather than a limited choice of just 6 flavours. The authors state this demonstrates an 'anti-ECE', by supporting the standard economic model that more choice is beneficial to chooser motivation.

Berger, Draganska and Simonson (2007) also found no evidence for the ECE. In their experiment, participants were asked to select the chocolate they would most like to sample from one of two different brands. One brand contained an intermediate (10) selection of chocolates, whilst the second brand contained an extensive (30) number of options. After choosing and sampling a chocolate, participants rated perceived quality of the product and brand, as well as their likelihood of purchase. The authors found that despite the fact that participants rated choosing from the extensive choice as more difficult and frustrating; the majority of participants were attracted to the brand offering the extensive, rather than the limited selection of chocolates. In addition, quality ratings, and likelihood of purchase were both found to be higher for the brand offering the extensive selection of chocolates, in comparison to the intermediate choice brand. The authors' interpret this as demonstrating that the size of a brand's assortment may be seen as a quality cue.

Kahn and Wansink (2004) found that assortment size, as well as the perceived variety and structure of that assortment could influence consumption levels. In their experiment, participants were offered jelly beans to eat, from either a limited (6 colours) or an extensive (24 colours) selection. These assortments were either organised by colour, or scrambled altogether (disorganised selection). Kahn and Wansink (2004) observed that consumption levels increased as choice level increased, for organised assortments (no difference was found for disorganised assortments). However it may be questionable to assume that increased consumption necessarily equates to increased satisfaction. This point was demonstrated by Reibstein, Youngblood, and Fromkin (1975) who also found that increased choice lead to increased consumption. In their experiment, participants were asked to select which soft drink they would like to try from either a limited (2) or an increased (4) selection of flavours. Participants' consumption and satisfaction levels were then examined. The authors found that participants who chose from the increased selection drank more of their chosen drink, than participants who chose from the more limited selection. However, even though there were increases in consumption levels, no differences were found in terms of satisfaction levels. As such this raises doubt over the use of either of these two studies showing increased consumption with increased choice as providing evidence against the ECE, even though the former was considered relevant in Scheibehenne, Greifeneder and Todd's (2010) meta-analyses (discussed momentarily below).

Scheibehenne et al., (2009) found no evidence for the ECE except in a study which called for choice justifications. The authors conducted a series of studies to examine potential moderators of the ECE. In the first study option

variety was manipulated. Participants read descriptions of either a large (30) or small (5) variety of restaurants, and were then asked whether they would prefer cash or a voucher to dine at one of the restaurants. The authors found no evidence of the ECE, with participants in both large and small variety conditions being equally likely to opt for a restaurant voucher over cash. The authors then examined the moderating impact of prior preferences, cultural differences, further increases in choice set size and choice justification on the ECE. Of these four manipulations only choice justification was found to elicit an ECE. The authors claim this fits with the assumption that justification becomes more difficult when options become more difficult to distinguish from one another – which naturally increases as assortments grow larger. This assumption is further supported by Sela, Berger and Liu (2009), who found that because choosing from larger assortment sizes is more difficult, people will select options which are easiest to justify. In their experiment, participants presented with a large selection of 10 ice cream flavours were much more likely to select a reduced fat option than participants who were presented with a limited selection of only 2 options. The authors suggest that this is because when presented with increased choice, people will choose options that are easier to justify.

Finally, Scheibehenne et al., (2010) conducted a meta-analysis of 50 studies which had examined the ECE, and found an overall effect size of virtually zero, meaning that no evidence was found for a reliable occurrence of the ECE across the choice literature. Nevertheless the large degree of variance in study outcomes led the authors to conclude that a theoretical account which could help to cover the divergent findings was needed. It is suggested that this may depend on the prevalence of particular moderator variables, such as a call for post-

decisional justifications (see Scheibehenne et al. 2009), and the interaction between the structure of the choice assortment and decision processes. For example, this could involve the interaction between choice complexity, in terms of the number of attributes that alternatives are differentiated on (see for example, Greifeneder et al., 2010), with individual differences in the degree to which decision makers make use of complex versus heuristic decision processes (see for example, Scheibehenne & Todd, 2009).

The main aim of the current research was to investigate the potentially causal role of counterfactual thought in driving the ECE. The rationale for this is provided in Section 1.6 below. If supportive evidence is found for this overarching hypothesis, it is possible that this in turn may go some way to explaining some of the divergent findings noted in Scheibehenne et al.,'s (2010) meta-analyses. Specifically, it may be the case that variability in the experimental circumstances of studies considered in the meta-analyses may have made counterfactual alternatives more or less readily available. As such, via predicted influence on counterfactual generation, it is possible that there are certain situational factors which may be influential in determining the prevalence of the ECE. Evidence for factors known to influence the availability of counterfactual thoughts, alongside the predicted impact of each upon the ECE is considered in Sections 1.8 and 1.9 below, whilst the potential for the current research to explain the divergent findings noted in Scheibehenne et al.,'s (2010) meta-analyses is a point to which I will return in greater detail in Chapter 6.

### *1.5.2 Existing Explanations for the ECE*

There are several, not necessarily mutually exclusive, existing explanations for the ECE. From an economic perspective, as the number of

options increases the marginal value of the chosen option may decrease because more of the rejected alternatives share positive attributes with the chosen option or may even have positive attributes that the chosen option lacks. That is, "opportunity costs", i.e. the loss of benefits associated with the next best alternative foregone, tend to increase with option size reducing the satisfaction with the actual option chosen. However, while opportunity cost might explain a reduction in marginal satisfaction from a larger choice set it does not explain why people show less satisfaction in absolute terms when faced with more options. If one is a perfectly rational decision maker then the option chosen is still the best available and should provide the highest level of satisfaction under the circumstances and certainly no lower than selecting the same alternative from a smaller choice set.

However, as previously mentioned, psychological research stretching back to Simon (1956) has demonstrated that people repeatedly fall short of perfectly rational decision making due to limited cognitive capacity. Consequently, individuals are rarely able to fully process all the possible information that they would need to make an optimal choice (Botti & Iyengar, 2006); a problem that grows with choice set size (Dhar, 1997; Gourville & Soman, 2005; Huffman & Kahn, 1998; Schwartz, 2004; Fasolo, Hertwig, Huber, & Ludwig, 2009). This may lead to decisions made from extensive selections being harder to justify (Scheibehenne et al., 2009; Sela et al., 2009), or to the use of potentially maladaptive simplifying decision making heuristics (Payne et al., 1988; Tversky & Kahneman, 1974). In either case this may result in reduced enjoyment with decision outcomes which are likely to be perceived as suboptimal. Further, Schwartz (2004) argues that this can lead to an increased likelihood of regret,

making decisions both harder to make in the first place (anticipated regret) and harder to enjoy (post-decisional regret). Supporting this suggestion a number of studies have found more self-reported regret for options chosen from larger choice sets (Schwartz, Ward, Monterosso, Lyubomirsky, White & Lehman, 2002; Iyengar & Lepper, 2000). Indeed, Roese & Summerville (2005) suggest that the top six biggest regrets in life involve those areas which offer the *greatest amount of choice and opportunity*, namely; education, career, romance, parenting, the self and leisure.

## *1.6 Developing the Rationale for the Current Research*

### *1.6.1 Regret as a Counterfactual Emotion*

But how is it that we come to experience more regret as choice levels increase? Regret is defined as a negative cognitively determined emotion that we experience when realizing or imagining that our present situation would have been better, had we acted differently (Zeelenberg, 1999). In this respect, regret has been termed a counterfactual emotion, in that the experience of regret cannot occur without a prior counterfactual inference (Kahneman & Miller, 1986; Landman, 1993). Epstein and Roese (2008) define counterfactuals as evaluative thoughts about imagined alternatives to past events, which are typically associated with various negative emotions (see Kahneman & Miller, 1986; Niedenthal, Tangney, & Gavanski, 1994; Roese, 1997; Roese & Olson, 1995). They are epitomised by the phrase “what might have been” and may serve the important beneficial functions of behaviour and mood regulation. As the number of available options increases the range of alternative states of the world that did not actually occur, i.e. counterfactuals, also increases. The current thesis suggests that previous research which has noted a link between increased

choice and regret (e.g. Iyengar & Lepper, 2000; Schwartz et al., 2002; Roese & Summerville, 2005) may have picked up on one aspect of a general increase in counterfactual thought. Supporting this contention, Markman, Gavanski, Sherman, and McMullen (1993) showed that generating counterfactuals heightened general feelings of dissatisfaction. Consequently I suggest that it is counterfactual thoughts concerning the realisation that better choice alternatives may have potentially been foregone which may drive the experience of regret and ultimately undermine satisfaction.

### *1.6.2 Summary of Main Aim of the Current Thesis*

Therefore, to summarise so far, the main aim of the current thesis was to explore an alternative explanation for the ECE. Section 1.5.2 reviewed evidence that increased choice has been associated with increased regret (e.g. Iyengar & Lepper, 2000; Schwartz et al., 2002; Roese & Summerville, 2005). Following this association, and the nature of regret as a counterfactual emotion, the current research suggests that the ECE may be attributable to a general increase in counterfactual thought. As the more options one has available increases, it is likely that post-decisional counterfactual thoughts concerning potentially 'better' imagined alternatives will also increase. It is predicted that it is this increased imagination of potentially 'better' alternatives which may be detrimental to satisfaction. What follows now, and for the remainder of this chapter is an introduction to relevant aspects of the counterfactual literature. I also explain how, based upon this literature, I intend to manipulate various factors which should influence the availability of counterfactual thoughts, in order to examine the subsequent impact on the prevalence of the ECE.

### 1.7 What is Counterfactual Thinking?

Counterfactuals have been defined as evaluative thoughts about imagined alternatives to past events (Epstude & Roese, 2008), epitomised by the phrase “what might have been” (Roese, 1997). Research into counterfactual thinking has found that people create counterfactual alternatives to reality by mentally undoing certain facts in their mental representation of reality (Byrne, 2005). Indeed, according to Roese and Olson (1995), in order to generate a counterfactual thought one typically starts with some factual outcome as the point of departure for the counterfactual supposition, and then alters (or *mutates*) some factual antecedent, whilst simultaneously assessing the possible consequences of that alteration. These counterfactual thoughts usually move in a direction that brings simulated occurrences closer to default expectations about how the world works. As Roese and Olson (1995) state, ‘counterfactuals recapitulate expectations’ (pp. 28). According to McEleney and Byrne (2006), this tendency to compare states of reality with ‘what might have been’ is a universal characteristic of human thought, which has been documented to occur from early childhood (Harris, 2000), and across cultures (see, for example, Gilovich, Wang, Regan, & Nishina, 2003).

Spontaneously generated counterfactuals tend to be upward (i.e. imagining how an outcome could have turned out better had one acted differently), suggesting an overall emphasis on improvement (Nasco & Marsh, 1999; Roese & Olson, 1995; Koehler & Harvey, 2004). Such counterfactuals are typically associated with the experience of a range of negative affect including shame, guilt, disappointment and regret (Kahneman & Miller, 1986; Niedenthal et al., 1994; Roese, 1997; Roese & Olson, 1995). As Kahneman and Tversky (1982b, pp. 202) state, mental simulations typically have ‘implications for

emotions that arise when reality is compared with a favoured alternative, which one had failed to reach but could easily imagine reaching'. Conversely, downward counterfactuals are considerations of how things could have turned out worse, and these thoughts are usually associated with the experience of positive affect, such as relief (Roese, 1997). It has been argued that counterfactuals typically involve and may serve the important beneficial functions of mood and behaviour regulation (Roese & Olson, 1995), in terms of providing a source of motivation to consider how the event happened, and how one could strive to prevent its future occurrence (see also, Zeelenberg, 1999).

In Sections 1.2 and 1.3 I considered the basic assumptions of rational decision making from an economic perspective, and psychological evidence demonstrating how people frequently violate these principles. It has been argued that each of these simplifying heuristics often used in judgements of probability may relate back to an underlying process of counterfactual thought (e.g. Byrne, 2005). In each instance people imagine alternatives to reality which are consistent with their mental representations (Byrne, 1997; Legrenzi, Girotto, & Johnson-Laird, 1993). For example, regarding the availability and representativeness heuristics, people are shown to be biased towards outcomes for which alternatives are more readily available, or outcomes which are consistent with their mental representations of reality. On the other hand, in the case of anchoring, the anchored information is immutable, akin to a single possibility idea. Thus people find it difficult to imagine an alternative to it. This explains why judgements are often found to be biased in favour of the anchored information, as people find it very difficult to move away from this as a starting point.

However, that people frequently violate the principles of economic rational decision making based upon the ease with which counterfactual alternatives come to mind, does not necessarily mean that this process is *irrational*. Indeed, it has been argued that the counterfactual imagination of possibilities is organized along the same principles as rational thought (Byrne, 2005). Byrne (2005) suggests three main steps to illustrate this conclusion: 1) that humans' are capable of rational thought, despite the exhibition of systematic errors in judgement. 2) That the principles that guide people to think about possibilities are rational, in that they provide one with the competence to make rational decisions, even if these are then restricted by the limitations of working memory. 3) Finally, that the same principles which guide a process of rational thought also guide the counterfactual imagination. This is further reflected by the fact that some aspects of reality are found to be more commonly altered than others, and these aspects are known as 'fault lines' of reality, or points at which reality appears to be 'mutable' (Kahneman & Tversky, 1982a; Roese & Olson, 1995). Evidence for each of these 'fault lines' is now considered in turn.

### *1.8 Counterfactual Mutability*

#### *1.8.1 Exceptional versus Routine Events*

Research has shown that people tend to imagine alternatives to exceptional events more readily than routine events (Kahneman & Miller, 1986; Gavanski & Wells, 1989). In Kahneman & Tversky's (1982a) experiment, for instance, participants read a scenario detailing an automobile accident. Participants were informed that the person involved had either a) left work early but drove home by his usual route, or b) left work at the normal time but took an unusual route home, and were then asked to imagine how the event could have

been avoided. The authors found that people typically mutated the exception rather than the norm, i.e. when the departure time was exceptional, participants noted the accident could have been avoided if he left work at the normal time. Conversely when the route taken was exceptional then most participants noted that it could have been avoided had he taken his usual route. Kahneman and Miller (1986) state this demonstrates a fundamental tendency to create counterfactual alternatives which reflect normality or typicality.

Lundberg and Frost (1992) found a similar pattern of results. Their experiment was conducted within the field of financial decision making, and asked participants to read a series of scenarios detailing misplaced investment opportunities. In each case both a routine and an exceptional circumstance led the protagonist to lose money. For example, in one case participants read how 'Mr. Jones' needed to place stops on his investments one afternoon, before a predicted drop in the market at the end of the day, which would have caused him to lose money. However, that afternoon he had to attend a business lunch, which participants are told was a frequent occurrence. As such he left his trusted colleague, well known for his reliability, in charge of placing the stops. Out of character, the colleague simply forgot to place the stops, and Mr Jones subsequently saw what had been a significant profit earlier on that day turn into a substantial loss. Participants are asked to imagine how Mr Jones would be feeling, and to complete one or more likely 'If only.....' thoughts he may have had. Lundberg and Frost (1992) found that participants were significantly more likely to undo the exceptional, rather than the routine, event in each situation, i.e. 'if only my colleague had not forgotten to place the stops', rather than 'if only I had not gone out to lunch'. By transferring to a domain in which participants made

judgements requiring expertise and the evaluation of technical information, the authors conclude that this is a robust finding, and one which is not limited to relatively more easily understood judgements of social interactions (see also, Buck & Miller, 1994).

### *1.8.2 Action versus Inaction*

Another debated determinant of counterfactual mutability concerns the *action effect*, whereby research has shown that people may be more likely to generate counterfactual thoughts following action than inaction (Byrne, 2005; Gilovich & Medvec, 1995). One of the earliest investigations into the effect was conducted by Kahneman and Tversky (1982a), in which participants were asked to consider two hypothetical scenarios. In the first, Paul considered switching his stocks from Company A to Company B, but decided against it. In the second, George considered the same switch in stocks, and decided to make the switch. Thus the outcome of Paul's decision can be seen to stem from inaction, whilst the outcome of George's decision is the result of action. Participants were informed that both Paul and George would have been better off by \$1200 if they had chosen the alternative course of action (or inaction), i.e. Paul would have been better off financially had he swapped his stocks, whilst George would have been better off had he not swapped his stocks. Participants were asked to judge which investor would experience the most regret at this loss of income. The vast majority (92%) of participants believed George, the actor, would feel more regret than Paul, the non-actor.

Numerous other studies have replicated this effect, leading Gilovich and Medvec (1995) to conclude that the action effect is one of the most robust findings in the counterfactual literature. For example, using a variety of

hypothetical scenarios, Landman (1987) demonstrated that good outcomes were viewed more favourably, and bad outcomes more negatively when these were achieved through action, than when the same outcomes were achieved through inaction. Gleicher, Kost, Baker, Strathman, Richman and Sherman (1990) varied the salience and outcome valence of the investment scenario, and also found that where outcomes were negative, actions were associated with greater experience of negative affect than failures to act. When outcomes were positive, participants were found to experience greater positive affect following action, but only when the counterfactual alternative was made highly salient. Similarly, in Avni-Babad's (2003) experiment, participants were provided with a version of the investment scenario, minus counterfactual information regarding how the investment would have turned out had the investor decided to do the opposite (i.e. act or not act). The action effect was replicated – participants judged that the actor would generate more counterfactual thoughts, and would experience greater levels of regret than the non-actor, even in the absence of prior counterfactual information.

In Ritov and Baron's (1990) experiment, participants were asked to imagine a scenario in which they had a choice of either killing 5 people (i.e. through action), or letting 10 people die (through inaction). The authors found that participants consistently opted to do nothing. This provides further evidence for the action effect, as the potential regret stemming from action was judged to be significantly greater than the comparative regret resulting from inaction. In addition, Zeelenberg, van der Pligt and Manstead (1998) coded data from 64 cases presented on Dutch TV show 'I Am Sorry', which gave individuals the opportunity to apologise to individuals they had fallen out with. The authors found

a significant focus on actions, with most participants choosing to apologise for things they had done, as opposed to things they failed to do (Study 1). This finding was further replicated in a second experiment (Study 2a) using a large scale survey of the Dutch population, in which participants were asked whether they typically felt more regret following actions or failures to act. Once again, results indicated that the majority of participants reported experiencing more regret following actions than inactions.

Connolly, Ordóñez and Coughlan (1997) also replicated the action effect in their experiment using a hypothetical scenario in which the person described either switched, or didn't switch, from aspects of a required university course. The authors found that participants judged that a person who experienced the same outcome as a result of action would experience greater regret in response to a negative outcome, and greater elation in response to a positive outcome, than a person who experienced the same outcomes as a result of inaction. As the same results were obtained whether the action was the result of the persons' own choice or through random computer re-assignment, the authors' claim this demonstrates that control and responsibility for action do not appear to be key to the prevalence of the action effect. Further, Byrne and McEleney (2000) (Experiment 1) used Kahneman and Tversky's (1982a) original investment scenario, and found that participants judged the actor to experience more regret than the non-actor, when the outcomes of the scenarios were both known and the same. These findings were also replicated in Experiment 3, which used a variation of the investment scenario, but with a negative outset, demonstrating that results were not dependent upon a neutral initial scenario state.

Other research has identified potential explanations for the effect. According to Norm Theory (Kahneman & Miller, 1986) actions are rendered more mutable than failures to act as a result of inaction being perceived as more normal. Thus, in deciding to act, a person is acting 'abnormally', and thus counterfactual alternatives become more readily available (i.e. the event is more mutable), than if one is considering the same outcome caused as a result of inaction. Kahneman and Tversky (1982a) suggest that this may lead to emotional amplification, whereby people have a tendency to react more strongly to those events for which it is easiest to imagine another outcome occurring. This has been attributed to mental models (Byrne & McEleney, 2000), and the more explicit representations people hold in mind for action (this will be discussed in greater detail in Chapter 4).

Additional research has identified limitations to the action effect including N'gbala and Branscombe (1997) who found that the effect only occurred when people were able to directly compare the consequences of action with those of inaction. In addition, by providing a measure of mutability the authors found that whether the action/inaction versions of events were presented alone or together, they were both mutated with equal frequency, seemingly contrary to norm theory's account. Zeelenberg, van den Bos, van Dijk and Pieters' (2002), also found evidence that the action effect only occurred when prior information was both available and positive. However, a more extensive introduction to the action effect literature and potential explanations for the effect is provided in Chapter 4, in which I investigate the potential for default options to improve satisfaction with extensive choice, due to the predicted impact of defaults (or inaction) upon counterfactual thought.

### *1.8.3 Controllable versus Uncontrollable Antecedents*

Other research has found that people tend to generate counterfactuals more readily following controllable than uncontrollable antecedents. For example, in Girotto, Legrenzi and Rizzo's (1991) experiment, participants were asked to read a scenario in which the protagonists' drive home was delayed for several reasons. The authors found that participants were more likely to generate counterfactual thoughts regarding aspects which were under the protagonists' direct control (such as stopping for a beer), rather than aspects which were beyond his control (such as stopping for traffic). McCloy and Byrne (2000) furthered this using an alternative version of the scenario. The authors found that participants were most likely to focus on events that were within the protagonists' control which had previously been deemed to be socially unacceptable, i.e. choosing to stop for a burger, over factors which were more socially acceptable e.g. visiting his parents.

In Markman, Gavanski, Sherman and McMullen's (1995) experiment, participants played a computer simulated 'wheel of fortune' game. Participants were shown two spinning wheels, and were told that the outcome of one would determine how many lottery tickets they won, whilst the outcome of the other would determine how much a second player (actually a confederate) won. The game was fixed to either result in the participant either experiencing a 'near-big-win', in which they narrowly missed the jackpot of 75 lottery tickets, and landed on 10 instead, paired with a loss to the other player. Alternatively participants experienced a 'near-big-miss', in which they narrowly avoided landing on bankrupt and got 10 tickets instead, paired with a big win by the other player. Control was manipulated by either allowing participants to spin the wheel for

themselves, or by allowing participants to choose which of the 2 wheels would be theirs. The authors found that participants were significantly more likely to generate counterfactual thoughts about the aspect of the game which they perceived to be under their control. In addition, these counterfactual thoughts were found to predict affective reactions to the spin outcome. Specifically, satisfaction was found to decrease as the number of counterfactual thoughts generated increased. The authors suggest these results demonstrate that it is the features of a game which are focused on, which determine the alternatives to reality which are imagined, in line with the counterfactual availability heuristic.

#### *1.8.4 Negative versus Positive Outcomes*

Research has also found that counterfactuals may be cued more readily following negative than positive decision outcomes (Roese, 1997; Boninger, Gleicher & Strathman, 1994; Sanna & Turley, 1996; Tsiros & Mittal, 2000). For example, using both a scenario study and a real-life example of satisfaction following exam performance, Sanna and Turley (1996) found that counterfactuals were three times more likely to be generated following negative than positive outcomes. In their experiment, participants were asked to read a vignette in which the protagonist, Pat (who either typically performed well or poorly in courses), had either passed or failed a recent exam. Participants were asked to retell the story into microphones, and the number of spontaneously generated counterfactuals was recorded (Study 1). The authors found that participants were significantly more likely to generate counterfactual thoughts where outcomes were negative, and in which prior expectations had been violated. This effect was replicated in a second study (Study 2), which examined the impact of outcome valence upon counterfactual generation following real-life exam performance.

Specifically, as outcomes became more positive, the number of spontaneously generated counterfactuals decreased.

Tsiros and Mittal (2000) found similar results. Their experiment used a hypothetical purchasing scenario in which the protagonist, Paul, wished to purchase a laptop computer. Participants were provided with either positive or negative feedback information about the outcome of his decision (Study 4). The authors found that participants were significantly more likely to generate counterfactual thoughts when the feedback information provided to them was negative. Further, in line with the overarching hypothesis of the current thesis, the authors found evidence that it was this increased tendency to engage in a process of counterfactual thought which drove the experience of regret, ultimately undermining satisfaction.

In addition, Walchi and Landman (2003) examined the impact of counterfactual thought on consumer affect. In their experiment, participants who were involved in job-searching were asked to read a description of a software programme designed to customise CV's for applications to different organisations. Participants were told to imagine they had purchased and used the programme, and were then given feedback relating to the success of their job search. In the positive feedback condition, participants were informed that their CV had been identified as an important contributing factor to the success of their job search. In the negative feedback condition participants were told that their CV had been identified as the major reason why they hadn't been invited for interviews, whilst participants in the neutral feedback condition were told their job search was proceeding satisfactorily, and received no feedback regarding their CV. The authors found that participants who received negative feedback

exhibited significantly greater levels of spontaneous counterfactual thought and regret, in comparison to the other two conditions.

Other evidence for the effect of valence upon counterfactual generation is more indirect. For example, both Gleicher et al., (1990) and Landman (1987) used Kahneman and Tversky's (1982a) investment scenario, and only found evidence for an action effect when outcomes were negative. When outcomes were positive the action/inaction manipulation had a reduced impact upon affective reactions, suggesting that counterfactual thoughts were more readily cued, and subsequently more influential in judgements pertaining to negative outcomes. However, other researchers have failed to find evidence of this effect. For example, in Roese & Olson's (1993) scenario based study, participants were found to generate counterfactual alternatives following positive and negative outcomes with equal frequency (see also Markman et al., 1993). However, a more extensive introduction into the existing research on counterfactuals and valence will be provided in Chapter 5. In that chapter I investigate whether valence may be influential in determining the prevalence of the ECE, due to its predicted impact upon counterfactual thought.

### *1.9 Existing Links between the ECE and Counterfactual Thought*

Previous research has theoretically linked the ECE with counterfactual thought. For example, Anderson (2003) suggested that the mutability of alternatives could directly impact upon decision-satisfaction as increased counterfactual thought is associated with increased regret. Further, Gingras (2003) found that participants were less satisfied with decisions made from diverse options, as opposed to more similar options, and attributed this difference to increased counterfactual thought. However, despite this body of research, and

the fact that the notion of counterfactuals appears to be at the heart of theorising about the ECE (Schwartz et al., 2002; Schwartz, 2004), it is somewhat surprising that no studies, as far as I am aware, have actually tried to measure their presence in conditions of more vs. less choice.

Sagi and Friedland (2007) argued that counterfactuals may not be as important to judgments of regret following choice as other authors have suggested. In their experiment, participants read a scenario detailing possible options of ways to spend a free evening, and were told to imagine that they had chosen to go to the cinema, and that the film they watched turned out to be long and boring. Participants were then asked to imagine the regret they might feel for having chosen this option. The authors found that increasing option set size and increasing option diversity lead to increased regret, and on the assumption that unpopular options would not be simulated counterfactually as alternative choices, they argued that counterfactual thinking was unlikely to play a role in decision regret.

However, it is not unreasonable to suggest that the consideration of alternatives and the simulation of their characteristics is also a process that involves some form of counterfactual thought. In addition, in that research comparisons were drawn about increased choice on the basis only of decisions made between 2 vs. 3 alternatives, and no direct measure of counterfactual thought was utilized. The current experiments subsequently aim to investigate the authors' claim that increased option set size cannot lead to increased counterfactual thought. This will be done by a) directly examining the prevalence of counterfactual thoughts in conditions of more vs. less choice, and b)

manipulating counterfactual availability through various means in order to determine any impact upon the ECE.

### *1.10 Manipulating Counterfactual Thought*

One possible way of undermining the systematic generation of counterfactuals is through the introduction of a cognitive load dual-task (Ward & Mann, 2000). Previous research (e.g. De Neys & Schaeken, 2007) has found that activities which involve effortful processing become harder when cognitive resources are burdened through a cognitive load dual-task. Although counterfactuals may vary in the degree to which their generation relies on effortful processing (see for example, Kahneman, 1995; Goldinger, Kleider, Azuma, & Beike, 2003; I return to a discussion of this point in Chapter 2), there is consistent evidence that reasoning about counterfactual possibilities draws upon executive processes, including working memory. This has been shown in developmental research where the link between working memory and counterfactual thinking is well established (see, for example, Müller, Miller, Michalczyk & Karapinka, 2007; Beck, Riggs & Gorniak, 2009), and has been shown to extend to judgements that are often considered to be influenced by the automatic activation of counterfactual thoughts (Morsanyi & Handley, 2008). In addition, patients with dysexecutive syndrome associated with prefrontal lobe lesions demonstrate relatively specific deficits of counterfactual thinking (e.g., Gomez-Beldarrain, Garcia-Monco, Astigarraga, Gonzalez, & Grafman, 2005) as do patients with disorders associated with frontal lobe functioning, namely Parkinson's Disease (McNamara, Durso, Brown, & Lynch, 2003) and schizophrenia (Hooker, Roese & Park, 2000).

Indeed, thinking counterfactually depends upon considering multiple possibilities (Byrne, 2005), the representation of which is considered to draw upon the resources of working memory (Johnson-Laird & Byrne, 1991). For example, Ward and Mann (2000) found that normally restrained eaters ate considerably more when placed under a high cognitive load. The authors attribute this to the fact that when placed under high load, participants were unable to engage in a process of counterfactual thinking in which they would normally compare their current behaviour with a standard or ideal state, leading to relatively unrestrained behaviour.

Consequently one objective of the current thesis was to explore the impact of load upon the prevalence of the ECE. Assuming load is found to reduce counterfactual thinking then one would also expect a high load to reduce the ECE, if the effect is being driven by an underlying process of counterfactual thought. These hypotheses were tested in Experiment 1. Experiment 2 examines whether a similar process may account for the 'paradox of reversibility', where research has shown that having the opportunity to change your mind post-decision may also be counter-intuitively detrimental to satisfaction (evidence for this effect is reviewed in Chapter 2).

Notably, it is possible that the addition of a secondary load task may also impact upon other potential explanations for the ECE. For example, when placed under high load a) a person may feel even less able to fully process all of the available information presented to them (Simon, 1956; Huffman & Kahn, 1998; Botti & Iyengar, 2006), which may mean that b) decisions are made even harder to justify (Scheibehenne et al., 2009; Sela et al., 2009), or c) that the individual may be more likely to adopt potentially maladaptive decision strategies (see, for

example, Payne et al., 1988; Tversky & Kahneman, 1974). However, in each of these instances it would appear that the addition of load may lead to an increased likelihood of participants exhibiting an ECE: as load is likely to exacerbate the experience of each of these factors. Yet, as discussed above, the current research predicts that the addition of load will *reduce* the experience of the ECE – if the effect is being driven by a process of counterfactual thought. Specifically, it is predicted that load will lead to a reduction in counterfactual thought, and that this may lead to a reduced tendency for participants to exhibit an ECE. As such, whether any experience of the ECE is heightened or reduced under high load will give us an initial insight into the processes underlying the effect. Finally, by then conducting two mediation analyses: one under low load, and a second under high load, it will be possible to determine whether the any impact of choice level upon satisfaction is indeed being driven by a process counterfactual thought, or whether load may instead be impacting on one of the other potential explanations for the effect listed above.

Experiment 3 was designed in order to investigate the longitudinal implications of the ECE, and the rationale for this is provided in Section 1.11 below. Experiments 4, 5 and 6 were focused upon the counterfactual action effect, and aimed to manipulate counterfactual availability by presenting participants with a default option, as research has shown that choosing to stick with a default may be viewed as being akin to inaction (e.g. Ritov & Baron, 1992). As such, it was predicted that if counterfactuals were driving the ECE then presenting participants with a default option should reduce the availability of counterfactual thoughts, and potentially improve subsequent satisfaction with extensive choice. Experiment 7 was designed to examine whether people are

able to accurately forecast the potential impact of extensive choice upon post-decisional satisfaction levels. Finally, Experiment 8 aimed to manipulate counterfactual availability via task outcome valence. It was predicted that counterfactual thoughts would be cued more readily following negative, than positive decision outcomes. On this basis it was hypothesised that if counterfactuals were driving the ECE then the effect would be stronger following a negative task outcome.

### *1.11 Longitudinal Effects of Counterfactual Thinking*

Research has also examined the longitudinal effects of the counterfactual emotion of regret. In several instances evidence has been found that regrets following failures to act, or omissions, persist longer than regrets following actions, or commissions. For example, Kinnier and Metha (1989) asked participants what they regretted most when they looked back over their lives. The authors found that the vast majority regretted failures to act, in terms of not having taken their education more seriously, not being more assertive and not spending more time with family. Similar patterns of results were found by Gilovich and Medvec (1994), Feldman, Miyamoto and Loftus (1999), and Roese and Summerville (2005) (I provide an extensive review of this literature in Chapter 3).

Gilovich, Medvec and Chen (1995) argued that one reason why people regret inactions more than actions in the long term is that cognitive dissonance reduction is more active for actions. Actions are psychologically fixed by their factual status, meaning that for actions there is typically one focal imagined alternative (i.e. not having acted). By contrast, failures to act are more psychologically open, more imaginatively boundless, and this openness to opportunity means people are less able to engage in a psychologically beneficial

process of dissonance reduction (see also, Roese & Summerville, 2005). Following this, Gilovich and Medvec (1995) suggest that the theoretical mechanisms behind the reduction in the experience of regret include both behavioural repair work, whereby people undertake steps to correct their regretted actions, and psychological repair work, in terms of identifying 'silver linings' and cognitive dissonance reduction (Gilovich et al., 1995; Festinger, 1957; Cooper & Fazio, 1984). As such, there is substantial evidence to suggest that there is a reduction in the experience of regret following actions over time. In Experiment 3 I apply this aspect of counterfactual theory to the ECE. It was hypothesised that any ECE which may be apparent in the short-term would reduce over time due to the temporal pattern to the experience of regret.

### *1.12 Summary of Aims and Experimental Chapters*

In Section 1.5 I considered evidence for the ECE, and in Section 1.6 I developed the rationale for my research – to investigate the overarching hypothesis of counterfactual thought as a potential driving force behind the ECE. Following this, Sections 1.8 and 1.9 introduced the relevant counterfactual literature and how this links to the field of choice. In Section 1.10 I described how I intend to manipulate factors to influence the availability of counterfactual thoughts across different choice tasks in order to test my overarching hypothesis. To summarise therefore; in Chapter 2 I use a secondary cognitive load task in order to manipulate the extent to which participants are able to engage in counterfactual thinking. It was predicted that the ECE would be found under low, but not high load, due to the predicted impact of load upon counterfactual thought. In Chapter 3 I investigate the longitudinal implications of the ECE. Based upon the counterfactual literature it was predicted that any ECE which may be

apparent in the short term (under low load), would reduce over time due to the predicted temporal pattern to the experience of regret. In this experiment I transfer to the field of the psychology of health, and use placebo treatments to explore whether choice can impact upon physiological as well as psychological well-being. The implications of this for furthering our understanding of the true extent of the “problem” of extensive choice are considered.

The experiments detailed in Chapter 4 were designed to draw upon another key aspect of the counterfactual literature – the counterfactual action effect. These experiments were designed to test whether satisfaction with extensive choice might be improved if participants were offered a default option, due to the predicted impact of defaults (i.e. inaction) upon counterfactual thought. Experiment 7 was designed to contribute to both the default and ECE literatures by examining whether participants predictions about preferred choice types would match the actual experiences of those in Experiments 4 – 6. In Chapter 5 I aimed to manipulate counterfactual availability via outcome valence. This was based upon the findings of the previous experimental chapters, and upon the counterfactual literature which has demonstrated that counterfactuals may be cued more readily following negative than positive decision outcomes. It was predicted that if counterfactuals were driving the ECE then the effect would be stronger following a relatively negative decision outcome, and subsequently reduced where outcomes were positive. In each instance I consider my findings in terms of both the existing ECE and counterfactual literatures. Finally, Chapter 6 is a summary of my findings and an attempt to evaluate the wider implications of these findings for the psychology of choice and consumer well-being. I also identify possible directions for future research.

## Chapter 2 – Investigating the Role of Counterfactual Thinking within the Excess Choice Effect (and Reversibility Paradox) using Cognitive Load

### Introduction

#### *2.1 Chapter Overview*

The experiments detailed in this chapter aimed to explore the potentially causal role of CFT in driving two paradoxical effects within the current choice literature. These refer to the excess choice effect (ECE), and reversibility paradox, whereby respective research has noted that extensive choice and decision reversibility may be associated with decreased chooser satisfaction levels. A secondary cognitive load task was implemented into the procedure with the aim of manipulating the availability of thoughts about unchosen options, in order to determine any subsequent impact upon the two choice paradoxes. I begin now by providing a brief recap of the ECE literature, and an introduction to the existing reversibility paradox literature, before moving on to describe how both paradoxes may be linked by the same underlying process – of increased counterfactual thought. Finally I provide the rationale for implementing a secondary load task in order to investigate the potentially causal role of counterfactual thought in supporting these paradoxes.

#### *2.2 The Excess Choice Effect*

As reviewed in Chapter 1, the notion that the provision of choice is advantageous for individuals and society is widely accepted (Schwartz, 2000; 2004). Indeed, according to many psychologists, freedom and autonomy are essential to well-being, and choice is critical to freedom and autonomy (Ryan & Deci, 2001). Modern societies provide high levels of choice across a range of life domains which previously had limited choice including consumer goods

(Schwartz, 2004), education and employment (Iyengar et al., 2006), health care (Propper et al., 2005), pensions (Thaler & Benartzi, 2004) and religion (Wolfe, 2001). Nevertheless, such unprecedented levels of choice are not necessarily associated with higher well-being. Life satisfaction, for instance, has stayed constant in many western countries despite economic growth and expansions in choice (Layard, 2005; Centre for Economic Performance, 2006).

As previously discussed, psychological research is beginning to address this apparent paradox. One avenue involves investigation of the ECE, in which psychological effects of few vs. many choice options on satisfaction with the chosen alternative are explored. As we have seen in Chapter 1, economic theory suggests that increasing choice should, all else being equal, increase satisfaction with the chosen option, because there is a greater chance of satisfying individual preferences (Dolan & White, 2007). However this is bounded and there appears to be an optimal threshold beyond which satisfaction with chosen options decreases as the option set increases (Shah & Wolford, 2007; Reutskaja & Hogarth, 2009). Iyengar and Lepper (2000), for instance, demonstrated that individuals were more likely to purchase gourmet jams or chocolates when offered a limited (6) rather than an extensive (24) array of options, and this effect has since been replicated in numerous empirical studies across a range of domains including consumer goods (Lee & Lee, 2004, Mogilner et al., 2008; Chernev, 2003a; 2003b; Greifeneder et al., 2010), job seeking (Iyengar et al., 2006), and enrolment in pension schemes (Iyengar et al., 2004; although c.f. Scheibehenne et al., 2010).

As discussed in Chapter 1, the main aim of the current thesis was to investigate an alternative explanation for the ECE, which follows on from

research which has noted a link between increased choice and regret (e.g. Iyengar & Lepper, 2000; Iyengar et al., 2006; Schwartz et al., 2002, Roesse & Summerville, 2005). Specifically, this refers to an increased tendency to consider post-decisional counterfactual alternatives when presented with a large choice set. The rationale for this stems from the fact that regret is defined as a counterfactual emotion, the experience of which cannot occur without a prior counterfactual inference (Kahneman & Miller, 1986; Landman, 1993). As the number of available options increases the range of alternative states of the world that did not actually occur, i.e. counterfactuals, also increases.

As such it is suggested that previous research which has noted a link between increased choice and regret (e.g. Iyengar & Lepper, 2000) may have picked up on one aspect of a general increase in counterfactual thought. Supporting this contention, Markman et al., (1993) showed that generating counterfactuals heightened general feelings of dissatisfaction. Consequently I suggest that it is counterfactual thoughts concerning the realization that better choice alternatives may have potentially been foregone which may drive the experience of regret and undermine satisfaction. This was investigated in Experiment 1 using a secondary cognitive load task in order to manipulate the availability of counterfactual alternatives (details of this will be provided in Section 2.5 below).

### *2.3 The Paradox of Reversibility*

A second avenue of current psychological research into the effects of choice upon well-being concerns the impact of reversibility, i.e. whether or not a person is allowed the opportunity to change their minds post-decision. According to economic theory, having the option of reversing your choice post-decision can

only be beneficial for the chooser, as it allows greater time for the individual to ensure they have made the right choice which fully satisfies their preferences (Perloff, 2010). Further to this, Schwartz (2004) states that having the opportunity to change your mind post-decision is highly valued amongst decision-makers as it lessens the burden of having to make a good decision first time around.

However, recent psychological research has found evidence that reversibility may also undermine satisfaction, and lower the utility experienced from the chosen good. This is referred to as the 'paradox of reversibility' (Gilbert & Ebert, 2002; Schwartz, 2004).

For example, in Gilbert and Ebert's (2002) experiment, students in a photography course were asked to take two personally meaningful photos, and then choose one to keep. In the reversible choice condition participants were told that they would be able to change their minds about their choice at a later time, and in the non-reversible condition they were told that their decision was final. Results showed that whilst the vast majority of participants said they would opt to be in the reversible condition if given a choice, those participants who actually were in this condition were significantly less happy with their original choice than the 'non-reversible' participants. Gilbert and Ebert (2002) suggest this effect may occur as having the opportunity to change your mind post-decision inhibits the psychological processes that would normally aid the manufacture of satisfaction. In other words, if a person is able to change their mind post-decision then they will do less work psychologically to justify their decision, in terms of reinforcing positive aspects of the chosen alternative, and disparaging the rejected alternatives (Schwartz, 2004). An alternative possibility is that reversibility may also affect satisfaction as a direct result of increased counterfactual thinking due

to the opportunity of being able to change one's choice. But what links these two seemingly disparate phenomena?

#### *2.4 The Counterfactual Opportunity Principle*

An increased tendency to engage in a process of post-decisional counterfactual thought may play a key role in these two paradoxes because of the same 'opportunity principle' (Roese & Summerville, 2005; Epstude & Roese, 2008). Both situations may be perceived to provide the "opportunity" for corrective action following a suboptimal choice (Epstude & Roese, 2008). In terms of the ECE, the more choices there are the more opportunities are available and consequently the greater the number of counterfactual possibilities. In terms of choice reversibility the situation is perceived to be changeable compared to conditions where this opportunity is not available. Consequently the counterfactual alternative will remain salient even after an initial decision has been made. In short, both situations are characterised by a greater number of perceived opportunities for correct(ive) action and associated counterfactual thoughts. If my central hypothesis is correct then a) I should find more counterfactuals under extensive than limited choice, and for reversible than non-reversible decisions, leading to a decrease in satisfaction and b) reducing the ability to systematically generate counterfactuals should reduce the effects of excess choice and reversibility upon post-decisional satisfaction levels.

#### *2.5 Manipulating Counterfactual Thought*

As discussed in Chapter 1, one possible way of undermining the systematic generation of counterfactuals is through the introduction of a cognitive load dual-task (Ward & Mann, 2000). Previous research (e.g. De Neys & Schaeken, 2007) has found that activities which involve effortful processing

become harder when cognitive resources are burdened through a cognitive load dual-task. Although counterfactuals may vary in the degree to which their generation relies upon effortful processing (see for example, Kahneman, 1995; Goldinger et al., 2003), a point to which I will return in the discussion section of this chapter, there is consistent evidence that reasoning about counterfactual possibilities draws upon executive processes, including working memory. As previously discussed, this has been shown in developmental research where the link between working memory and counterfactual thinking is well established (see, for example, Müller et al., 2007; Beck, et al., 2009), and has been shown to extend to judgements that are often considered to be influenced by the automatic activation of counterfactual thoughts (Morsanyi & Handley, 2008). In addition, patients with dysexecutive syndrome associated with prefrontal lobe lesions, and frontal lobe disorders such as Parkinson's disease and schizophrenia demonstrate relatively specific deficits of counterfactual thinking (see, for example, Gomez-Beldarrain et al., 2005; McNamara et al., 2003; Hooker et al., 2000).

Thinking counterfactually depends upon considering multiple possibilities (Byrne, 2005), and as we have seen in Chapter 1, the mental representation of counterfactual thoughts is subsequently considered to draw upon the resources of working memory (Johnson-Laird & Byrne, 1991). For example, in an experiment involving food consumption levels (Ward & Mann, 2000), it was found that load could lead normally restrained eaters to consume more food. The authors explain this may be due to the fact that load prevented participants from engaging in 'monitoring' behaviour – the process by which an individual

compares their current state with the standard or ideal state (i.e. counterfactual thinking).

## 2.6 Predictions and Summary of Aims

Consequently it was predicted that under low load, participants would generate more counterfactuals under extensive than limited choice (Experiment 1), and for reversible than non-reversible decisions (Experiment 2), and that this would lead 'extensive choice' and 'reversible' participants to experience decreased satisfaction with their decisions. However under high load, where the capacity for generating counterfactual alternatives should be reduced, the effects of extensive choice and reversibility on decreasing satisfaction should also be lessened. These specific predictions will be explored in follow-up analyses.

Notably, as reviewed in Chapter 1, it is possible that load may also impact upon other potential explanations for the ECE – in terms of increasing the likelihood individuals feel unable to process all the information presented to them (Simon, 1956; Huffman & Kahn, 1998; Botti & Iyengar, 2006), meaning that decisions may be perceived as being even harder to justify (Scheibehenne et al., 2009; Sela et al., 2009), or to the use of potentially maladaptive simplifying decision strategies (Payne et al., 1988; Tversky & Kahneman, 1974). However, crucially, one would predict the addition of a high load to *increase* the likelihood of experiencing an ECE, if any of the above factors were driving the effect. Whereas on the other hand if counterfactuals are driving the effect, and these are limited through cognitive load, then one would predict the addition of load to reduce any experience of the ECE. As such, whether any experience of the ECE is heightened or reduced under high load will give us an initial insight into underlying factors contributing to the effect. Separate mediation analyses

conducted under low and high load will then determine whether any impact of choice level on satisfaction is being driven by a process of counterfactual thought.

In summary, the experiments presented in this chapter had three specific aims. The first of these was to examine the impact of counterfactual thinking on choice satisfaction by manipulating the potential for counterfactual generation during choice evaluation through cognitive load. Second, by investigating both the excess choice and reversibility paradoxes using the same empirical approach it was then possible to examine whether the same underlying process, i.e. counterfactual generation, underpins two quite seemingly different paradoxes. Third, as detailed below, the paradoxes were examined in a creative context whereby participants were asked to select drawing implements to complete a creative task (see also Chua & Iyengar, 2008). This allowed for an examination of the evidence for ECE and reversibility effects beyond the more thoroughly researched domain of consumer choices in order to explore how excess choice affects satisfaction with means (i.e. implements to complete a task) as well as ends (i.e. consumed products).

Notably, previous research has examined the link between choice and creative performance in the past, and results have shown that increased choice is correlated with enhanced creative performance. For example, Amabile and Gitomer (1984) found that children produced more creative collages when they were given a choice of materials to use, than when they were given no choice. However, the current experiment does not take variability in creative performance into account, as instead the focus is solely on satisfaction with implement choice (according to varying choice factors), merely within a creative context.

## *2.7 Experiment 1 Overview*

Experiment 1 examined whether counterfactual generation was greater under extensive vs. limited choice and whether this may account for the ECE. Participants were given a choice of drawing implements from an extensive vs. limited selection, and following completion of a creative drawing task rated satisfaction with their chosen implement. Participants were also asked to explain their reasons for their satisfaction, and from this 'thought-listing' measure I was able to record the number of spontaneously occurring counterfactual thoughts. In order to further explore the role of counterfactuals half of the participants evaluated their chosen option under normal circumstances and half evaluated it while simultaneously engaged in a secondary listening task. The aim of this task was to limit the ability of participants to systematically generate more or fewer counterfactual alternatives as a function of choice condition. If counterfactuals are important, and if the load manipulation affects their systematic generation, then we should see the ECE under low but not high load.

## 2.8 Method

### *2.8.1 Pilot testing*

A series of pilot tests were conducted in order to identify a) the most effective secondary task for manipulating cognitive load, b) the most effective means of measuring counterfactual generation, and c) which 6 of the 24 drawing implements and sculpting materials to use in the limited choice conditions.

#### *2.8.1.1 Participants*

Ten participants (6 women and 4 men, mean age = 31, with a range of 19 to 67 years), recruited via a method of convenience sampling, completed the pilot tests in return for a chocolate bar as payment.

### *2.8.1.2 Materials*

Three mathematical 'worksheets' (see Appendix 2.1) each containing 25 simple sums were constructed by the experimenter for use in one aspect of pilot testing. A musical software programme 'Fruityloops' was used to construct a musical recording for use in a cognitive load task pre-test. This recording was put onto blank CD, and was played to participants on a CD player. In addition, the song '48 Hours' by the band 'Negativland', was downloaded from the internet and also put onto a CD. Two different counterfactual questionnaires were also piloted, both in the form of printed hand-outs (see Appendices 2.2 and 2.3). In addition, 24 different 'drawing implements', 24 'sculpting materials' (see Appendices 2.5 and 2.6 for a full list of all materials), and a stop-watch were also used.

### *2.8.1.3 Design*

A repeated-measures within-subjects design was used, with each participant completing all 3 stages of pilot testing. For the counterfactual generation questionnaires aspect a between subjects design was used, with each participant completing only 1 of 2 different piloted questionnaires.

### *2.8.1.4 Procedure*

#### *Secondary Cognitive Load Task*

For the first part of pilot testing, three alternative secondary tasks already established within the literature as providing means of manipulating cognitive load were piloted. These were chosen from a large selection of similar tasks (e.g. Ward & Mann, 2000; Parent, Ward & Mann, 2007; De Neys & Schaeken, 2007) on the basis that they all met a crucial design criterion – they were all auditory tasks. As such, participants would be able to continue writing whilst simultaneously partaking in the load task. The three piloted tasks were: a) a

musical 'piano notes' task, similar to that devised by Knowles and Condon (1999), in which participants were required to listen to a recording of a series of musical notes and press a buzzer every time they heard a piano note played, b) another music-based task devised Baumeister, Schmeichel, DeWall and Vohs (2007), which involved participants listening to the song '48 Hours' by a band called 'Negativland', and pressing a buzzer every time they heard the word 'time' mentioned, and c) an alphabet task, similar to that devised by Healy, Wohldmann, Parker and Bourne (2005), which required participants to recite the alphabet backwards by every third letter.

In order to examine the relative effectiveness of each of these tasks at inducing a high cognitive load, three sets of 25 simple mathematical sums were drawn up by the experimenter. Participants were instructed to try and complete as many of the sums as possible, whilst simultaneously undertaking each of the secondary tasks in turn, for a period of three minutes each. The number of sums successfully completed was then used as an indication of the most effective means of inducing a high cognitive load.

#### *Counterfactual Generation Questionnaires*

For this second aspect of pilot testing, 2 different 'counterfactual generation' questionnaire designs were tested, in order to determine the most effective method to encompass in the main experiment. The two methods tested were both of an –'open-ended' nature (similar to that used by Crawford & McCrea, 2004), in that neither questionnaire directly instructed participants to generate counterfactuals. This first type of questionnaire (referred to from now on as 'open-ended'), simply asked participants to list their thoughts about each satisfaction judgement, whilst the second type of questionnaire (referred to from

now on as 'semi-structured') asked participants to list three reasons for each satisfaction judgement (see Appendices 2.2 and 2.3 for both types of questionnaire). Notably, 'structured' counterfactual questionnaires (such as that used by White & Lehman, 2005), which explicitly instruct participants to generate counterfactuals, were not selected for pilot testing as it was deemed this would not provide the reader with an accurate representation of the number of spontaneously occurring counterfactual thoughts (a critical dependent variable throughout the current thesis).

Participants completed a 'mini-experiment' in which they were asked to select a drawing implement from the selection in front of them, which they then used to complete a creative task ('interpreting' a cartoon image). After completing this 'interpretation' task participants were asked to rate their satisfaction with their implement choice (Appendix 2.4), and following this were given one of the 2 counterfactual generation questionnaires to complete (Appendices 2.2 and 2.3). In both cases participants were asked to reflect back on the responses they had given on the first questionnaire, and to explain their reasons for each 'satisfaction judgement', and the number of overall responses given was recorded.

#### *The Limited Choice Set*

The final stage of pilot testing was designed to determine which 6 of the 24 implements should be used in the 'limited choice' conditions. To do this, participants were presented with the 24 different drawing implements and 24 different sculpting materials to be used in the extensive choice sets. Participants were asked to imagine that they would shortly undertake a creative task, which would involve them selecting one drawing implement, and (later – as part of a separate task) one sculpting implement, which they would then be required to

use in order to draw or 'interpret' a basic cartoon image. In line with the procedure used by Shar and Wolford (2007) participants were then asked to rank-order each of the drawing implements and sculpting materials from 1 (most effective) to 24 (least effective) in terms of how effective they believed each implement would be, and as such, how likely it was that they would select that implement for use in the experiment(s).

#### 2.8.1.5 Pilot Experiment Results and Discussion

##### *Secondary Cognitive Load Task*

The order of secondary tasks ranking from hardest to easiest in terms of the number of successfully completed sums in the 3 minute period was found to be: a) the alphabet task, b) the 'piano notes' task, and c) the 'Negativland' task ( $M_s = 3.3$  vs.  $8.12$  vs.  $13.73$  respectively). On the basis of this, and participants comments following completion of this aspect of pilot testing, it was deemed that the alphabet task was in fact too hard, with some participants struggling to complete any of the sums in the allocated time. As such this task was ruled out from use in the main experiment, so that participants would still be able to simultaneously concentrate on the primary experimental task. Conversely, the 'Negativland' task was deemed to be too easy for use in the main experiment, and following the procedure used by Baumeister et al., (2007), actually appeared to involve very limited participation from subjects at times. As such, the musical 'piano notes' task was selected as the most effective means of inducing a high cognitive load in the main experiment. In addition, this task was also considered to be the most appropriate for use in the main experiment, as its musical basis fitted in well with the experiments' 'creative theme'. Consequently, participants' may have been less likely to be suspicious of the purpose of this 'secondary

task', and more likely to fully engage with it, if they viewed it as an integral part of the main experiment. In addition, it was deemed this task would be most useful as the task instructions could be manipulated to place participants under either a high or a low cognitive load, as such ensuring that both groups of participants receive the same quantity of instructions, keeping the experimental conditions as similar as possible.

Upon consideration of participants' comments upon completion of the 'piano notes' secondary task it became apparent that one note every three seconds (as per the Knowles & Condon, 1999, experiment) was, in several participants' own words 'a little too easy', giving participants a fairly decent amount of time in between notes to concentrate on completing the sums. As such, to further increase cognitive load in the main experiment, and to ensure participants really were under a high cognitive load, the musical recording was altered slightly, so that a single note was played every two seconds, instead of 1 every 3 seconds (as per Knowles & Condon, 1999). This meant that, as well as having more notes to think about in general, the number of 'target' piano notes was also increased. The ratio of piano notes to 'other' notes was kept the same, however, and increased to 4.5 every minute (9 every 2 minutes), where it had previously been 3 piano notes every minute. As such, the recording, and the task itself, was kept as similar as possible to the original methodology.

#### *Counterfactual Generation Questionnaires*

Participants were found to disclose considerably more information regarding the reasons behind their satisfaction judgements when they were given the semi-structured rather than the open-ended questionnaire (average number of reasons disclosed per satisfaction judgement: 2.6 vs. 1.2 respectively).

Consequently the semi-structured method was selected for use in the main experiment, as it appeared to encourage a more thorough consideration of all the determining factors behind each satisfaction judgement. In addition, upon reviewing participants' comments after having completed this aspect of pilot testing, it became apparent that the time gap between answering the first satisfaction rating questionnaire, and the second counterfactual generation questionnaire made it 'somewhat difficult to remember' the precise reasons behind each rating at the time of judgement. The final questionnaire was subsequently designed with this information in mind, so that participants would rate their satisfaction, and then directly underneath this list their reasons for that judgement (see Appendix 2.7 for final questionnaire design).

#### *The Limited Choice Set*

This data was averaged and used to form 2 'effectiveness rating' scales, in which each implement was given a final rank from 1 to 24 (see Appendices 2.5 and 2.6). Upon examination of the scales, it became clear that the top 2 drawing implements were outstandingly clear favourites. As such it was decided that these 2 implements (the 'felt-tip' and 'pencil crayon') should be eliminated from the selection of implements used in all conditions in the final experiment, in order to ensure the choice sets contained a more equivalent set of options.

Consequently in the limited choice conditions participants would be presented with a choice between 6 options, whilst those in the extensive choice conditions would have a (slightly reduced) choice of 22 options. In order to keep the two creative tasks as similar as possible, the top 2 'sculpting materials' ('Plasticine' and 'pipe cleaners') were also dropped from use in the second creative task in the main experiment. Finally, on the basis of the effectiveness scales, 6

implements were selected for use in the limited choice conditions. Following the procedure used by Shar and Wolford these were 2 high (1 and 2 in effectiveness ranking lists), 2 medium (places 10 and 11), and 2 low (places 21 and 22) ranking implements (please see Appendices 2.5 and 2.6 for final lists of implements used in both choice sets).

## *2.8.2 Experiment 1*

### *2.8.2.1 Participants*

One hundred Psychology undergraduate students (61 women and 39 men, mean age = 24, with a range of 18 to 67 years) at Plymouth University took part in the experiment in exchange for course credit.

### *2.8.2.2 Design*

The experiment had a 2 (choice level: limited vs. extensive) X 2 (load level: low vs. high) X 2 (task: task one vs. task two) mixed factorial design with repeated measures on the last factor. Two tasks were used with the aim of testing whether results would generalise across tasks. Notably, there is evidence within the counterfactual literature that using more than one task may lead to an increased tendency to generate counterfactual alternatives in preparation for, or anticipation of, a second task (see, for example, Markman et al., 1993; Roese & Olson, 1995). However, as the two tasks used in this experiment involve different types of creative choices, using different types of materials (i.e. one selection of pens to draw with and one selection of materials to sculpt something out of), it is therefore unlikely that participants would generate counterfactuals as a form of mental preparation for the second task, as at the moment of reflection following the first task they will be unaware of what the second task will involve, or what type of materials will be on offer. Consequently, the generation of counterfactual

alternatives cannot be based upon the success or failure of the choice in the first task in this manner. Nevertheless the presentation of the order of tasks was counterbalanced in order to reduce any potential order effects upon either satisfaction or counterfactual generation.

### *2.8.2.3 Materials*

As previously detailed, on the basis of pre-testing, 22 different drawing implements were used in task one. These included a mixture of paint-roller pens, felt tip pens, twig pencils, wax crayons, and coloured chalks. No implements which participants may have had strong prior preferences towards, such as biros, were included. 22 different sculpting materials were used in task two, including a mixture of coffee beans, string, mini pom-poms, cat biscuits and split-peas. A similar amount of each material type was placed inside a see-through plastic cup. Again no materials which participants had strong prior preferences towards, such as Lego bricks, were included (see Appendices 2.5 and 2.6 for a full list of all materials used).

*Load Manipulation* – Participants listened to a recording of four musical instruments playing one note every two seconds, via headphones, and pressed a key every time a piano note was played. This task was similar to that devised by Knowles and Condon (1999), and was selected from three tasks used at the pre-testing stage as being the most effective means of manipulating cognitive load.

### *2.8.2.4 Procedure*

Participants were informed they would be taking part in an experiment on 'individual differences in creativity', to avoid focusing on the main issue of choice (Appendix 2.8) and were randomly allocated to one of the four conditions. Before starting the experiment participants were given a short practice session of the

cognitive load manipulation task in order to ensure they understood the instructions. Participants were instructed to listen to a recording of a series of musical notes, and to either press a buzzer every time they heard a piano note played (high-load conditions), or to simply ignore the musical distraction (low-load conditions) (Appendix 2.9). Participants' responses to this secondary task were recorded using a software programme designed to measure time of response and whether or not the response given was accurate. However unfortunately the programme corrupted, meaning the data for this task were lost, and subsequently no further discussion of accuracy of performance on this secondary task across conditions is provided. However, through observation the experimenter could determine that all participants were engaged in the secondary task, and were all pressing the buzzer at random intervals (high load conditions). Unfortunately I cannot determine whether these responses were accurate, however as the main aim of this secondary task was simply to place participants under a form of either high or low cognitive load, and as all participants appeared to be engaged in the task, it would appear the task was largely successful in this respect.

Participants then began the first of two creative tasks. This was either a 'drawing' task, or a 'sculpting' task. For the drawing task, participants were presented with a limited (6) or an extensive (22) selection of drawing implements, and were instructed to "select one implement which you feel would best allow you to interpret a basic cartoon image according to your own artistic preferences" (Appendix 2.10). After making a choice they were presented with the cartoon image (a sheep in a field, see Appendix 2.11) and were instructed to study the image for one minute (Appendix 2.12). The image was then removed and participants were given five minutes to complete their interpretation(see Appendix

2.13 for a sample 'interpretation'). Upon completion they answered the questionnaire whilst under a high or a low cognitive load.

Choice satisfaction was measured using three items adapted from Iyengar and Lepper (2000) with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*): "I am happy that I made the right choice from the selection of implements available", "I feel my choice of implement prevented me from expressing myself artistically" (reversed), "If I could start the experiment again I would select the same implement" (Appendix 2.7). The internal consistency of the three items was high for this task ( $\alpha = .83$ ). As such data from the three items are collapsed to give a single satisfaction measure. After each item participants were asked to give "*at least two* reasons why you responded in that particular way". These responses were later coded and used as evidence of counterfactual thinking.

Following this, participants were given a filler task to perform for five minutes. The aim of this filler task was to direct participants' focus away from the task they had just completed, and thus reduce any potential interference effects during the final creative 'sculpting' task. In addition, this filler task served another important function. Previous research has shown that viewing pictures of nature can have restorative effects (Berto, 2005). Indeed, Berman, Jonides and Kaplan (2008) found that viewing pictures of nature could improve directed-attention abilities, and as such help to boost depleted self-regulatory resources. Based upon this, a similar task was adopted for use as a filler in the current experiment, with the aim of helping to increase potentially depleted self-regulatory resources, and as such reduce any potential fatigue effects which may otherwise interfered with performance during the second creative task.

The task itself required participants to watch an on-screen slide show, consisting of thirty photographs of natural settings, for example of lakes, mountains, and woodland. In order to ensure that participants would actively study the images, the task was adapted so that participants were required to rate each image in terms of how tranquil they thought it was on a scale of 1(not at all tranquil) to 7 (extremely tranquil) (Appendix 2.14). Each image was displayed for eight seconds (with a two second blank screen separating the images). The theme of tranquillity was selected in order to emphasise the peacefulness of the images, which according to Berman et al., (2008) may be one reason why natural environments help to restore directed-attention abilities. By presenting the task in this manner and giving participants a questionnaire to complete, it was deemed that participants would be more likely to view the task as an important aspect of the main experiment, and as such may engage with the task more fully than if they had suspected it to be a filler task. However, the data from this task is not used for any further analysis. This task lasted for exactly five minutes.

Upon completion of this participants moved on to the second creative task. For the 'sculpting' task, participants were required to select one material to use to create a 3D model/interpretation of a cartoon image (a fish, see Appendix 2.15). Again, participants were given one minute to study the image and a further five minutes to interpret it (see Appendix 2.16 for a sample 'interpretation'). They were then asked to complete a second questionnaire, which was identical to the first except that the phrase 'drawing implement' was replaced with the phrase 'modelling material'. Again, internal reliability across the three items was high for this task ( $\alpha = .89$ ) and the questions were answered either under low or high load.

Finally, participants were debriefed and thanked for their participation (see Appendix 2.17).

#### *2.8.2.5 Coding Counterfactuals*

Participants' responses to the 'thought listing' aspect of the questions were coded by two independent coders prior to commencing with analyses. Six categories were generated. These were; 'Choice Counterfactuals', which involved the explicit comparison of the chosen option with foregone alternative(s), for example: "Maybe salt could be a better alternative". 'Problem Counterfactuals', which involved a counterfactual consideration of how performance could have been improved, had an aspect of the task been different, e.g.: "I could have been more creative if I could have used more than one medium". 'Positive Implement Appraisals', which involved positive descriptions of the chosen implement, e.g.: "I found the pen easy to use". 'Negative Implement Appraisals', which involved negative descriptions of the chosen implement, e.g.: "Hard to hold comfortably". 'Positive Comparisons', which involved drawing a comparison between the chosen option and other options, e.g.: "easier to use than some others". Finally 'Other Responses' included any response which did not fit into any of the five main categories, e.g.: "I'm rubbish at drawing anyway so I can't blame the implement".

All statements were then coded by one of the original coders and a third coder who had not been involved in developing the coding framework. High levels of agreement were observed between the two judges: Kappa = .83,  $p < .001$ . As inter-rater reliability was established, the coded counterfactual responses from the first judge were used for further analysis. The category of response which is of particular interest for the purposes of this experiment is

'Choice Counterfactuals'. Preliminary analysis found no substantive differences in results whether we used the absolute number of counterfactuals a person generated or the proportion of all statements which were counterfactuals. The analysis below therefore used the raw number generated to provide the reader with a clearer indication of overall counterfactual prevalence (however for completeness, details of counterfactual analyses using proportions of counterfactual responses generated are presented in Appendix 2.22). Of all statements recorded 18% were counterfactuals, and of all counterfactuals recorded 89% were choice counterfactuals.

## 2.9 Results and Discussion

### 2.9.1 *Satisfaction Analyses*

The data from both tasks were analysed both combined and separately using a multivariate approach. This was done in order to a) get a detailed overview of the effects of choice level and counterfactual generation across the two tasks, and b) determine whether the two tasks appeared to have been equally successful methods of manipulating satisfaction with choice. For the first part of the analysis, a 2 (choice: limited vs. extensive) X 2 (load: low vs. high) x 2 (task: picture vs. model) mixed factorial ANOVA with repeated measures on the last factor was conducted (Table 2.1).

Table 2.1. Mean and standard deviations of participants' satisfaction ratings and counterfactuals generated.

Task	Choice	Low load				High load			
		Counterfactuals		Satisfaction		Counterfactuals		Satisfaction	
		Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Picture	Limited	.48	(.92)	5.36	(1.56)	.64	(.86)	4.60	(1.91)
	Extensive	1.20	(1.26)	3.81	(1.49)	1.04	(1.40)	4.62	(1.67)
Model	Limited	.84	(.80)	4.73	(1.73)	1.00	(1.29)	3.67	(1.99)
	Extensive	1.28	(1.40)	4.24	(1.60)	.64	(.86)	4.98	(1.76)

There were no significant main effects of choice level, load level, or task:  $F(1,96) < 1, p > .05$  in each case. Overall, satisfaction was similar under limited vs. extensive choice ( $M_s = 4.60; 4.42$ ), under low vs. high load ( $M_s = 4.54, 4.47$ ) and for the drawing and modelling tasks ( $M_s = 4.60, 4.41$ ). An unpredicted interaction was found between task and choice:  $F(1,96) = 5.48, p = .02, \eta^2 = .05$ , suggesting that choice level was more important for the drawing task than the modelling task. However there was no interaction between task and load:  $F(1,96) = .14, p = .71, \eta^2 = .001$ , and the three way interaction between task, load and choice was also found to be non-significant:  $F(1,96) = .06, p = .81, \eta^2 = .001$ . Nevertheless follow-up analyses were conducted on the interaction between task and choice in order to determine whether the manipulation of choice level appeared to have worked equally well across tasks.

T-tests revealed that for the drawing task, the manipulation of choice level worked as intended. Specifically, participants were found to be more satisfied with limited than extensive choice under low load ( $t(48) = 3.58, p = .001$ ), and this effect was no longer significant under high load ( $t(48) = -.05, p = .96$ ) (see Table

2.1). However a slightly different pattern of results was found for the sculpting task. In this task no effect of choice level was found under low load: ( $t(48) = 1.05$ ,  $p = .30$ ), and yet under high load, a significant effect of choice was found: ( $t(48) = -2.48$ ,  $p = .02$ ). Crucially this effect was found to be in the opposite direction to that predicted under low load, such that satisfaction was higher with limited than extensive choice. As such it appears that choice level did have a different impact across tasks, and in this respect it may be that the ECE is to some extent task dependent. However in order to get a balanced overview of the effects of choice level on satisfaction and counterfactual thought across tasks I nevertheless concentrate on the effects collapsed across task type during later follow-up satisfaction, counterfactual (Section 2.9.2), and mediation (Section 2.9.3) analyses.

Finally, in line with predictions the repeated measures ANOVA also revealed a significant interaction between choice and load level:  $F(1,96) = 12.84$ ,  $p = .001$ ,  $\eta^2 = .12$  (Figure 2.1).

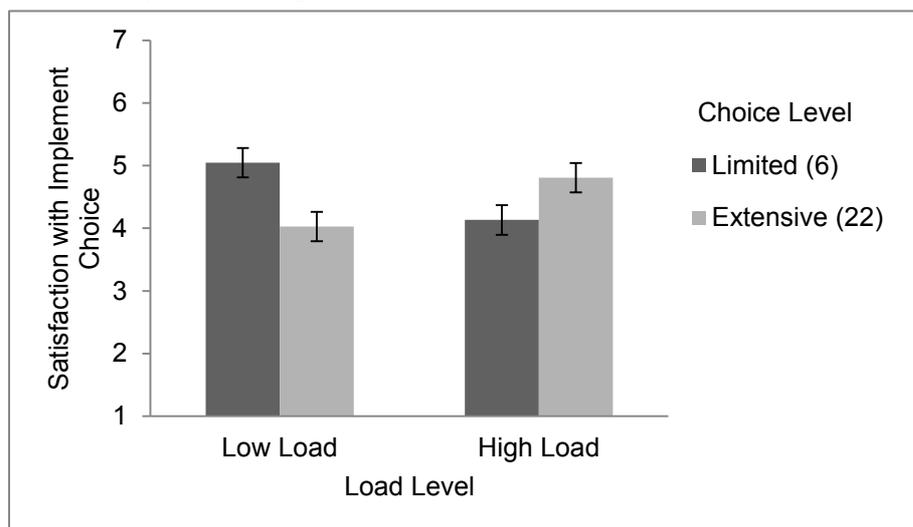


Figure 2.1. Participants' mean stated satisfaction ratings as a function of choice set size and load manipulation (both tasks collapsed). Standard errors are represented in the figure by the error bars attached to each column.

A simple main effects analysis was then conducted on the significant interaction found between choice and load, in order to examine satisfaction between limited and extensive choice: a) under low load to examine the replicability of past findings and b) under high load to examine whether the choice effect continued to be robust under high load. Under low load, satisfaction was found to be higher under limited vs. extensive choice ( $M_s = 5.05, 4.03, F(1,96) = 9.32, p = .003, \eta^2 = .09$ ). This finding replicates previous research into the ECE. Under high load, the effect of choice level was also found to be significant:  $F(1,96) = 4.06, p = .05, \eta^2 = .04$ . Crucially, however, collapsing across tasks this was found to be in the opposite direction, such that satisfaction was higher for extensive than limited choice ( $M_s = 4.81, 4.13$  respectively). These findings are subsequently more consistent with people's stated preferences for more vs. less choice.

### 2.9.2 Counterfactual Analyses

The impact of choice level upon the total number of counterfactuals generated was then examined using a 2 (choice: limited vs. extensive) X 2 (load: low vs. high) x 2 (task: picture vs. model) mixed factorial ANOVA with repeated measures on the last factor (Table 2.1). Analysis revealed a marginal main effect of choice level:  $F(1,96) = 2.99, p = .09, \eta^2 = .03$ , with more counterfactual thoughts being generated following extensive than limited choice ( $M_s = 1.04, .74$ ). However, there was no main effect of load:  $F(1,96) = .48, p = .49, \eta^2 = .005$  or task:  $F(1,96) = .49, p = .49, \eta^2 = .005$ , with similar numbers of counterfactual thoughts being generated under low vs. high load ( $M_s = .95, .83$ ) and for the drawing and modelling tasks ( $M_s = .84, .94$ ). In addition, the interaction between

choice and load was found to approach significance:  $F(1,96) = 2.61, p = .11, \eta^2 = .03$ .

Paralleling earlier satisfaction analyses once again there was no three way interaction between task, load and choice:  $F(1,96) = .70, p = .41, \eta^2 = .01$ , and no interaction between task and load:  $F(1,96) = .70, p = .41, \eta^2 = .01$ . However, an unpredicted marginal interaction was found between task and choice:  $F(1,96) = 3.29, p = .07, \eta^2 = .03$ . Again this appeared to suggest that the impact of choice level upon the number of counterfactuals generated was more important for Task 1 than Task 2. Follow-up analyses were subsequently then conducted on this marginal interaction in order to explore whether this was the case.

T-tests revealed that for the drawing task the impact of choice level upon counterfactual generation was broadly in line with predictions. Specifically, under low load counterfactual generation was significantly higher under extensive than limited choice ( $t(48) = -2.31, p = .03$ ) (see Table 2.1), whilst under high load there was no impact of choice on counterfactual generation ( $t(48) = -1.22, p = .23$ ). However for the sculpting task, no effects of choice level were found under low ( $t(48) = -1.36, p = .18$ ) or high load ( $t(48) = 1.16, p = .25$ ). Again this appears to suggest that the impact of choice level upon counterfactual generation may be context dependent, to some extent. Nevertheless following the analytic procedure outlined in earlier satisfaction analyses, in order to get a balanced overview of the impact of choice level upon counterfactual generation across tasks I examine the effects collapsed across tasks during later counterfactual follow-up, and mediation (Section 2.9.3) analyses.

A simple main effects analysis was then conducted on the marginal interaction between choice and load in order to examine specific predictions that

choice level would only influence the number of counterfactuals generated under low but not high load, collapsed across tasks. Analysis revealed that under low load the number of counterfactuals generated was significantly higher following extensive than limited choice ( $M_s = 2.48, 1.32$ ;  $F(1,96) = 5.59, p = .02, \eta^2 = .06$ ). Subsequently this provides support for predictions that under low load, more counterfactuals would be generated following extensive than limited choice. Under high load this effect of choice upon counterfactual generation was no longer significant ( $M_s = 1.68; 1.64$ ;  $F(1,96) = .007, p = .94, \eta^2 < .001$ ).

### *2.9.3 Is the Moderating Effect of Load due to its Effect on Counterfactual Generation?*

To investigate whether these differences in counterfactual generation accounted for the differences between the choice effects on satisfaction under high vs. low load two mediation analyses were conducted, one for low load and one for high load. If my predictions are correct then choice level should influence the generation of counterfactuals and thus mediate the satisfaction effect only under low but not high load. As previously discussed I again collapse across task in the following analyses.

Following Baron and Kenny (1986) each analysis had three steps: Step 1 regressed choice level on satisfaction, Step 2 regressed choice level on counterfactuals and Step 3 regressed both choice level and counterfactuals onto satisfaction. The results of the two analyses are summarised in Figure 2.2 with the results from Step 1 shown in brackets and those from Step 3 in italics. The paths for low load are shown in the upper half of the figure and those for high load in the bottom half.

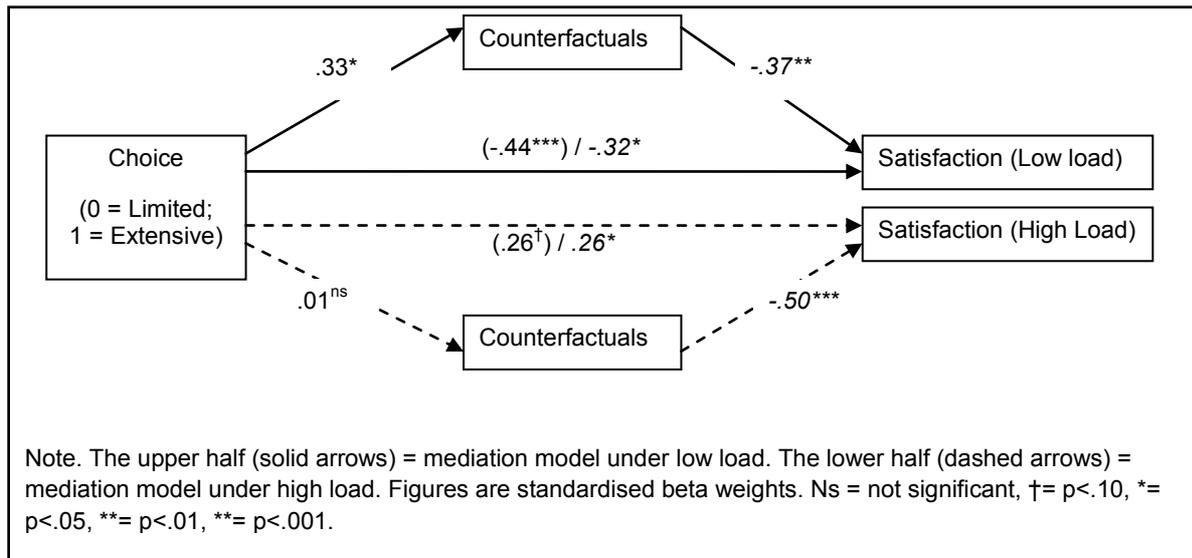


Figure 2.2. Mediation analysis showing the role of counterfactuals in mediating the effect of choice set size on stated satisfaction for participants under low but not high load.

Step 1 replicated the above analyses such that the effect of choice on satisfaction was negative under low load ( $\beta = -.44, p < .001$ ), i.e. satisfaction was lower under extensive than limited choice, but positive under high load ( $\beta = .26, p = .07$ ), i.e. satisfaction is higher under extensive than limited choice. Step 2 replicated counterfactual analyses such that choice was found to influence the number of counterfactuals generated under low ( $\beta = .33, p = .02$ ) but not high load ( $\beta = .01, p = .94$ ). Further, the positive effect of choice under low load shows that more counterfactuals were generated under extensive than limited choice. Step 3 suggests that the number of counterfactuals generated negatively affected satisfaction under both low ( $\beta = -.37, p = .006$ ) and high load ( $\beta = -.50, p < .001$ ), but that there was only a drop in the effect of choice under low ( $\beta$ s =  $-.44$  vs.  $-.32$ ) but not high load ( $\beta$ s =  $.26$  vs.  $.26$ ). Sobel tests further supported the argument that counterfactuals were mediating the effect of choice on satisfaction under low ( $z = 1.85, p = .032$  (one tailed)) but not high load ( $z = .08, p = .47$ ). Further, Step

3 also shows that under high load, when taking counterfactual thinking into account, choice level became a significant predictor of satisfaction, but in the opposite direction to that noted under low load – specifically as choice level increased, so too did satisfaction ( $\beta = .26, p = .034$ ).

The experiment replicates previous research into the ECE in the novel context of creativity. Although Chua and Iyengar (2008) demonstrated that high choice may limit creativity I believe this is the first experiment to show the ECE for selection of tools to perform a creative task. Perhaps more importantly, the findings also demonstrate that the ECE disappeared under high cognitive load, thus identifying load as another important moderator of the ECE (Scheibehenne et al., 2009; 2010). Given that many people may reflect upon real-world decisions under conditions of high load conditions (e.g. someone evaluating shopping purchases in a hectic shopping environment, or in a noisy kitchen with their children when they get home) compared to the relatively low load conditions of an experimental lab (e.g. Iyengar & Lepper, 2000; Chernev 2003a; 2003b) this may help to explain inconsistencies in previous research (Scheibehenne et al., 2009; 2010). In line with predictions there was also evidence that the reason why satisfaction was lower under high choice and low load was due to the number of counterfactuals generated. Irrespective of load, more counterfactuals meant lower satisfaction (Anderson, 2003), but only under low load did the number of options to consider systematically alter the number of counterfactual thoughts generated.

An unexpected finding was that satisfaction with high choice was actually higher than low choice under high load. This reversal of the ECE is consistent with economic theory and lay perceptions that more choice makes people

happier. Specifically it may be that the presence of many choice options is seen as a good thing and this perception is only "undone" if one is able to then systematically generate counterfactuals. Under high load systematic counterfactual generation is inhibited and thus the initial reactions are not overturned and satisfaction with extensive choice remains high. If true, then the ECE is not as paradoxical after all if lay people are commenting on their preferences for extensive choice under normal everyday (high load) conditions, whereas psychologists have explored these issues under relatively low load conditions with low ecological validity. This is an avenue for future research to explore.

### *2.10 Experiment 2 Overview*

Given that the ECE was found to be mediated by an increase in counterfactual thought in Experiment 1, Experiment 2 was designed to investigate whether the same process might account for another paradoxical finding within the choice literature – the paradox of reversibility. It was predicted that when presented with a reversible choice, participants would engage in more counterfactual thinking than if they were told their decision was non-reversible. Further it was predicted that this increase in counterfactual thinking would lead 'reversible' participants to experience decreased satisfaction with their choice. In addition, if counterfactuals could be made less available under reversibility, through the addition of a high cognitive load, then this should lead to a subsequent increase in satisfaction levels.

### *2.11.1 Participants*

Ninety-four Psychology undergraduate students at Plymouth University (49 women and 45 men, mean age = 25, with a range of 18 to 58 years) completed the experiment in return for course credit.

### *2.11.2 Design*

The experiment had a 2 (reversibility level: reversible vs. non-reversible) X 2 (load level: low vs. high) between subjects design. Given the similarity in results across the two tasks in Experiment 1, only the drawing task was used here.

### *2.11.3 Materials*

Since the aim of this experiment was to investigate the role of counterfactuals for choice reversibility rather than choice amount the same 10 options were provided to all participants. This number of options was selected based upon previous research into the optimal levels of choice for satisfaction (Shar & Wolford, 2007; Reutskaja & Hogarth, 2009). On the basis of pre-testing ten moderately preferred implements were selected, including a twig pencil, an oil pastel, a gel pen, a wax crayon, and a paint pen (Appendix 2.5). The load manipulation was the same as for Experiment 1.

### *2.11.4 Procedure*

The basic procedure was the same as in Experiment 1 with the following change. During briefing participants were lead to believe they would have to complete *two* creative 'interpretations' of different cartoon images (Appendix 2.18), when in actual fact they only had to complete one. This was done in order to create a choice context in which a manipulation of reversibility would be possible. Participants were presented with the selection of 10 drawing

implements, and were instructed to “select one implement which you feel would best allow you to ‘interpret’ a cartoon image, according to your own artistic preferences” (Appendix 2.10). After having made this selection participants were instructed either that they would (reversible conditions) or would not (non-reversible conditions) be able to exchange the implement they had just selected later on in the experiment (Appendix 2.19). Participants were deliberately given this information relating to reversibility after having made their choice based upon the recommendations of Gilbert and Ebert (2002), as prior knowledge may have elicited different decision making processes which may otherwise have impacted upon results.

After making their choice, participants completed the drawing task as per Experiment 1. They were then placed under either a high or a low cognitive load to complete the satisfaction questionnaire. This was identical to the questionnaire used in Experiment 1 with one addition. Based upon previous research (Gilbert & Ebert, 2002; Dijksterhuis & van Olden, 2006) we felt it was also important to assess participants’ “*revealed satisfaction*” (i.e. whether or not they wanted to change their original choice before starting the next task). With this in mind, participants in reversible conditions were instructed: “You now have the opportunity to change your implement choice before starting work on your next image ‘interpretation’. Would you like to select a different implement for use in the next part of the experiment?” Whilst participants in the non-reversible conditions were instructed: “At this point in the experiment some participants are given the opportunity to change their choice of implement. Had you been placed in this condition would you have taken up the opportunity to select a different implement before starting work on image two?” (see also Gilbert & Ebert, 2002). Participants

were required to give a simple Yes/No response (see Appendix 2.20).

Participants were then told they wouldn't actually have to do a second drawing before being fully debriefed (see Appendix 2.21).

Notably, in Markman et al.'s (1993) research it was demonstrated that people typically generate more counterfactual thoughts if they believe they will have the opportunity to carry out the same task again. This is relevant to the current experiment as participants were informed they would be carrying out a second, very similar task, upon completion of the first. Crucially, however, the current experiment differs from this research due to the manipulations of load and reversibility. As such, although we might expect to see a general increase in due to the anticipation of a second task, this is predicted to occur equally across all conditions, and should not impact upon the experimental manipulations such that counterfactual generation is predicted to be a systematic function of whether participants are presented with a reversible or a non-reversible choice, and further, that any effect of reversibility upon counterfactual generation and subsequent satisfaction will be reduced under high cognitive load.

#### *2.11.5 Coding Counterfactuals*

Participants responses to the 'thought listing' aspect of the questionnaire items were coded according to the same criteria established in Experiment 1 with the "Choice Counterfactuals" being the target of further analysis. Of all statements recorded 13% were counterfactuals, and of all counterfactual responses recorded 90% were choice counterfactuals. Notably, this pattern of response is very similar to that found in Experiment 1.

### 2.12.1 Does Load Moderate the Choice Reversibility Effect?

As noted above, satisfaction in this experiment was examined in two ways:

a) revealed satisfaction, i.e. whether the person would want to reverse their original choice if they could; and b) stated satisfaction based on the responses to the questions used also in Experiment 1. Revealed satisfaction results were consistent with the hypothesis that reversibility would be important under low but not high load. Under low load 87% of people who had initially expected that they could change their implement for the second task (reversible) opted to do so, whereas only 54% of people who did not originally expect this possibility (non-reversible) said they would like to change,  $\chi^2(1) = 6.04, p = .014$ . Under high load, the percentages opting to change were not significantly different,  $\chi^2(1) = 1.08, p = .30$  (reversible = 75%; non-reversible = 61%).

Stated satisfaction was then examined using a 2 (reversibility: reversible vs. non-reversible) X 2 (load: low vs. high) between participants ANOVA (Table 2.2), with a follow-up simple main effects analyses designed to examine satisfaction between non-reversible and reversible options a) under low load to examine the replicability of past findings and b) under high load to examine whether the paradox of reversibility continued to be robust under load.

Table 2.2. Mean and standard deviations of participants' satisfaction ratings and counterfactuals generated.

Task	Choice	Low load				High load			
		Counterfactuals		Satisfaction		Counterfactuals		Satisfaction	
		Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Picture	Non-reversible	.50	(.98)	5.00	(1.53)	.52	(.79)	4.64	(1.34)
	Reversible	1.04	(.98)	4.46	(1.22)	.75	(.90)	4.42	(1.65)

Contrary to predictions, there was no main effect of either reversibility,  $F(1,90) = .41, p = .53, \eta^2 = .004$ , or load  $F(1,90) = .01, p = .94, \eta^2 > .001$  and no significant interaction  $F(1,90) = .01, p = .94, \eta^2 > .001$ . Satisfaction was very similar between reversible ( $M=4.44$ ) and non-reversible ( $M=4.82$ ) conditions, and under low ( $M=4.73$ ) vs. high ( $M=4.53$ ) load. Neither of the simple effects comparisons were significant ( $F$ 's  $< .25, p$ 's  $> .61$ ). In sum load moderated the choice reversibility effect only for revealed but not stated satisfaction.

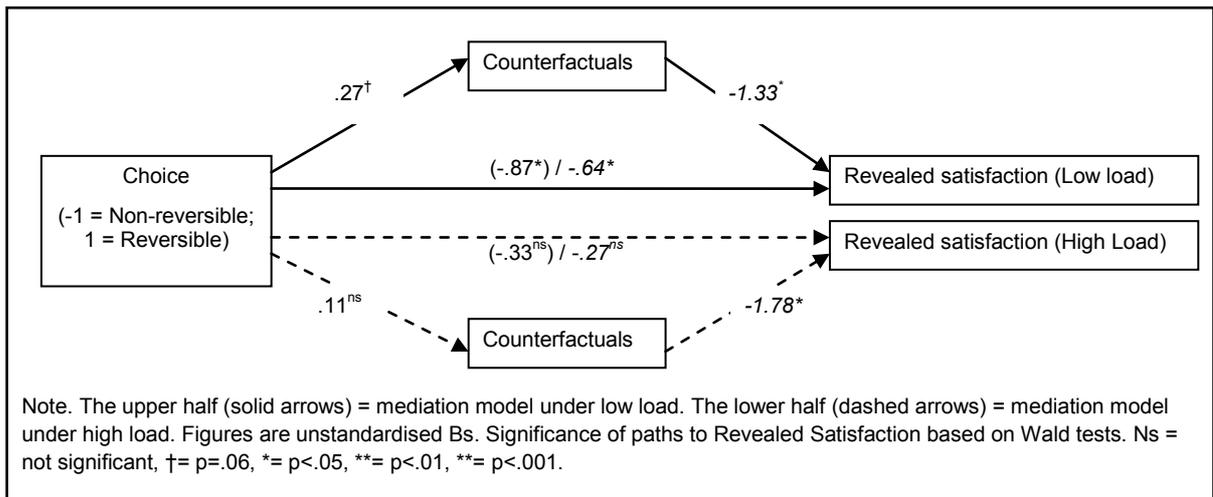
### 2.12.2 Counterfactual Analysis

The impact of reversibility upon the total number of counterfactuals generated was then examined using a 2 (reversibility: reversible vs. non-reversible) X 2 (load: low vs. high) between participants ANOVA (Table 2.2) (for completeness, counterfactual analyses using the proportion of counterfactual responses generated are provided in Appendix 2.23). In line with predictions, a main effect of reversibility was found:  $F(1,90) = .4.19, p = .04, \eta^2 = .04$ . The total number of counterfactuals generated was found to be lower overall in the non-reversible than reversible conditions ( $M$ s = .51, .89 respectively). However, contrary to predictions there was no main effect of load,  $F(1,90) = .52, p = .47, \eta^2 = .006$ , and no significant interaction,  $F(1,90) = .70, p = .41, \eta^2 = .008$ .

A simple main effects analysis was then carried out on the non-significant interaction (see Winer, 1971, for the justification of this procedure) in order to examine specific predictions that: a) under low load counterfactual thought would be greater following reversible than non-reversible choice, and b) under high load any impact of reversibility upon counterfactual generation would be reduced. Under low load the number of counterfactuals generated was found to be significantly higher following reversible than non-reversible choice:  $M_s = 1.04, .50$ ;  $F(1,90) = 4.15, p = .05, \eta^2 = .04$ , consistent with predictions. In addition, under high load this effect of reversibility upon the number of counterfactuals generated was no longer found to be significant:  $F(1,90) = .73, p = .39, \eta^2 = .008$ , with similar numbers of counterfactual thoughts being generated following reversible and non-reversible choice ( $M_s = .75, .52$ ).

### *2.12.3 Is the Moderating Effect of Load on Revealed Satisfaction due to its Effect on Counterfactual Generation?*

To examine the load effect on revealed satisfaction I again used a three step mediation approach. Binary logistic regressions were used in the steps predicting revealed satisfaction (yes = same choice; no = change choice). The results of the two analyses are summarised in Figure 2.3 with the results from Step 1 shown in brackets and those from Step 3 in italics.



*Figure 2.3.* Mediation analysis showing the role of counterfactuals in mediating the effect of reversibility of choice on revealed satisfaction for participants under low but not high load.

Step 1 replicated satisfaction analyses such that the effect of reversibility on revealed satisfaction was only significantly negative under low load ( $B = -.87$ ,  $p = .02$ ). That is, people were less likely to stick with their original option if they were expecting to be able to change it, but not under high load ( $B = -.33$ ,  $p = .30$ ). In line with counterfactual analyses, Step 2 suggests that reversibility influenced the number of counterfactuals generated more under low ( $\beta = .27$ ,  $p = .06$ ) than high load ( $\beta = .14$ ,  $p = .36$ ). Finally Step 3 suggests that the number of counterfactuals generated negatively affected revealed satisfaction under both low ( $\beta = -1.33$ ,  $p = .05$ ) and high load ( $\beta = 1.78$ ,  $p = .02$ ), but that there was only a drop in the effect of reversibility under low ( $\beta$ s =  $-.87$  vs.  $-.64$ ) but not high load ( $\beta$ s =  $-.33$  vs.  $-.27$ ). The mediation effect of counterfactuals based on a Sobel test was, however, only marginally significant,  $z = 1.38$ ,  $p = .08$ .

This experiment provides further support for the reversibility paradox (Gilbert & Ebert, 2002). Specifically, under low load participants were more likely to stick with their initial choice for a second task if the ability to reverse their

option was unexpected (non-reversible) vs. expected (reversible). This finding is not simply due to the slight difference in instructions for the two conditions since it was not prevalent under high load. Moreover, the fact that 54% of those in the "non-reversible" condition said they would have liked to change if they could supports the notion that non-reversible participants easily understood the question. Rather, the difference seems to be caused by the propensity to systematically generate counterfactual thoughts under reversible vs. non-reversible expectations under low but not high load. Indeed, a comparison of Figures 2.2 and 2.3 reveals a remarkably similar pattern of data for both high vs. low choice (Figure 2.2) and reversible vs. non-reversible options (Figure 2.3). In all conditions more counterfactuals were associated with lower satisfaction and the role of counterfactuals appeared stronger under low than high load.

In contrast to the revealed satisfaction results, however, no significant effects of reversibility were found for stated satisfaction levels. Although not initially predicted this result is nonetheless also consistent with the counterfactual opportunity principle (Roese & Summerville, 2005; Epstude & Roese, 2008). Specifically, when opportunities exist for corrective action then behaviour regulation, rather than affect regulation, tends to be the dominant focus of counterfactual thought. Consequently, in a situation like the present one where participants are expecting to be able to change their choice for a subsequent task their counterfactual thoughts may have been more focused on what they needed to do in terms of future behaviour, i.e. stick or change, than attempting to regulate any emotional outcomes. This account is also consistent with the findings of Experiment 1 whereby choice level was found to impact upon participants' *stated* satisfaction levels via counterfactual generation. In this case, participants were

not expecting to be able to change their choice implement in order to carry out the same task again. As such, we would expect to find that affect regulation, rather than behaviour regulation, would become to primary focus of counterfactual thought, consistent with the counterfactual opportunity principle (Roese & Summerville, 2005; Epstein & Roese, 2008).

## 2.13 General Discussion

Previous research has identified that contrary to economic theory and lay beliefs, increased choice and the option of reversibility may be detrimental to chooser satisfaction levels (Schwartz, 2004; Iyengar & Lepper, 2000; Iyengar et al, 2004; 2006; Gilbert & Ebert, 2002). The experiments detailed in the current chapter were designed to investigate the potentially causal role of counterfactual thought in driving these effects. In addition to monitoring the number of counterfactuals generated under conditions of limited vs. extensive choice (Experiment 1) and under expectations of reversible vs. non-reversible choice (Experiment 2) half of the participants rated their satisfaction with their chosen alternatives under high cognitive load. The aim of this load manipulation was to undermine the systematic generation of counterfactuals and thus "undo" the normally deleterious effects of excess choice and expected reversibility on option satisfaction.

Results from Experiment 1 indicated that under normal (low load) conditions people were generally more satisfied with their chosen drawing implement when they had selected it from only a few (6) rather than many alternatives (22). This replicates the ECE found for jams, chocolates and essays (Iyengar & Lepper, 2000) in the novel, more creative, context of drawing, whilst extending this literature to include satisfaction with means (i.e. drawing

implements used to create a picture) rather than the final outcome of a decision itself (e.g. taste of a chocolate or performance on an essay). Some differences were found across task-type, which suggested that the ECE may be task dependent to some extent. Nevertheless when collapsing across tasks the ECE was found to persist. Given the difficulty in replicating the ECE elsewhere this was encouraging (e.g. Scheibehenne et al., 2010). Under high load however participants were more satisfied with their drawing implement when they had selected it from the extensive choice set. Crucially for the central hypothesis of the current thesis, the effect of choice set size on satisfaction was mediated by the number of counterfactual alternatives generated under low but not high load. The number of counterfactuals generated was an important influence on satisfaction under both load conditions but only when load was low were these counterfactuals systematically related to choice set size.

Importantly, the finding that the ECE was reversed, not exacerbated, under high load, provided further support for the primary hypothesis of the current thesis. This is because one would expect the ECE to have been heightened under high load if the effect were instead being driven by other potential explanations. For example, regarding explanations involving information processing and limited cognitive capacity (Simon, 1956; Huffman & Kahn, 1998) one would predict that individuals would feel even less able to process all of the information presented to them when under high cognitive load, which should exacerbate experience of the effect. Further, this may mean that decisions are perceived as being even more difficult to justify (see, for example, Scheibehenne et al., 2009; Sela et al., 2009), or to an increased reliance on maladaptive simplifying decision strategies (see, Payne et al., 1988; Tversky & Kahneman,

1974). In either case one would predict that the addition of a high load should increase likelihood that individuals would exhibit an ECE. Therefore, the finding that load did not exacerbate the effect provided initial evidence in support of the primary hypothesis of the current thesis, which was later substantiated by mediation analyses.

Results from Experiment 2 indicated that under low load people were less likely to want to change their original choice if this possibility was previously unexpected. It was hypothesised that people in this condition would tend to generate less counterfactuals' than those who were expecting the ability to reverse their original decision and this should account for their lower propensity to want to reverse their decision. Results were found to be largely consistent with this account. First, the number of counterfactuals generated under low load was found to be significantly higher in the reversible-expected than in the reversible-unexpected condition. However, although adding counterfactuals to the mediation model reduced the direct effect of condition on satisfaction from significance to non-significance the Sobel test of mediation was only marginally significant. Nevertheless, and as predicted, there was no systematic relationship between condition and counterfactual generation under high load. Moreover, as with Experiment 1 the number of counterfactuals generated under high load was also found to be related to satisfaction, it was simply that the load manipulation undermined their systematic generation as a function of whether the ability to reverse one's options was expected or unexpected.

These experiments suggest that excess choice and choice reversibility may both affect satisfaction via increased counterfactual thought. Whilst the claim that counterfactual thinking underpins levels of reported satisfaction in decision

making contexts is common (see, for example, Schwartz et al., 2002; Anderson, 2003; Gingras, 2003), the present experiment provides direct evidence of a link between the number of counterfactual alternatives generated and reported satisfaction. However, as reviewed in Chapter 1, the link between counterfactuals and choice satisfaction is not universally accepted. Sagi and Friedland (2007) have argued that counterfactual thinking does not contribute to judged regret in choice tasks. They showed that regret was related to the number of positive attributes possessed by the full set of non-chosen options and that this even extended to unpopular options that would rarely be chosen. As participants would be unlikely to generate a counterfactual for an unpopular option, they claimed that counterfactual thinking was unlikely to contribute to judgments of regret. There are a number of reasons why I believe these findings are not decisive regarding the role of counterfactuals in choice satisfaction. First, it could be argued that evidence showing that the characteristics of non-chosen options contributes to choice evaluation is in itself consistent with the idea that participants represent the non-chosen items as counterfactual alternatives. We may often, for example, consider alternative choices in a fleeting and superficial manner before dismissing them or they may be considered in depth and ruminated upon. In both cases, however, these considerations will contribute, perhaps to differing extents, to our feelings regarding a decision. It is also worth pointing out that in contrast to the experiments presented here, Sagi and Friedland (2007) only examined decision contexts with a maximum of 3 options, a much more limited set than in the present studies. In addition, their study was scenario-based and participants were presented with a chosen option at the outset which they were then asked to assign a level of regret. Whilst scenario

based studies are common in research on counterfactual thinking (see, for example, Byrne, 2005), there is some evidence that they can be misleading regarding the cognitive processes underlying the evaluation of 'real' choices (see, for example, Feeney & Handley, 2006). Finally, Sagi and Friedland did not incorporate a direct measure of counterfactual thinking in their study, unlike the experiments presented here, and consequently there is no direct evidence that their participants were not engaging in a process of counterfactual thinking. Future research could explore this further by examining the role of counterfactual thinking in scenario based studies of this kind, perhaps by employing self-report measures of the kind used in the present studies.

A key assumption underlying the approach taken in this experimental work is that evaluating choice satisfaction depends upon an effortful process of counterfactual generation and evaluation. Whilst there is some evidence that counterfactual thinking draws upon the resources of working memory and executive function (Johnson-Laird & Byrne, 1991; Ward & Mann, 2000) there is also evidence that intuitive biases in judgment often arise because of automatic activated counterfactual processes. For example, consider the case of an employee, Paul, who leaves work at the normal time and is involved in an accident that is demonstrably the fault of another driver. Compare this situation to one in which Paul leaves work early to watch a movie and the same outcome occurs. In which case would you assign greater levels of compensation? Typically in studies of this kind greater blame, responsibility and less compensation is assigned in the latter case, where counterfactuals are presumably more available because of the exceptionality of Paul's behaviour in the second scenario (see Byrne, 2005, for a review).

Goldinger et al., (2003) demonstrated that secondary load led to an increase in the level of compensation and blame associated with the exceptional scenario, particularly for participants of lower working memory span. They claim that this finding shows that counterfactuals for the exceptional scenario are generated automatically. Those participants who have access to fewer available resources are less able to inhibit these counterfactuals and are consequently more affected by them. Whilst it is undeniably the case that some counterfactuals are so salient that they come to mind very rapidly, counterfactuals nevertheless vary in the degree to which their generation depends upon controlled processing. The comparison of two scenarios, where one involves an exceptional event, may well make a counterfactual readily available. However, the current experiments were carefully designed to ensure that participants were making choices between similar options, where there was no single option with distinctively more attractive features. Consequently I would argue that the decision is a challenging one, where evaluating satisfaction would involve careful and considered evaluation of the features of alternative choices. Furthermore, Goldinger et al. (2003) used an approach which involved the evaluation of two different decisions scenarios, which is quite different to a task that involves making a single decision that has meaningful consequences for subsequent activity. It is quite possible that such scenario based judgments encourage a comparative process which may play a limited role in everyday counterfactual thinking (see, for example Feeney & Handley, 2006).

To conclude, the current research replicates Iyengar and Lepper's (2000) work showing that more options can lead to lower satisfaction and furthers previous research into the reversibility paradox (Gilbert & Ebert, 2002) by

demonstrating that people are less likely to stick with their original choice if they believe they will be able to change their mind in the future. Importantly, however, these effects were only replicated under low load, i.e. the normal conditions in prior research. Under high load the effects disappeared. This pattern is accounted for by demonstrating that while under low load people generate more counterfactuals for the high choice and reversible than low choice and non-reversible conditions, consistent with the counterfactual opportunity principle (Roese & Summerville, 2005; Epstein & Roese, 2008). By contrast, there was no relationship between choice level or reversibility and counterfactual generation under high load.

Chapter 3 aims to extend these findings in an investigation designed to examine the long term implications of the ECE upon chooser satisfaction and well-being. Based upon the results of Experiment 1 which highlighted the underlying causal role of counterfactual thought in driving the ECE, it was predicted that any ECE which may be apparent in the short term would reduce over time, due to the predicted temporal pattern to the experience of counterfactual thoughts and emotion. Following this, Chapters 4 and 5 consider additional alternative means of manipulating factors which should influence the availability of counterfactual alternatives, relating to the presentation of default options and choice outcome valence, respectively, in order to further explore the boundaries of the relationship between counterfactual thought and the ECE.

## Chapter 3 – A Longitudinal Investigation into the Excess Choice Effect

### Introduction

#### *3.1 Chapter Overview*

In this chapter I describe a longitudinal investigation into the ECE, which was designed to build upon the findings of Chapter 2, and upon previous research, by examining whether the effects of choice level upon satisfaction a) persist over time, b) would transfer to the different and novel domain of health psychology, and c) could have any impact upon physical well-being, in terms of reported improvement in the severity of physical symptoms, as well as the previously replicated effects upon psychological satisfaction. I will begin by providing the rationale for investigating the long term implications of the ECE, before discussing the theoretical counterfactual account on which subsequent predictions are based. Following this I will provide the rationale for transferring to the domain of health psychology in order to examine any impact of choice level upon physical, as well as psychological well-being.

#### *3.2 Existing Research on the Longitudinal Effects of Choice*

As reviewed in the previous chapter, there is increasing empirical evidence to suggest that extensive choice can be detrimental to short-term chooser satisfaction and well-being (Lenton, Fasolo & Todd, 2008; Botti & Iyengar, 2006; Iyengar & Lepper, 2000; Iyengar, et al., 2006; Reutskaja & Hogarth, 2009; Shar & Wolford, 2007; Lee & Lee, 2004; Chernev 2003a; 2003b; Greifeneder et al., 2010; results detailed in Experiment 1). Given that a relatively large amount of research has been conducted into the short-term and instantaneous effects of choice level upon satisfaction, and also given the fact that many real-life decisions faced by modern consumers have long lasting implications (particularly

in the highly consequential fields of employment, health care, and pensions, for example) it is perhaps somewhat surprising that no studies, to date, have tried to investigate the long term implications of the ECE. If a person is dissatisfied with a decision made from an extensive selection of options at the initial time of choice, do these feelings persist or dissipate over time? Schwartz (2004) theorized that ever-increasing choice and the autonomy that comes with it may have a deep rooted impact upon psychological well-being – in terms of contributing to the reductions in life satisfaction and increases in depression that are found across many modern societies. Schwartz (2004) suggests this may be due to the fact that increased autonomy leads to increased expectations, and that this contrast between expectations and actual experiences may lead people to blame themselves for their perceived ‘failures’. However as yet, empirical evidence for any long term effects of extensive choice on satisfaction and well-being is very limited. In light of this lacuna the main aim of the current experiment was to test the longevity of the effects of choice, in order to provide a clearer picture of potential long term consequences to chooser well-being, and thus determine the true extent of the ‘problem’ of extensive choice.

### *3.2.1 The Longitudinal Experience of Counterfactual Emotion*

The current experiment is longitudinal according to the American Psychological Association’s (2012) definition that it: “follows the same individuals or groups of subjects over an extended period of time”, and was designed to build upon the previous findings of Experiment 1, wherein the ECE was found to be mediated by counterfactual thought. Whilst there is little direct empirical evidence regarding the longitudinal effects of excess choice, a number of studies have been conducted into the longevity of counterfactual thought, specifically with

regard to the experience of counterfactual emotion. As previously discussed, counterfactual thoughts are evaluative reflections on “what might have been” (Roese & Olson, 1995; Epstude & Roese, 2008), which are typically associated with the experience of a range of negative affect, including regret, shame, guilt and disappointment (Zeelenberg, van Dijk, van der Pligt, Manstead, van Empelen & Reinderman, 1998; Niedenthal et al., 1994; Guttentag & Ferrell, 2008). Of these, the counterfactual emotion that has received most attention from decision theorists is that of regret (Connolly & Zeelenberg, 2002). Research has focused on the role of responsibility within the experience of regret (Sugden, 1985), typically finding that regret involves some degree of personal responsibility for the decision outcome (see for example, Zeelenberg, Van Dijk, & Manstead, 1998, 2000; Ordóñez & Connolly, 2000), whilst other research has focused on structural aspects of the emotion such as whether we are more likely to experience regret following controllable or uncontrollable circumstances (Giroto, Legrenzi & Rizzo, 1991; Markman et al., 1995; Roese & Olson, 1995), or as a result of action or inaction (Kahneman & Tversky, 1982a; Byrne & McEleney, 2000; Avni-Babad, 2003; Chapter 4 of this thesis).

The current experiment is based upon another key aspect of current regret research – which concerns the temporal pattern to our experience of this counterfactual emotion. According to Landman and Manis (1992), the vast majority of people regret choices made at some stage or other in their lives. In many cases, people continue to experience painful regret years after having made the ‘wrong decision’ (Wrosch, Bauer & Scheier, 2005). Notably, people typically exhibit reduced emotional responses to remembered life experiences over time (Walker, Vogl & Thompson, 1997). This is known as the ‘fading affect

bias'. However, regret appears to be uniquely resistant to the 'fading affect bias', with feelings of regret remaining potent for months or even years after making a bad decision (Beike & Crone, 2008).

In several instances evidence has been found that regrets following failures to act, or omissions, persist longer than regrets following actions, or commissions. For example, Kinnier and Metha (1989) asked participants what they regretted most when they looked back over their lives. The authors found that the vast majority regretted failures to act, in terms of not having taken their education more seriously, not being more assertive and not spending more time with family. Similarly, Gilovich and Medvec (1994, Study 1) conducted a telephone survey in which participants were also asked about their regrets of action and inaction. The authors found that failures to act, such as missed educational, romantic, and career opportunities, failure to seize the moment, and not spending enough time with friends and relatives, were more frequently regretted than actions, such as bad educational, career, and romantic choices, and unwise financial decisions. In addition, in a separate survey, when asked to think about their one most regretted action and their one most regretted inaction, participants consistently reported greater regret for what they failed to do (Gilovich & Medvec, 1994, Study 5). Similarly, in Feldman et al.,'s (1999) experiment, participants were also asked to write descriptions of strongly regretted events in their lives. The authors found that whilst the intensity of regret was equal for actions and inactions, participants' consistently reported more retrospective regrets for inaction than for action.

Following this Roese and Summerville (2005) state that a key component of why regrets of inaction may last longer than regrets of action is because

inactions reflect greater perceived opportunity. In their meta-analyses Roese and Summerville (2005) found that the six biggest regrets in life related to (in descending order) education, career, romance, parenting, the self, and leisure, which the authors state is due to the fact that these are the areas in which opportunity for corrective action remains highest. In addition, Byrne and McEleney (2000, Study 2) found that when decision outcomes were both known and negative, actions were regretted more than inactions in the short term, but over time this effect reversed and inactions were regretted more than actions. Gilovich et al., (2003) found that this effect generalised across cultures, with participants in China, Japan and Russia also more likely to regret inactions rather than actions over time, in line with US and UK research.

Consequently, whilst there is substantial evidence to suggest that in the short term people tend to regret actions more than inactions (Kahneman & Tversky, 1982a; Landman, 1987; Avni-Babad, 2003; Connolly, et al., 1997; Byrne & McEleney, 2000; I provide an extensive review of this literature in Chapter 4), in the long term evidence suggests that the regret associated with actions dissipates to a certain extent, and it is inactions which are found to lead to the greatest experience of regret.

### *3.2.2 Why Does the Experience of Regret Following Inaction Persist Longer than Regret Following Action?*

Gilovich et al., (1995) showed that one reason why people regret inactions more than actions in the long term is that cognitive dissonance reduction is more active for actions. This may be partly attributable to the fact that inaction is typically viewed as the status quo, with action a comparative departure from the norm (see Kahneman & Miller, 1986) (I provide a full review of this literature in

Chapter 4). It has been argued that this distinction may lead individuals to feel a greater sense of personal responsibility for actions than inactions (see, for example, Gilovich & Medvec, 1995), thus eliciting a greater amount of cognitive dissonance, and associated dissonance reduction. Further, because actions are psychologically fixed by their factual status, they typically have one focal imagined alternative, i.e. not having acted (Roese & Summerville, 2005). As such, the highly salient consequences of factual actions may also mean individuals are more likely to engage in a process of dissonance reduction, in order to reduce the sting of those consequences. By contrast, regrets of inactions are more psychologically open, more imaginatively boundless, and this openness to opportunity means people are less able to engage in a psychologically beneficial process of dissonance reduction. Furthering this, Gilovich and Medvec (1995) suggest that the theoretical mechanisms behind the reduction in the experience of regret include both behavioural repair work, whereby people undertake steps to correct their regretted actions, and psychological repair work, in terms of identifying 'silver linings' and cognitive dissonance reduction (see also, Gilovich et al., 1995; 2003; Festinger, 1957; Cooper & Fazio, 1984).

### *3.2.3 Predicted Impact on the Excess Choice Effect*

Building upon what we know about the temporal pattern to the experience of regret, and also given the findings of Experiment 1 in which it was demonstrated that counterfactual thought was influential in determining the prevalence of the ECE, it was predicted that any ECE which may be apparent in the short term (following an 'active' choice) would reduce over time. In order to assess this, satisfaction with choice will be measured initially, and at follow-up stages 7 and 14 days after having made that choice. The degree to which

participants reported thinking about counterfactual alternatives will also be assessed, in order to examine whether any differences in satisfaction appear to correspond to predicted differences in counterfactual thought.

### *3.3 The Excess Choice Effect and Intermediate Choice*

The current experiment aimed to build upon the methodology used in Chapter 2, and extend research into the ECE which has focused on more intermediate choice set sizes (e.g. Shar & Wolford, 2007; Reutskaja and Hogarth, 2009). As such, satisfaction was examined according to a very limited (2), optimal (12) and extensive (38) number of options, rather than simply limited (6) versus extensive (22) choice, as per Experiment 1. These specific choice set sizes were selected on the basis of the procedures used by Shar and Wolford (2007), and Reutskaja and Hogarth (2009), who found that satisfaction was a curvilinear function of the number of options available; with the optimal choice set size for satisfaction being an intermediate level of around 12 options, and both very limited choice and extensive choice being equally detrimental to satisfaction. As discussed in Chapter 1, very limited choice has been associated with reduced chooser satisfaction and well-being on the basis that it may reduce a persons' sense of perceived control and responsibility for their own fate (see Deci & Ryan, 1985; Taylor & Brown, 1988). The current research was designed to examine whether this same pattern of results would be found in the novel domain of health psychology.

### *3.4 Health Psychology and Physiological Well-Being*

By transferring to the field of the health psychology it was then also possible to determine whether choice level could have any impact upon physical, as well as psychological well-being. In order to create a decision with longitudinal

implications participants chose a placebo treatment (a 'Bach's flower essence') from a selection of either 2, 12 or 38 options, which they were asked to use every day for a two week period. Measures of psychological and physiological satisfaction with choice (in terms of any improvement in the severity of reported symptoms), and counterfactual thought were recorded at the start, middle (day 7) and end (day 14) of the two week period. By using placebo treatments in this manner a choice scenario was created whereby participants would continue to evaluate the effects of their choice for a substantial period of time, in contrast to the more short-term consequences of decisions assessed in most previous choice research (e.g. using consumer goods, Iyengar & Lepper, 2000; Reutskaja & Hogarth, 2009; Shar & Wolford, 2007). The rationale for the specific placebo treatment used in the current research is now provided, following a general introduction into placebo treatments.

#### *3.4.1 Placebo Treatments*

According to Kirsch (2005) 'placebos' are sham treatments that are used clinically to placate a patient, or experimentally to establish the efficacy of a drug. Placebos are widely used in medical research (Hróbjartsson & Norup, 2003), and the 'placebo effect' subsequently refers to any portion of that treatment which was produced purely via psychological means. Placebo treatments have been shown to improve subjective and objective measures of disease in a large number of patients with a range of clinical disorders (Eccles, 2002; Brown, 1998). For example, previous research has found placebo effects in the treatment of depression (Kirsch & Sapirstein, 1998; Kirsch, Moore, Scoboria, & Nicholls, 2002), asthma (McFadden, Luparello, Lons, & Bleecker, 1969; Neild & Cameron, 1985; Spector, Luparello, Kopetzky, Souhrada, & Kinsman, 1976), pain

(Huskisson, 1974; Nagao, Komia, Kuroanagi, Minaba, & Susa, 1968; Linde, Witt, Streng, Weidenhammer, Wagenpfeil, Brinkhaus, Willich, & Melchart, 2007), respiratory tract infections (Eccles, 2002), and a wide variety of other ailments and illnesses including Alzheimer's disease, rheumatoid arthritis and the common cold (see Hróbjartsson & Gøtzsche, 2001, for a review).

Kirsch (1985; 2005) suggests that placebo effects work on the basis of the response expectancy hypothesis, in that they are produced by the self-confirming nature of what one expects to feel following a course of treatment (see also, Morris, 1999). Following this, research has shown that placebo treatments are most effective when both patients and doctors believe that a powerful treatment is being used (Roberts, Kewman, Mercier, & Hovell, 1993), and subsequently both expect that treatment to work (Montgomery & Kirsch, 1997; Linde et al., 2007). The degree of belief a patient has regarding the efficacy of their treatment has been shown to be influenced by a range of factors, including; the method of administration (pill versus injection; de Craen, Tijssen, de Gans, & Kleijnen, 2000), the level of dosage a person is asked to consume (de Craen, Moerman, Heisterkamp, Tytgat, Tijssen, & Kleijnen, 1999; Kirsch & Weixel, 1988), whether the placebos contain a recognised brand name or not (Branthwaite & Cooper, 1981), the enthusiasm of the doctor (Kaptchuk, Kelley, Conboy, Davis, Kerr, Jacobson, Kirsch, Schyner, Nam, Nguyen, Park, Rivers, McManus, Kokkotou, Drossman, Goldman, & Lembo, 2008) and the colour of the placebo pill (see de Craen, Roos, de Vries, & Kleijnen, 1996, for a review). Other personality predictors have been found to include absorption and spirituality (Hyland, Geraghty, Joy & Turner, 2006), and motivational concordance (Hyland, Whalley & Geraghty, 2007). Via impact upon expectancy each of these factors has been

shown to subsequently contribute to the effectiveness of a placebo treatment.

The current research was also interested to discover whether initial choice level could have any impact upon the experience of a placebo effect.

#### *3.4.2 Bach's Flower Essences*

The specific placebo treatments used in the current research were Bach's flower essences. These essences are dilutions of flower material, developed by Bach (1931), who believed that floating flowers in water would result in the water acquiring an esoteric property, specific to that flower, which then had a curative effect when taken by patients. Flower essences were selected for use in the current experiment as although many people believe them to be an active treatment, research has shown them to be no different from placebo (Walach, Rilling & Engelke, 2001; Armstrong & Ernst, 1999; Hyland et al., 2006; 2007). In addition, using flower essences meant that all 38 possible choice outcomes (i.e. all 38 different types of flower essence) were objectively equal placebo treatments, meaning the choice presented to participants was an illusory one.

This was an important methodological advance from the previous choice literature which has typically examined satisfaction according to choice level using objectively different outcomes (e.g. Iyengar & Lepper, 2000; Shar & Wolford, 2007; Reutskaja & Hogarth, 2009; Chernev 2003a; 2003b; Greifeneder et al., 2010; Arunachalam et al., 2009; Berger et al., 2007). Indeed, only one study (Mogilner et al., 2008) as far as I am aware, has previously examined the impact of choice upon satisfaction using an illusory choice set. In this experiment, participants were shown a menu consisting of either a limited (5) or an extensive (50) number of different coffee options. After making their selection, participants were all given a small amount of the same coffee to try, allowing for a controlled

examination of the effects of assortment size upon satisfaction. The current research subsequently aimed to extend this procedure in order to examine the impact of limited (2), intermediate (12) and extensive (38) choice upon outcome satisfaction. By ensuring all participants experienced an outcome which was objectively the same in this manner, it was then possible to provide a thoroughly controlled examination of the impact of choice set size manipulations upon outcome satisfaction.

Finally, as previously mentioned, by using placebo treatments it was then also possible to further previous research into the ECE by determining whether choice level could have any impact upon reported physiological symptoms, i.e. any impact upon the likelihood of participants experiencing a placebo effect. This was done by asking participants' to rate the severity of their symptoms at all three times of testing, i.e. at the initial choice stage, and at follow-up stages after 7 and 14 days of using the treatment. In this manner it was then possible to ascertain a measure of improvement in reported symptomatology over time. The procedure used was a replication of previous research (Hyland et al., 2006; 2007), but with the addition of the novel manipulation of initial choice level.

### *3.5 Predictions*

Given the previous research demonstrating a reduction in the experience of regret following actions over time (Kinnier & Metha, 1989; Gilovich et al., 1995; Gilovich & Medvec, 1994; 1995; Roese & Summerville, 2005) it was predicted that the ECE would not remain robust over time. Specifically, it was predicted that at the initial time of choice satisfaction would be an inverted U-shaped function of the number of alternatives available, and that participants would be most satisfied if they chose their flower essence from a selection of 12 rather than 2 or 38

options. This prediction was based upon the quadratic function found in earlier studies (e.g. Shar & Wolford, 2007; Reutskaja & Hogarth, 2009), and upon the impact of choice level on counterfactual thought demonstrated in Experiment 1. It was also predicted that this ECE would reduce over time due to the temporal pattern to the experience of regret following actions. These specific predictions will be explored in follow-up analyses. In addition I was also interested to find out whether choice level might influence the extent to which participants experienced a placebo effect, in terms of causing any improvement in the reported severity of physiological symptoms over time.

## 3.6 Method

### 3.6.1 Participants

83 undergraduate students at Plymouth University (53 women and 30 men, mean age = 26, with a range of 20 to 69 years) took part in the experiment in return for course credit, and a free sample of Bach's Flower Essence.

### 3.6.2 Materials

The data were recorded using the online 'UoP Health Psychology Online Research Centre' questionnaire system created by Dr. Ben Whalley, available at: <http://voice.psy.plymouth.ac.uk>.

Participants were presented with a choice between either 2, 12 or 38 Bach flower essences. Bach's flower essences were used following previous research, as these are the 'original and most widely recognised flower essence' (pp. 55 Hyland et al., 2006).

### 3.6.3 Procedure

Participants were informed the experiment was investigating the effectiveness of Bach's Flower Remedies as a treatment for minor physiological

and psychological complaints including “stress, fatigue, aches and pains”, and were asked to sign up if they had been experiencing any of these symptoms (Appendix 3.1). Participants attended an initial laboratory session in which they enrolled on the online questionnaire system, completed the first section of questionnaires (Appendix 3.2), and picked their flower essence from a selection of either 2, 12 or 38 options. Each option was presented with a short (one – two sentence) on-screen description of its proposed healing properties, as provided by Bach (1931). Participants were asked to take their time considering the options, and to pick the essence which they felt would be most relevant to their symptoms, and subsequently would most like to trial.

After making their choice, the experimenter made up an individualised essence by adding two drops of their chosen “stock essence” to a 10 cc bottle of diluted brandy (60%, with 40% water). This procedure is based on that used in previous research using flower essences (e.g. Hyland et al., 2006), and follows the guideline provided by the manufacturer for creating a ‘genuine’ essence. Participants took this individualised essence home with them, and were instructed to take one to two drops three times a day for two weeks (Appendix 3.2), and to complete further online questionnaires on days 7 and 14 which they received via email. As Gosling, Vazire, Srivastava and John (2004) demonstrated, data collection via email is both valid and consistent with other more traditional methods of data collection. All participants were then fully debriefed and reminded of their right to withdraw via email at the end of the two week period (see Appendix 3.7).

#### 3.6.4 The Questionnaires and Dependent Measures

The questionnaires were designed to provide a measure of satisfaction with choice (DV1), and contained the following key item (adapted from Iyengar & Lepper, 2000) which was asked at both the initial ('Time 1') stage, and at the repeat 7 ('Time 2') and 14 ('Time 3') day stages: 'How satisfied are you with the flower essence you have chosen?' Participants were required to give answers on a 7 point Likert-scale, ranging from 1 (*very dissatisfied/not at all*) to 7 (*very satisfied/a great deal*) (Appendix 3.2).

Participants were also asked to provide an indication of the extent to which they thought about counterfactual alternatives whilst making their choice (DV2). This was done using a self-report measure adapted from Gilbar, Plivazky and Gil (2010), in which participants were asked: 'How much did you think about the other options which were available to you?' This was also measured at both the initial ('Time 1') stage, and at the repeat 7 ('Time 2') and 14 ('Time 3') day stages, and again participants were required to answer on a 7 point Likert-scale (ranging from 1 *not at all* to 7 *a great deal*) (Appendix 3.2).

Finally, the questionnaires were also designed to provide a physiological measure of satisfaction, with regard to any reported improvement in the severity of participants' physical symptoms (DV3). Participants were asked (at all 3 time stages): 'How much are your symptoms bothering you today?' Again participants were asked to respond using a 7 point Likert-scale, ranging from 1 (*not very much*) to 7 (*a great deal*) (Appendix 3.2).

### 3.7.1 Excluded Data

Due to high levels of non-response (31%) at the study mid-point (7 days) I only focus on responses at Time 1 (Day 1) and Time 3 (Day 14). For completeness, preliminary analyses on the Time 2 (Day 7) data are provided in Appendix 3.3.

### 3.7.2 Satisfaction Analysis

For the first analysis, a one way ANOVA with planned contrasts was conducted in order to assess satisfaction levels at Time 1. A significant main effect of choice level was found:  $F(2,80) = 3.13, p = .05, \eta^2 = .07$ . Based on the quadratic function found in earlier studies (e.g. Shar & Wolford, 2007; Reutskaja & Hogarth, 2009) I hypothesised that satisfaction would be very similar for both minimal choice (2 options) and extensive choice (38 options) while satisfaction for moderate choice (12 options) would be greatest. Thus to test this quadratic prediction I conducted planned contrasts of the form (-.5, 1, -.5) to see whether the medium level choice (12) differed significantly from the two extremes. In line with these predictions, satisfaction with 12 options was found to be significantly higher than satisfaction with 2 and 38 options:  $F(1,80) = 4.71, p = .03, \eta^2 = .06$  ( $M_s = 5.03, 4.10, 4.66$  respectively). This replicates the short term ECE, and provides support for previous research (e.g. Shar & Wolford, 2007; Reutskaja & Hogarth, 2009), which has shown that satisfaction appears to be an inverted U-shaped function of the number of alternatives available. Notably, the relatively average satisfaction ratings for the 2 and 38 options conditions, of around 4 on a scale of 1 – 7, reflect that participants in these conditions were neither particularly satisfied nor dissatisfied with their choices. Rather it appears to be that the main

difference was the increased, above average satisfaction ratings generated by participants in the 12 option condition.

I then went on to check for the presence of an interaction between time and choice. However, as 11 participants (13.3%) failed to complete the Time 3 questionnaire, it was not possible to assess changes in their satisfaction levels over time. As this was considered a fairly significant drop-out rate, additional analyses were conducted in order to determine whether these 11 participants differed in any way from the remaining participant group, and details of this are provided in Appendix 3.4. As such, data from the remaining 72 participants, from Time 1 to Time 3, is now subject to further analysis.

A 3 (Choice Level: Low, Medium, High) x 2 (Time: Time 1, Time 3) ANOVA with repeated measures on the last factor revealed a significant main effect of time upon satisfaction:  $F(1,69) = 25.43, p < .001, \eta^2 = .27$ , with satisfaction with choice in general being higher at Time 1 than at Time 3 ( $M_s = 4.86, 3.60$ ). No significant main effect of choice level was found:  $F(2,69) = .70, p = .50, \eta^2 = .02$ . Similar average levels of satisfaction were found across the 2, 12 and 38 option conditions ( $M_s = 4.16, 4.42, 4.07$ ). In addition, a marginal interaction was found between time and choice level:  $F(2,69) = 2.49, p = .09, \eta^2 = .07$ , see Figure 3.1 (a full table of means is provided in Appendix 3.5).

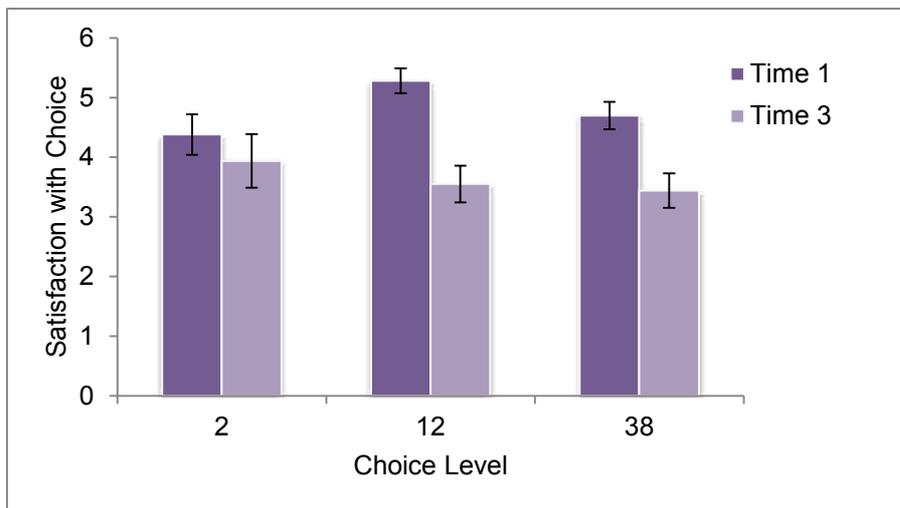


Figure 3.1. Bar chart displaying participants' mean psychological satisfaction ratings as a function of choice set size at Time 1 and Time 3. Standard errors are represented in the figure by the error bars attached to each column.

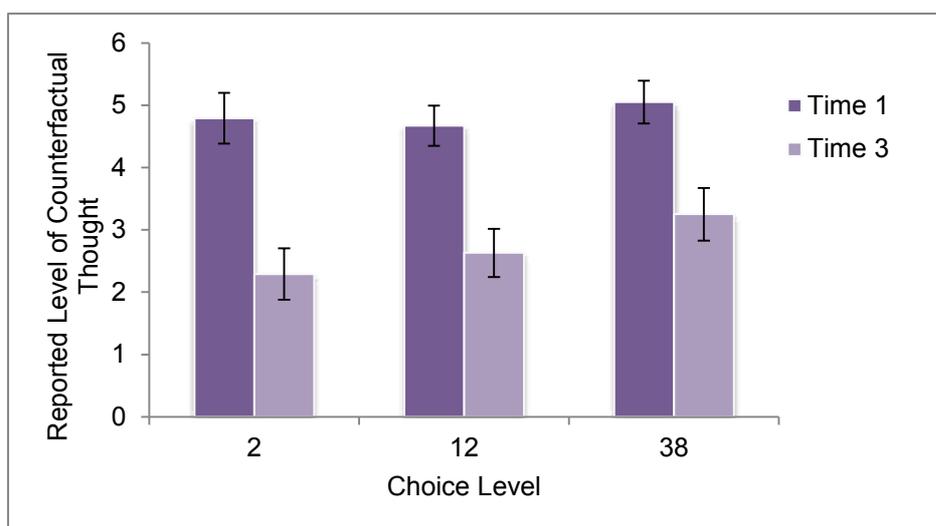
Two follow-up one way ANOVA's with planned contrasts were then carried out on the marginal interaction in order to examine specific predictions regarding the effects of choice level upon satisfaction a) at Time 1, and b) at Time 3. At Time 1 there was a significant main effect of choice level upon satisfaction:  $F(2,69) = 3.22, p = .05, \eta^2 = .09$ . Once again planned contrasts of the form (-.5, 1, -.5) were conducted in order to examine predictions that satisfaction with moderate choice (12 options) would be greater than satisfaction with either a very limited (2) or an extensive (38) number of options. Replicating earlier analyses using all 83 participants, the first of these planned contrasts revealed that at Time 1, satisfaction with 12 options was significantly higher than satisfaction with 2 and 38 options:  $F(1,69) = 6.23, p = .02, \eta^2 = .08$  ( $M_s = 5.28, 4.38, 4.70$  respectively), thus providing further support for predictions and for the short-term ECE.

At Time 3 no main effect of choice level upon satisfaction was found:  $F(2,69) = .47, p = .63, \eta^2 = .01$ , and planned contrasts revealed that satisfaction in the 12 option condition was no longer significantly different from satisfaction in the 2 or 38 option conditions:  $F(1,69) = .12, p = .73, \eta^2 = .002$  ( $M_s = 3.55, 3.94, 3.44$

respectively). This provides initial evidence to suggest that the effects of choice level upon satisfaction are not long-lasting, as over a two week period satisfaction evened out regardless of initial choice level.

### 3.7.3 Counterfactual Analysis

Based upon the theoretical model of counterfactual thought discussed earlier, and upon the results of Experiment 1, it was predicted that any differences in satisfaction would be attributable to differences in the extent to which participants engaged in counterfactual thought. A self-report style measure was used to provide an indication of this. Data from this question was analysed using a 3 (Choice Level: Low, Medium, High) x2 (Time: Time 1 vs. Time 3) ANOVA with repeated measures on the last factor. A significant main effect of time upon counterfactual thought was found:  $F(1,69) = 92.21, p < .001, \eta^2 = .57$ . In line with predictions, in general participants reported engaging in more counterfactual thought at Time 1 than at Time 3 ( $M_s = 4.93, 2.61$ ), see Figure 3.2 (a full table of means is provided in Appendix 3.5). However, no main effect of choice level upon counterfactual thought was found:  $F(2,69) = 1.03, p = .36, \eta^2 = .03$ , with similar average amounts of counterfactual thoughts reported across the 2, 12 and 38 option conditions ( $M_s = 3.47, 3.69, 4.04$ ). In addition no time/choice level interaction was found:  $F(2,69) = .49, p = .61, \eta^2 = .01$  (see Figure 3.2).



*Figure 3.2.* Bar chart displaying participants' mean levels of reported counterfactual thought as a function of choice set size at Time 1 and Time 3. Standard errors are represented in the figure by the error bars attached to each column.

Subsequently although the overall drop in the counterfactual thoughts at Time 3 appears to be in line with predictions, as no differences in the extent to which participants reported thinking about counterfactual alternatives were found according to choice level at Time 1, results from this self-report measure do not parallel earlier satisfaction analyses. The positive correlations found between satisfaction and counterfactual thought (both at Time 1:  $r = .40, p < .001$ , and Time 3:  $r = .22, p = .07$ ) may give us some insight as to why this may be the case, as this suggests that perhaps counter-intuitively (given the findings of Chapter 2), increased choice was associated with decreased counterfactual thought. However this is a point to which I will return in greater detail during the discussion section of this chapter (Section 3.8).

#### 3.7.4 Symptom Analysis

Data for symptoms were then analysed, in order to see whether initial choice level had had any impact on reported physical symptoms. A one way ANOVA

with planned contrasts was carried out. Severity of symptoms at Time 1 (recorded before participants had made their choice of essence) was included as a covariate in order to take account of individual differences in analyses<sup>1</sup>.

Results revealed a significant main effect of choice level on reported symptoms at Time 3:  $F(2,68) = 3.10, p = .05, \eta^2 = .08$ . Symptoms were found to be lower if participants initially chose their essence from the 12 rather than the 2 or 38 selection ( $M_s = 2.69, 3.44, 3.63$  respectively, estimated marginal means using prior symptoms as covariate,  $M = 3.65$ ), and planned contrasts revealed this difference to be significant:  $F(1,68) = 5.38, p = .02, \eta^2 = .07$ . This appears to be in contrast to earlier predictions that any ECE would reduce over time, subsequently providing evidence to suggest that choice level does have long lasting effects, and can affect physiological as well as psychological well-being.

However, it is important to note that the above results may demonstrate a regression to the mean, in the sense that symptoms may have reduced naturally over time. This is perhaps particularly relevant given that the participants were initially selected on the basis that they were currently experiencing various minor psychological or physiological ailments. As no control group was included in this experiment, it is therefore difficult to determine whether responses in the 12 option condition may perhaps be in line with a natural decline in symptoms over time, meaning responses generated in the 2 and 38 option conditions may be the anomalies: perhaps with a choice between 2 or 38 options leading to detriments to what may otherwise be a natural reduction in symptoms. In order to test for this the current experiment should be repeated, but with the inclusion of a control group who are just given one essence and are asked to use this for a period of

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<sup>1</sup>For completeness, the symptom analyses were also run with the covariate taken out, and details of this are provided in Appendix 3.6.

weeks. From this it would then be possible to determine whether it is 12 options leading to an improvement in symptoms over time, or 2 and 38 options restricting improvement, which may account for these findings.

### 3.8 Discussion

The current research replicated the short-term ECE within the novel domain of health psychology. In addition, the current experiment found evidence that the initial effects of choice level upon psychological satisfaction do not appear to be long lasting, and evened out over a two week period. This appeared to be in line with predictions, and with counterfactual theory. However, the counterfactual findings from the current experiment were equivocal, perhaps due to limitations in the measure used to provide an indication of counterfactual thought. As such, further research will be needed in order to gain direct empirical support for the role of counterfactual thought in driving this reduction in the ECE over time. Finally, perhaps the most interesting finding was a difference in reported physiological symptomatology, 14 days after the initial time of choice. Specifically, participants who chose their flower essence from a moderate choice set of 12 options were found to report significantly greater improvement in their physiological symptoms at the end of the 2 week period, than participants who chose from either 2 or 38 options. This furthers the previous choice literature by demonstrating that a) choice level can have a long term impact upon chooser well-being, and b) that choice can affect physiological as well as psychological well-being. Each finding is now considered in greater detail.

In line with previous research (e.g. Shar & Wolford, 2007; Reutskaja & Hogarth, 2009), the current research found evidence for the optimizing effects of intermediate choice, and detrimental effects of extensive and very limited choice

upon short term satisfaction. The fact that extensive and very limited choice were found to both be highly detrimental to satisfaction is an important point of contention with economic rational choice theory, demonstrating that once choice has exceeded an optimal level there is no further apparent benefit beyond that gained by having a choice of only 2 options in the first place. This finding may also help to explain why Scheibehenne et al., (2009) failed to find an ECE in their experiment which asked participants to choose whether to donate money to charity or keep it for themselves. In this experiment participants were presented with a choice of either 2 or 30 options. The authors found no difference in the likelihood of participants choosing to donate according to choice set size, which they interpret as evidence against the ECE. However, as the present research shows, it may be the case that the choice set sizes used were inappropriate for an investigation into the ECE, as very limited choice is shown to be equivalent to extensive choice. In order to truly examine the ECE a more intermediate level of choice must be provided as a point of comparison with these two extreme 'ends of the scale'.

Regarding the long term impact of choice, psychological satisfaction two weeks after having made the initial choice was found to be the same regardless of whether participants chose from 2, 12 or 38 options, demonstrating that the ECE noted at the initial time of choice does not persist over time. This appears to be in line with counterfactual theory, specifically with evidence suggesting that there will be a reduction in the experience of counterfactual emotion following action over time (Kinnier & Metha, 1989; Gilovich & Medvec, 1994; 1995). Gilovich and Medvec (1995) suggest that the amount of regret experienced following action will reduce either as a result of behavioural or psychological

repair work. As participants in the current experiment were unable to partake in any behavioural 'repair work', as their decisions were non-reversible, it appears that they may have undertaken psychological 'repair work' in terms of attempting to reduce the cognitive dissonance associated with negative choice outcomes (i.e. the lower satisfaction experienced with either 2 or 38 options). Supporting this, Anderson, Taylor and Holloway (1966) found that with increased choice came increased cognitive dissonance – causing participants to re-evaluate their chosen option as more desirable, and their rejected options as less desirable post-choice. However, as no direct measures of dissonance reduction were included in this experiment this suggestion is largely speculative, and further research will be needed in order to investigate any potential link between extensive choice and an increased tendency to engage in psychological 'repair work' over time.

Pertaining to the point at which the ECE begins to fade, preliminary analyses conducted on the Time 2 measure suggest that the ECE may have reduced as early as 7 days after having made the initial choice (see Appendix 3.3). However, further research using an increased sample size would be needed in order to determine whether this is the case, or indeed to determine the exact point at which the effects of choice upon psychological satisfaction begin to fade. Nevertheless, in line with counterfactual theory the current data show that the ECE does not remain robust over time, and is reduced to non-significance after a two week period, even when participants continued to evaluate the consequences of their choice for the duration of that time period.

Results from the self-report measure of counterfactual thought were not found to support the satisfaction data. However, as previously mentioned, the

positive correlations between satisfaction and the extent to which participants reported thinking about counterfactual alternatives may give us some insight as to why this may be the case. At both times of testing evidence was found that increased satisfaction was associated with increased counterfactual thought. This finding is counter-intuitive, given the findings of Chapter 2, and indicates that the wording of the counterfactual question may have (wrongly) placed emphasis on the extent to which participants considered the other *factual* options available to them at the time of making their choice, as opposed to generating a measure of post-decisional counterfactual thought. Participants were asked '*How much did you think about the other options which were available to you?*' As similar numbers of counterfactual thoughts were reported for 2, 12 and 38 options it appears the more participants considered the other options as factual possibilities at the time of choice, the more satisfaction they experienced with their chosen essence. As such it appears that this was an ineffective means of measuring the underlying construct of counterfactual thought, which instead may be most appropriately measured using a thought-listing task (as per Chapter 2). Subsequently I will not use this self-report measure to provide an indication of counterfactual thought in any future experiments. Therefore whilst the satisfaction data appear to be consistent with counterfactual theory, the current self-report data do not lend any further support to this. Subsequently future research may wish to repeat the current experiment but with the inclusion of an open-ended thought-listing CFT measure (as per Chapter 2) in order to gain empirical evidence for this claim.

Although the finding that there was a reduction in the ECE over time itself appears to be in line with counterfactual theory, the fact that there was an overall

drop in psychological satisfaction over time suggests that something else other than counterfactual thought may have been driving satisfaction down at Time 3. There are a number of potential explanations for this. These are based upon contextual differences between the environments in which participants completed the Time 1 and Time 3 questionnaires. For instance, satisfaction at Time 1 may have been driven up on the whole due to, a) the fact that participants had just been given something (i.e. their flower essence) for free (– the memory of this may have been less influential in judgements made at Time 3), b) the positive social interaction with the experimenter at Time 1 (which was not present at Time 3), or c) the mere presence of an experimenter at Time 1 may have led to an observation bias, or ‘Hawthorne effect’ (Landsberger, 1958; Gillespie, 1991), whereby research has demonstrated that participants’ behaviour can be affected simply by being aware that an experimenter is paying attention to them. In each case these positive experiences at Time 1 may have acted as anchors leading to increased satisfaction ratings (see Tversky & Kahneman, 1974; Simonson & Tversky, 1992). Or, finally d) it may be the case that at Time 1 participants may have had increased expectations about the potential results of the treatment, leading to an overall increase in satisfaction, whilst at Time 3 participants may have felt their expectations weren’t met, potentially also contributing to the drop in overall satisfaction.

In order to test these explanations future research may wish to repeat the current experiment, either a) ensuring participants are given something for free at both times of testing (i.e. an additional prize for participation at Time 3), or b) with both questionnaires completed in the same setting – i.e. either both in or out of the laboratory, in order to hold constant any potential anchoring effects involving

interactions with the experimenter. The latter explanation may be tested for by assessing whether participants' expectations about the treatment were met or not at the end of the 14 day period. If the overall drop in satisfaction is due to disconfirmed expectations, then this provides a potentially important addition to the previous health literature – which has identified that a key factor contributing to placebo effectiveness is expectancy (Kirsch, 1985; 2005; Morris, 1999). Participants must believe the placebo is going to work in order for it to be effective. However in the current experiment, I found evidence for a placebo effect, in terms of improvement in the severity of physical symptoms. Therefore it would appear most likely that the drop in satisfaction was the product of a situational anchoring bias rather than disconfirmed expectancies, as one would not necessarily predict to find a placebo effect where expectations are disconfirmed.

Whilst no evidence was found for any long lasting impact of choice level upon psychological satisfaction, choice level was nevertheless still found to have a long term effect on physiological well-being. Results from the symptom analyses suggest that choice level may have a deeper rooted impact, which appears to have resulted in experience of greater improvement in physical symptoms, crucially following use of the (objectively) same placebo treatment. This is a somewhat unexpected finding given that the effects of choice level upon psychological satisfaction were not found to persist over time. Thus it appears the success of a placebo treatment, in terms of the extent to which participants report experiencing improvement in symptom severity, may be influenced by the size of the choice set that participants initially chose from. This not only contributes towards research into factors affecting the effectiveness of placebo treatments,

but also to the ECE literature, by demonstrating that choice level can impact upon physical as well as psychological well-being.

These findings have several implications. Firstly, by examining the longitudinal impact of choice level, the current study extends our knowledge of the true 'problem' of extensive choice (Schwartz, 2004). In line with Schwartz's (2004) suggestion, it appears that choice level may indeed have a long term impact upon well-being. Schwartz (2004) proposed that extensive choice could lead to increased expectations, and subsequently decreased well-being when decision outcomes don't match up. The current data provide empirical support for this claim. As previous research has shown, expectations are key to eliciting a placebo effect. As such it appears that choice level may have impacted upon well-being via its impact upon expectations. When presented with an intermediate number of options participants may have experienced optimal expectations about their decision outcome, due to the fact they may have felt able to cope with the number of options they had to choose from. This expectation level may subsequently have been matched by their experiences, resulting in greater experience of a placebo effect, and greater benefit to their physical well-being. On the other hand, for an extensive number of options, participants' expectations may have perhaps been unrealistically high (Schwartz, 2004). Upon being presented with so many options, participants may have felt so overwhelmed by the increased responsibility for picking the best outcome, that their actual experience could not match up to their expectations. As previous research has shown, if participants' expectations about the results of a treatment are shown to be unrealistic then they will be unlikely to experience any placebo effect (Montgomery & Kirsch, 1997), and subsequently no improvement to their physical

well-being. However, as no measure of prior expectations was included in the current experiment, this suggestion is speculative, and further research will be needed in order to investigate any potential link between different choice levels and prior expectations.

Thus not only does the current research extend our knowledge of the long term impact of choice level, but raises the possibility that the underlying mechanism behind impact this may involve the influence of choice upon expectations. In doing so, these results also add to the previous literature into placebo treatments – by highlighting initial choice set size as an additional factor potentially contributing to the effectiveness of placebo treatments, alongside those factors already established in the health literature. Future research may subsequently wish to bear the influence of choice set size in mind when designing experiments into the effectiveness of placebo treatments.

Finally, the current research also highlights the potential importance of bearing choice level in mind during the construction of public policy. On the basis of economic theory, policy makers have been granting greater numbers of options in public goods and services on the basis of the belief that more choice can only lead to a better outcome (Botti & Iyengar, 2006). However as the current results demonstrate, it appears that not only does extensive choice (and very limited choice) lead to reduced satisfaction initially, but may also lead to impaired improvement in physical well-being, in comparison to a more optimal level of around 12 options. These findings are of particular importance within the relevant and highly consequential field of medical decision making (Schneider, 1998; Botti & Iyengar, 2006; Fasolo, Reutskaja, Dixon & Boyce, 2010), where it appears that choosers may potentially experience greater improvement in physical well-being

following a course of treatment if they are offered an intermediate level of choice initially. Following Eccles' (2002) claim that placebo effects form a part of the response to any active medical intervention (see also, Margo, 1999), one might perhaps predict similar potential benefits to choosers health and well-being of using an optimal choice level for decisions involving active health care treatments. Notably, however, this is also likely to be largely dependent upon situational factors such as whether the most effective treatment methods are made available or not, and the degree of variety in the choice set amongst real options (i.e. not involving an illusory choice). Nevertheless this remains an interesting avenue for future research to explore.

To conclude, the main aim of the current chapter was to investigate the longevity of the effects of choice level upon both psychological and physiological well-being. In doing so it was discovered that the short term effects to psychological satisfaction do not appear to persist over time. This appears to be in line with the predicted temporal reduction to the experience of regret. As noted above, however, the counterfactual findings in the current chapter were equivocal, perhaps because of limitations in the specific measure used. Although I did find an overall drop in counterfactual generation over time, as predicted, the ECE found at the initial time of choice was not found to be mediated by counterfactual thought, as per Experiment 1. Consequently in further studies I will re-adopt the open-ended thought-listing means of measuring counterfactuals adapted from Crawford and McCrea (2004), and previously used in Experiments 1 and 2. In addition, the current research also highlighted that not only did the ECE transfer to the novel domain of health psychology, but also that the effect had implications reaching beyond psychological satisfaction, by potentially also

influencing a persons' self-reported physiological well-being. An optimal choice level of 12 options was found to not only lead to improved short term satisfaction, but also to improved (reported) physiological well-being over time. The potential implications of these findings for our understanding of the ECE, for the psychology of health, for the construction of public policy, and for future research, have been discussed.

Notably, the improvement to physiological well-being found in the current experiment is a *placebo effect*, and as such results from the current experiment do not necessarily lead to the conclusion that any decision made from an optimal choice level will lead to long-term improvements in well-being. The results only concern decisions in which participants continued to be affected by the results of their choice for an extended period of time, or using placebo (or potentially active) health care treatments. Future research will therefore be needed in order to a) determine whether there are any long term effects to physiological well-being for decisions outside of the field of the psychology of health, for example with regard to decisions involving consumer goods, and b) to identify whether optimal choice levels might lead to similar improvements in physiology for active health care treatments.

The ECE has subsequently now been replicated in two experiments across varying domains (creativity and health psychology). In Experiment 1 it was demonstrated that this ECE was mediated by counterfactual thought, and could subsequently be reduced under high load, whilst in Experiment 3 the initial ECE and reduction in the effect over time also appears to be consistent with counterfactual theory. In my next chapter I aim to apply another aspect of counterfactual theory to the 'problem' of extensive choice (Fasolo et al., 2007)

with the aim of investigating a potential means of improving satisfaction with extensive choice. This relates to the counterfactual ‘action effect’, which has consistently demonstrated that counterfactual thoughts may be more prevalent following action than inaction (e.g. Kahneman & Tversky 1982a; Landman, 1987; Gilovich & Medvec, 1994; Avni-Babad, 2003; an extensive review of this literature is provided in Chapter 4). Many decisions made in applied settings will involve the use of default options as a ‘starting point’ (Thaler & Sunstein, 2008), and as Ritov and Baron (1992) showed, choosing to stick with a default may be viewed as being akin to inaction (see Chapter 4). In Experiments 4 – 6 I aim to apply this aspect of counterfactual theory to the ECE and determine whether choosing to stick with a default option might help to improve satisfaction with extensive choice sets, following the predicted impact of default options upon the generation of counterfactual alternatives.

## Chapter 4 – Investigating the Potential for Default Options to Improve Satisfaction with Extensive Choice

### Introduction

#### *4.1 Chapter Overview*

In the previous chapters we have seen evidence that extensive choice can lead to a decrease in satisfaction with chosen options, and even a decrease in the long-term effectiveness of a placebo treatment, compared to a more modest amount of choice. However, in the real world it may be highly problematic to try and limit the choice set available (e.g. for ethical reasons or market trading regulations). Consequently the main aim of the current chapter is to investigate how we might structure the choice environment in order to aid people to cope with extensive choice, and to explore what effect might this have on satisfaction with chosen options. One possible way of doing this is to offer defaults. These can be explained as “a set of rules put in place by a governing body, or choice architect, which will determine what happens to the decision maker if he or she chooses to do nothing” (Thaler & Sunstein, 2008, pp. 83). Research has shown that individuals typically display a strong preference towards sticking with a default option, if one is provided to them (Hartman, Doane & Woo, 1991; Simonson, 1992; Schweitzer, 1995; Madrian & Shea, 2001; Johnson & Goldstein, 2003; Sunstein & Thaler, 2003; Thaler & Sunstein, 2008 ; a full review of this literature is provided in Section 4.2 below), and this has led recent psychological research to consider the potential benefits that certain default options might have, in terms of ‘nudging’ individuals in welfare promoting directions (Thaler & Sunstein, 2008).

Notably for the current thesis, default options are potentially important because they shed light on the underlying process of counterfactual generation hypothesised in the current thesis to be an underlying cause of the ECE. Specifically, if someone sticks with a default they are accepting a status quo option, which is related to the counterfactual ‘action/inaction’ effect, whereby research has shown that individuals may be less likely to generate counterfactual alternatives following outcomes achieved via inaction as opposed to action (Kahneman & Tversky, 1982a; Landman, 1987; Gleicher et al., 1990; Byrne & McElaney, 2000; Ritov & Baron, 1990; Gilovich & Medvec, 1994; Connolly et al., 1997; Zeelenberg et al., 1998; Avni-Babad, 2003; I provide a full review of this literature in Section 4.3 below). As such, it was hypothesised that providing a default option might help to improve satisfaction with extensive choice due to the predicted impact of default options, i.e. inaction, upon counterfactual generation. I provide a thorough introduction into the counterfactual action/inaction effect in Section 4.3 below, which forms the theoretical basis for the experiments detailed in this chapter, following an introduction to existing research on default options.

#### *4.2 Existing Research on Default Options*

According to Thaler and Sunstein (2008) many decisions made in applied settings will involve the use of default options as a ‘starting point’. Indeed, the authors argue that the use of defaults is often unavoidable, in the sense that for any given choice, a governing body or “choice architect” (pp. 3) must set in place an associated rule which will obtain if the chooser does nothing. In this sense, default options have been defined as being both ubiquitous and powerful (see Thaler & Sunstein, 2008). This point is supported by a substantial body of psychological research which has shown that in any instance, a large proportion

of individuals will opt to stick with a default option if one is presented to them, whether or not that default is good for them. For example, in Hartman et al.,'s (1991) experiment, Californian electricity users were asked to rate their preferences regarding service reliability and rates. The authors found that when a company which was high in reliability was presented as a default option, the majority (60%) of participants chose this as their preference. Importantly however, the other half of the participants were presented with a low reliability company as their default, and still the vast majority opted to stick with the default option, with 58% selecting this as their preference.

Further, Simonson (1992) found that participants judged they would feel more regret if they started searching for a journal article in the last issue, to find it in the first issue, than if they started searching chronologically from the first issue, to find it in the last issue. Simonson (1992) argues this is because starting from the beginning and working chronologically is the default search option. As such switching from this is likely to elicit greater experience of negative counterfactual emotion. In Schweitzer's (1995) experiment, the type of investment strategy participants chose to recommend to a friend was found to be largely influenced by whichever option was presented to them as a default. Similarly, Luce (1998) examined the status quo bias within the field of consumer research, and found that participants who decided to stick with a default when considering choice of which car to purchase, experienced considerably lower levels of negative affect post-decision than participants who switched from the default.

#### *4.2.1 Existing Explanations for Default Preference*

Numerous potential explanations for this bias towards sticking with default options have been suggested. According to Sunstein and Thaler (2003) decision

uncertainty may play a role. Sunstein and Thaler (2003) suggest that the fact that in many domains people lack clear preferences means that what they choose is strongly influenced by the decision context, and default rules are one aspect of this. Alternatively, Samuelson and Zeckhauser (1988) claim that people may stick with defaults as a result of cognitive dissonance theory – as once an option has been selected this raises its value to some extent, causing the individual to interpret subsequent information with a bias towards the status quo option. Or, people may choose to stick with defaults simply because making an active choice is more effortful, and potentially more stressful, leading to inertia (Baron & Ritov, 1994).

On the other hand, people may choose to stick with default options simply because they perceive the default as a suggestion made by the policy maker, or experimenter, implying a recommended course of action (Johnson & Goldstein, 2003). Alternatively, it has been suggested that people may stick with default options as a result of loss aversion – whereby the potential losses associated with giving up a default option often loom larger than any potential gains associated with other options (Baron & Ritov, 1994; Kahneman et al., 1991; Tversky & Kahneman, 1991). Finally, and crucially for the current thesis, it has been suggested that sticking with a default option is similar to inaction (see Ritov & Baron, 1992), and as such, defaults may be associated with increased satisfaction in comparison to active choices due to the increased ease with which one is able to imagine counterfactual alternatives for action (Kahneman & Miller, 1986; Byrne & McEleney, 2000; a review of this literature is provided in Section 4.3 below). Tykocinski and Pittman's (1998) experiment provides further support for this, highlighting that one reason why people prefer inaction is in order to

shield themselves from the potential experience of the counterfactual emotion of regret associated with action.

Whatever the underlying explanation, our tendency to stick with default options is easily exploited. For example, Thaler and Sunstein (2008) cite examples of how successful businesses frequently cash in on the “immense power of defaults” (pp. 85), for example in the case of automatic magazine subscriptions. If renewal is automatic, and provided as a default that requires ‘unticking’, then many people will continue to pay for subscriptions they no longer want or need. Also, TV executives are reported to invest a lot of time working on network scheduling because they know that once a person has ‘switched on’ to a certain channel they are likely to stay there. The authors call this the “yeah, whatever” heuristic (pp.35).

#### *4.2.2 Defaults as Social ‘Nudges’*

Following this, recent research has begun to consider the potential benefits certain default options might have. Thaler & Sunstein (2008) described how defaults are powerful ‘nudges’, which might be used to move people in welfare promoting directions. For example, Madrian and Shea (2001) found that default options could be used to dramatically increase employee savings. Whilst Johnson and Goldstein (2003) found that using an opt-out default, as opposed to an opt-in default, could dramatically increase organ donation rates, which they conclude could potentially help to save thousands of lives each year. Thaler and Sunstein (2008) reiterate this, arguing that because default rules are inevitable in many situations, policy makers would be wise to bear the power of defaults in mind and consider structuring choices in a manner which would promote welfare.

The authors refer to this as a libertarian paternalistic approach to choice architecture (see Sunstein & Thaler, 2003).

Therefore to summarise so far, research has shown that individuals typically display a bias towards sticking with a default option if one is presented to them, and this has been shown to lead to improved satisfaction, and reduced experience of negative affect post-decision (e.g. Simonson, 1992; Luce, 1998). It has been suggested that default options are akin to 'inaction' (Ritov & Baron, 1992; 1995), and this link is a potentially important one for the current thesis, as it sheds light upon the underlying process of counterfactual generation hypothesised to be an underlying cause of the ECE. Specifically, if default options represent a means of eliciting choice via inaction, then this may lead to improved satisfaction with extensive choice, due to the predicted impact of 'inaction' upon counterfactual generation. I provide a specific rationale for the different experimental conditions in Section 4.4 below, following a more detailed introduction to the counterfactual 'action/inaction' effect, which forms the theoretical basis for the experiments detailed in the current chapter.

### *4.3 The Counterfactual 'Action Effect'*

Most decisions we make are subject to a degree of uncertainty. Forming expectations about the potential outcomes of different courses of action may help us to cope with this uncertainty (Zeelenberg et al., 2000). When the outcomes of our decisions do not match up to our expectations, in hindsight we might perceive that we have made a 'bad' decision, and the realisation of this often results in the experience of negative affect (Zeelenberg et al., 1998; 2000; Feeney & Handley, 2006). We might experience regret, shame, or disappointment with our decision outcome. Crucially the experience of these emotions depends upon our ability to

compare our actual state of affairs with some counterfactual alternative, i.e. our ability to imagine how things might have turned out had we acted, or chosen differently. Because of this, these are often termed 'counterfactual emotions' (Niedenthal et al., 1994; Guttentag & Ferrell, 2008). According to Bell (1982) the counterfactual emotion that seems to be the most relevant in terms of decision-making is that of regret. One key aspect of the current research into regret is focused upon whether we are most likely to experience this emotion as a result of action, or as a result of actions foregone (inactions). This is referred to as the 'action effect'.

A substantial amount of research into the counterfactual 'action effect' has found that people tend to regret actions more than they regret inaction, because it is easier for people to generate alternatives to reality for something they did, compared to something they did not do (Byrne, 2005). As discussed in Chapter 1, one of the earliest investigations into the effect was Kahneman and Tversky's (1982a) experiment, in which participants were asked to consider two hypothetical scenarios. In the first, Paul considered switching his stocks from Company A to Company B, but decided against it. In the second, George considered the same switch in stocks, and decided to make the switch. Thus the outcome of Paul's decision can be seen to stem from inaction, whilst the outcome of George's decision is the result of action. Participants were informed that both Paul and George would have been better off by \$1200 if they had chosen the alternative course of action (or inaction), i.e. Paul would have been better off financially had he swapped his stocks, whilst George would have been better off had he not swapped his stocks. Participants were asked to judge which investor would experience the most regret at this loss of income. The vast majority (92%)

of participants believed George, the actor, would feel more regret than Paul, the non-actor.

As previously discussed, a substantial amount of research has replicated this effect. For example, using a variety of hypothetical scenarios, Landman (1987) demonstrated that good outcomes were viewed more favourably, and bad outcomes more negatively when these were achieved through action, than when the same outcomes were achieved through inaction (see also, Gleicher et al., 1990; Byrne & McEleney, 2000; Ritov & Baron, 1990; Zeelenberg et al., 1998). Further, Avni-Babad (2003) found evidence for the action effect even when participants were not provided with prior counterfactual information. Gilovich and Medvec (1994) also found evidence for an action effect. In their experiment, participants were asked to read a scenario in which two protagonists, Sam and Jim are both enrolled at the same University. Both are only moderately satisfied where they are, and consider switching to a different university. In the end, Sam decides to stay put and Jim opts switch to a different university. Participants are informed that the decision turns out badly for both protagonists. Sam is unhappy that he stayed and Jim is unhappy that he decided to switch. Participants are asked to imagine who would experience the most regret. The authors found evidence for an action effect: participants consistently reported that Jim would experience more regret as a result of his action, than the comparative regret Sam would experience as a result of inaction.

Similarly, in Connolly et al.,'s (1997) experiment, participants were asked to read a hypothetical scenario in which the person described either switched, or didn't switch, from aspects of a required university course. The authors found that participants judged that a person who experienced the same outcome as a result

of action would experience greater regret in response to a negative outcome, and greater elation in response to a positive outcome, than a person who experienced the same outcomes as a result of inaction. As the same results were obtained whether the action was the result of the persons' own choice or through random computer re-assignment, the authors' claim this demonstrates that control and responsibility for action do not appear to be key to the prevalence of the action effect. This consistent replication led Gilovich and Medvec (1995) to conclude that the action effect is one of the most robust findings in the counterfactual literature.

#### *4.3.1 Explanations for the 'Action Effect'*

Kahneman and Tversky (1982a) argue that the effect occurs due to the fact that actions are more mutable than inactions, leading to 'emotional amplification', whereby people have a tendency to react more strongly to those events for which it is easiest to imagine another outcome occurring. Indeed, according to Norm theory's account (Kahneman & Miller, 1986), actions are rendered more mutable than failures to act, as a direct result of inaction being perceived as more 'normal' than action. In other words, in deciding to act, a person is acting 'abnormally', and thus counterfactual alternatives become more readily available (i.e. the event is more mutable), than if one is considering the same outcome caused as a result of inaction. Byrne and McEleney (2000) explain how this effect might be attributable to mental models theory. According to the mental models theory of thinking, people reason by representing discrete sets of affairs that are consistent with the information presented to them in the problem scenario (Thompson & Byrne, 2002; Feeney & Handley, 2006). These representations are known as "mental models" (Johnson-Laird, 1983), which,

according to Craik (1943), may be viewed as small scale models of the world. For example, when an individual understands a conjunction such as, 'there is a triangle and there is a circle' they represent its meaning (its intension), from which they can construct a representation of what it refers to (its extension) (Johnson-Laird, Legrenzi, Girotto, Legrenzi & Caverni, 1999). The representation of the extension takes the form of the mental model, in which the two objects are two mental tokens. Typically, mental models represent only true possibilities, which may be "fleshed out" to make fully explicit models also containing the false components in each possibility (see Johnson-Laird et al., 1999; Byrne, 2005).

Originally devised to explain the comprehension of discourse and deductive reasoning (see Johnson-Laird, 1983), the mental models theory has also been applied to probabilistic reasoning (e.g. Johnson-Laird et al., 1999), and counterfactual thought. For example, Byrne and McEleney (2000), describe how the counterfactual action effect may be the result of the more explicit representations people hold for action. In the case of the investment scenario for instance, participants will hold in mind two mental models for the actor – his past and present situations, whereas for the non-actor only one mental model is held in mind, as his past and present situations are unchanged. The authors explain that the result of this may be that people attribute less regret to the non-actor as no counterfactual alternative is readily available in their mental model, thus making inaction less *mutable*.

Providing support for this, Tykocinski and Pittman (1998) found that one reason why people prefer inaction to action is in order to shield themselves from the potential experience of regret following action. In their experiment, participants were asked to read a variety of hypothetical scenarios detailing

missed attractive opportunities. For example, in one scenario participants are asked to imagine they read about a fantastic holiday opportunity, but were too slow in getting to the travel agents office, and all of the available places were booked. The authors found that this initial inaction was likely to lead to continued inaction when participants were later presented with a similar, but considerably less attractive (in terms of cost) package deal. The authors term this effect *inaction inertia*, and suggest that this effect occurs as participants' anticipate experiencing increased regret if they choose to act and take up an opportunity which was less attractive than the opportunity which was previously missed. However, when participants were provided with negative feedback information about the original missed opportunity (for example, that the original tour guide fell ill and was replaced with a humourless substitute), the inaction inertia was found to subside. Participants in this negative feedback condition were found to be significantly more likely to take up the second, less attractive offer in comparison to participants who received no such feedback. The authors suggest this is because this information "absolves one of anticipated regret" (pp. 615), thus removing the problematic feature that would otherwise have led to continued inaction. As such, this study provides further evidence for the contention that people may prefer inaction over action due to the fact that action is associated with the greater experience of counterfactual thought and emotion.

Alternatively, these results have also been explained in terms of the status quo bias. According to Samuelson and Zeckhauser (1988), the term status quo bias refers to people's tendency to "do nothing, or maintain one's previous decision" (pp. 8). In their experiment, participants were asked to read a hypothetical scenario detailing possible investment opportunities. Participants

were either informed about the options with no additional information, or were presented with the same options, but with one designated as the status quo. The authors found evidence for a status quo bias – participants were found to have a strong tendency to maintain the status quo (i.e. to not switch from the default option), whilst in the other condition the options were regarded as equally attractive.

Kahneman, Knetsch and Thaler (1991) established a status quo bias simply by placing the object to be valued on the subjects' desk. Kahneman et al., (1991) suggest that this status quo bias is attributable to the endowment effect, and loss aversion, whereby the loss of the status quo looms larger than the potential gain of alternative options, as the choice is judged on the basis of a neutral reference point. If an individual is already given a default option then they will attribute a greater value to it, making any act to switch from the default (and break the status quo) a more risky option, as the chooser stands to lose something they already perceive as being theirs.

However, the account provided by Norm Theory finds support from the work of Ritov and Baron (1992; 1995) who noted that the investment scenario confounded inaction with this status quo bias, as in each case the target described is given a default state, those who decide to act are essentially breaking the status quo, whilst those who decide not to act are maintaining the status quo. In their experiment, Ritov and Baron (1992) used a variety of hypothetical scenarios in order to determine whether the results of the investment scenario were due to status quo bias, or a general preference for inaction. The authors found that subjects reacted more negatively to action whether the status quo was maintained or not, and preferred inaction to action even when inaction

was associated with change. The authors term this general preference towards inaction '*omission bias*', providing support for Norm Theory's account, rather than merely a preference towards maintaining the status quo.

#### *4.3.2 Evidence Against the 'Action Effect'*

Other research has identified limitations to the action effect. For example, in N'gbala and Branscombe's (1997) experiment participants were presented with a version of the investment scenario, however they received a version detailing either the action-alone aspect of the scenario, the inaction-alone aspect, or both the action and inaction aspects (comparative scenario). In addition, the authors included a measure of mutability, in order to test Norm Theory's prediction that actions were regretted more because they were more readily mutated than inactions. The authors found evidence that actions were regretted more than inactions only in comparative judgements, where information about action was presented alongside the alternative, inaction version of the story. In addition, the authors demonstrated that whether the action/inaction versions of events were presented alone or together, they were both mutated with equal frequency, seemingly contrary to Norm Theory's account.

The authors claim that these results are consistent with Gavanski and Well's (1989) theory about 'default events', in which the default event is "that which readily comes to mind as an alternative to a factual event" (pp. 162). According to N'gbala and Branscombe (1997) actions and inactions would be mutated with equal frequency when presented alongside a default event. In the case of the investment scenario, the antecedents of the outcomes (i.e. action or inaction) were each presented alongside a default alternative. That is, participants were informed that the actor could have improved his outcome by

not-acting, whilst the non-actor could have improved his outcome by acting. By demonstrating that participants only judged the actor to feel more regret than the non-actor when a comparative judgment could be drawn, and by providing a measure of mutability, the authors conclude that their results illustrate that the action effect is not the result of actions being perceived as more abnormal, but rather that the non-actors decision was judged to be more wise than the alternative decision to act.

Similarly, in Zeelenberg et al.,'s (2002) experiment, participants read versions of a hypothetical scenario in which a soccer coach decided whether or not to change the line-up of his team. The authors demonstrated that participants only experienced more regret as a result of action when information about prior outcomes was positive, or absent. In cases where information about prior outcomes was negative, i.e. when participants read information detailing how the soccer team had lost their previous match, action was deemed to be more 'normal' – resulting in more regret being attributed to inaction. The authors term this an *inaction effect*. Paralleling this, in a study using default options, Inman and Zeelenberg (2002) found that when prior information about the available alternatives was both available and negative then satisfaction could be improved if participants chose to switch to a different option, rather than opting to stick with a default. The authors argue that this is because in this instance action is perceived as more normal than inaction. As such the influence of prior information regarding the valence of choice outcomes will be an important methodological consideration for the current experiments. This is a point to which I will return in Section 4.5 below.

Finally, Gilovich and Medvec (1994) found that whilst actions were regretted more than inactions in the short term, over time a reversal of this effect occurs, and participants exhibited an inaction effect (see also, Kinnier & Metha, 1989; Feldman et al, 1999; Roese & Summerville, 2005). The authors suggest a variety of causal mechanisms which may be responsible for this reversal of the action effect, including factors which may reduce the pain of actions more so than the pain of inactions: a) behavioural repair work in terms of compensating for regrettable actions, and b) psychological repair work in terms of identifying silver linings and increased cognitive dissonance reduction. As well as factors which may increase the pain of inactions more than the pain of actions: a) that failures to act become harder to justify than decisions to act, and b) that the consequences of failures to act are seemingly infinite, leading to a greater potential for future counterfactual thought than decisions to act, which according to Gilovich and Medvec (1995), may be reflected upon as having seemingly finite consequences (see also, Gilovich et al., 1995; 2003).

Therefore to summarise so far, whilst there is considerable evidence for the action effect there is also a substantial body of research demonstrating the limitations of the effect. When prior information about inaction is negative, or when one is not able to directly compare action with inaction, then the effect is not found to occur, and theoretical explanations for this have been discussed. In most other instances, however, it appears that the action effect is fairly robust and widely replicated, and this has been attributed to counterfactual mutability (Kahneman & Miller, 1986; Byrne & McEleney, 2000; Byrne, 2005).

As previously discussed, Experiments 4 – 6 detailed in this chapter were subsequently designed to apply this aspect of counterfactual theory directly to the

field of decision making by comparing people's active choices, with their decisions to not act – in terms of choosing to stick with a default option. Only one study (Tsiros & Mittal, 2000), as far as I am aware, has previously linked default options directly with counterfactual thought. In this experiment, participants read a hypothetical scenario in which the protagonist, Paul, wished to purchase a laptop computer. Participants read how Paul made the decision to either stick with, or switch from, a default option (Study 3). Tsiros & Mittal (2000) found that participants were significantly more likely to generate counterfactual thoughts following a decision to switch from the default option. Further, supporting the overarching hypothesis of the current thesis, this increased tendency to engage in counterfactual thought was found to drive the experience of regret which ultimately undermined satisfaction. The current experiment(s) aimed to extend these findings directly to the ECE. Further, I aimed to contribute towards a greater understanding of the underlying mechanisms behind any potential benefits of default options, through the application of the counterfactual action effect literature.

#### *4.4 Rationale for the Current Experiment(s)*

The current experiments were designed to investigate the potential for default options to improve satisfaction with extensive choice. On the basis of the theoretical counterfactual account provided above, and following the findings of Experiment 1, it was predicted that satisfaction with an extensive number of options would be low when made via an active choice (also supported by Experiment 3), as a direct result of increased counterfactual thought. However, it was predicted that presenting one option as a default might cause satisfaction levels to increase comparatively, due to the fact that in sticking with a default

option (and deciding not to act to break the status quo), counterfactual alternatives may be less readily available.

Notably, participants in the default choice condition may also choose to switch from the provided default option, essentially making these 'switchers' akin to active choice participants. As such it is predicted that any participant who chooses to switch from the default will also experience decreased satisfaction in comparison to participants who opt to stick with the default, due to the fact that 'switchers' will then be required to make an active choice between the remaining options for themselves. However, based upon the previous literature into default options it is also predicted that very few participants placed in the default choice condition will opt to switch from that default. To summarise, it is predicted that the decreased satisfaction levels often associated with extensive choice (Iyengar & Lepper, 2000; Shar & Wolford, 2007, Reutskaja & Hogarth, 2009; results detailed in Experiments 1 and 3) might be improved if participants choose to stick with a default option, due to the predicted impact of inaction upon counterfactual thought.

#### *4.5 Methodological Considerations*

In the current experiments, rather than comparing extensive with limited or optimal choice (as per Experiments 1 and 3 respectively), I will now only be using extensive choice as: a) the dissatisfaction associated with extensive choice is the main focus of the ECE literature, b) this is where counterfactual thought levels were demonstrated to be highest (Experiment 1), and c) because the ECE has been previously established in Experiments 1 and 3. In this Chapter I attempt to manage the dissatisfaction associated with extensive choice via ideas from the counterfactual literature, and the presentation of a default option. As such, the

current experiments differ slightly from the typical ECE literature by comparing different extensive choice types with a no choice control group, with the overall aim of attempting to improve satisfaction with extensive choice. Consequently for both the active and default choice conditions, participants will be presented with a choice between an extensive number of 24 options.

As previously discussed (see Section 4.3.2), in Inman and Zeelenberg's (2002) study of default choice, it was found that when prior information about the available alternatives was both available and negative then satisfaction could be improved if participants chose to act, i.e. to switch from the provided default. Consequently bearing this in mind, in the current experiments participants will be making a choice with no prior information regarding the valence of choice outcomes on which to base their decision from the outset, making it in line with most of the previous literature into defaults and inaction. Finally, based upon Iyengar and Lepper's (2000; see also Chernev 2003a; 2003b) investigation into the ECE the current experiments consider satisfaction with chocolate choice, according to manipulations in choice type (active versus default). As previously stated, a control group will also be implemented who will just sample one of the chocolates in order to gain a base level of satisfaction with choice. Counterfactual thought will be assessed in the active choice and default choice conditions, using the same open ended thought-listing procedure used in Experiments 1 and 2. Because it will not be possible to assess counterfactual thought in the control group, as they have no alternatives with which to compare their outcome, the extent to which participants experienced the counterfactual emotion of regret will also be measured. In this manner it will then be possible to compare an aspect of counterfactual experience between the choice and no choice control conditions.

## 4.6

## Experiment 4

### 4.6.1

### Method

#### *4.6.1.1 Participants*

84 paid participants (46 women and 38 men, mean age = 30, with a range of 18 to 65 years) recruited by Plymouth University's paid participant pool, took part in the experiment, each receiving £4 in exchange for 30 minutes participation.

#### *4.6.1.2 Materials*

The extensive choice set consisted of 24 different luxury chocolates from Hotel Chocolat (a high end chain of chocolate stores in the UK). Hotel Chocolat was selected as they provide a wide variety of different flavoured luxury chocolates, which are decorated so that each different flavour has a unique appearance. This was important in order to further emphasise the different options in the extensive choice set. Further, Hotel Chocolat is a relatively new company (launched in 2003), and as they sell luxury, relatively expensive, chocolates it was deemed likely that most participants would be relatively unfamiliar with the majority of options presented to them, in comparison to using a better known brand. As such it was deemed this was likely to provide a more valid measure of choice satisfaction, as choices would be less likely to be affected by previous experience. The exact selection of chocolates used was determined through market research, whereby I asked the manager of Hotel Chocolat to provide me with information regarding the best, and worst selling chocolate flavours. On the basis of this, the top and bottom 5 flavours were excluded from use in the experiment. This was an important consideration as including these flavours could have impacted upon the types of choices

participants made – i.e. to specifically choose, or avoid certain options. In this manner it was determined that choices would be made from an extensive selection of options that were relatively more similar in terms of attractiveness. The chocolates were presented in paper cake cases (see Appendix 4.1), and were each accompanied by a short (one – two sentence) flavour description, as provided by Hotel Chocolat.

#### *4.6.1.3 Procedure*

Participants were informed that the experiment was designed to provide market research to an up-and-coming (unnamed) chocolate company (Appendix 4.2), and were placed into one of three conditions: active choice/ default choice/ control. In the active choice condition, participants were presented with the extensive selection of 24 chocolates, and were instructed to carefully consider each option presented to them, before selecting the option they most liked the look of, and subsequently would most like to sample (Appendix 4.3). In the default group, participants were presented with the same extensive selection of 24 chocolates, however this time one of these was presented as a ‘default’ option. These participants were instructed that ‘the default option in front of you has been pre-selected for you to sample. Are you happy to try this pre-selected chocolate or would you like to switch to a different chocolate type?’ (Appendix 4.4) to which participants were required to answer ‘stick’ or ‘switch’. If participants chose ‘switch’ they received further instructions (Appendix 4.5) detailing the same procedure as that used by ‘active choice’ participants, in order to select the option they most liked the look of from the remaining 23 options presented in front of them.

A matched yoked design was used so that in each case, the default option initially provided to participants was the same chocolate as that which was selected by the previous 'active choice' participant. In this manner it was then possible to determine any impact of defaults upon satisfaction with the objectively same outcome. Finally, participants in the control condition were simply presented with one chocolate, with no mention of other options (Appendix 4.6). Again this was the same chocolate flavour as that which was selected by the previous 'active choice' participant.

Participants in each condition were asked to sample their chosen chocolate, and to then answer a questionnaire designed to measure satisfaction with chocolate choice (DV1). This was done using three items adapted from Iyengar & Lepper (2000): 'The chocolate I sampled was tasty', 'I was not satisfied with the chocolate I sampled (reversed)', and 'I enjoyed the chocolate I sampled'. Each question called for ratings on a seven point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) (Appendix 4.7). The internal consistency of the items was high ( $\alpha = .87$ ), therefore data from the three items is collapsed to give a single satisfaction measure. In addition to this, counterfactual thought was also assessed in the 'active' and 'default' conditions (DV2). Using the same open-ended thought listing method used in Chapter 2, participants in the active and default choice conditions were asked to list "at least two reasons why you responded in that particular way" after each satisfaction item. These responses were later coded and used as a measure of spontaneously occurring counterfactual thought.

It was not possible to assess counterfactual thinking in control participants, as these participants were not required to make any choice, and subsequently

did not have any other options with which to compare the chocolate they sampled. As such these participants were given a shorter questionnaire, which asked for the same satisfaction ratings, but without the counterfactual thought listing aspect (see Appendix 4.8). Because of this methodological difference between the active/default and control conditions, an additional emotional indicator of counterfactual thought was also assessed. This was done by asking participants in all three conditions, about their experience of the counterfactual emotion of regret (DV3), which was also adapted from Iyengar & Lepper (2000). Participants were asked 'Do you regret eating the chocolate you sampled?' and were required to answer using a seven point Likert scale ranging from 1 (*not at all*) to 7 (*very much*).

Finally, again following the procedure used by Iyengar and Lepper (2000, Study 3; see also Chernev, 2003a) participants also answered a question designed to give a behavioural measure of satisfaction (Appendix 4.7). Participants were asked 'As you know payment for participating is £3 cash. You can now choose between getting £3 cash, or alternatively you can have a box of six chocolates that is worth £3. Would you like to stick with cash payment or switch to chocolates?' Participants' decisions to 'No thanks – stick with cash' vs. 'Yes please – switch to chocolates', was then used as a behavioural indicator of satisfaction with choice, with those participants choosing to switch to chocolates presumably more satisfied with their chocolate than participants who opted to stick with cash (see Chernev, 2003a). After completing this questionnaire, participants were debriefed and reminded of their right to withdraw (Appendix 4.9). In addition, at this stage participants who chose the chocolates over cash were informed this was a satisfaction measure, were given their cash payment,

and informed that the chocolates could in fact be purchased for £3 from the local Hotel Chocolat store if they still wished to do so.

#### *4.6.1.4 Coding Counterfactuals*

Participants responses to the counterfactual thought-listing aspect of the questionnaire were coded according to the same criteria established in Chapter 2. Responses were coded into six main categories: choice counterfactuals, problem counterfactuals, positive appraisals, negative appraisals, positive comparisons, and other responses. Once again the category of response which is of particular interest for this experiment is 'choice counterfactuals'. Following Chapter 2, once again no differences were found according to whether used the absolute number of counterfactuals a person generated or the proportion of all statements which were counterfactuals. The analysis below therefore used the raw number generated to provide the reader with a clearer indication of overall counterfactual prevalence (however for completeness, details of counterfactual analyses using proportions of counterfactual responses generated are presented in Appendix 4.15).

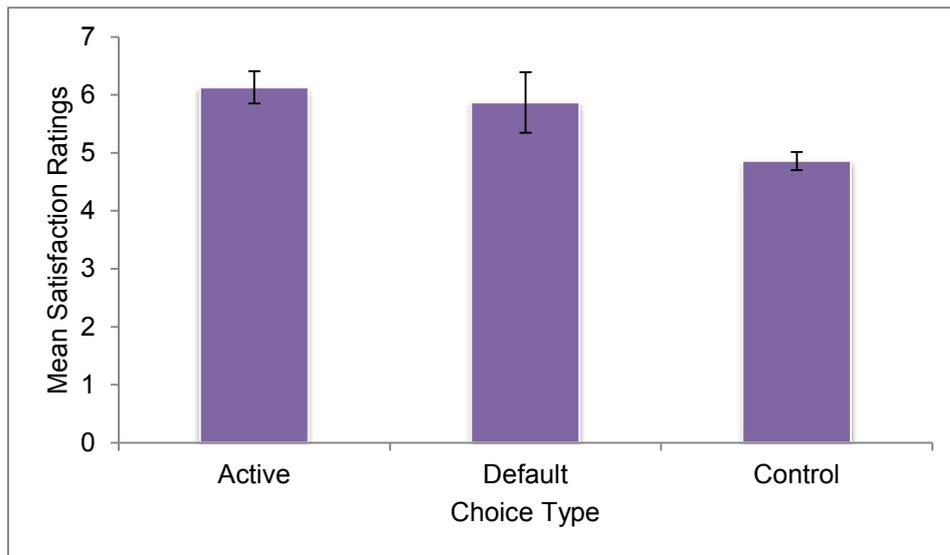
### 4.6.2 Results

As only 8 participants in the default group (9.5% of all participants) decided to switch to another chocolate type, these participants are now excluded from further analyses, in the interests of statistical power, and in order to focus on any differences between 'default stick' (i.e. 'inactive' choice participants), and active and control participants.

#### *4.6.2.1 Satisfaction Analysis*

A one way ANOVA revealed a significant main effect of choice type upon satisfaction:  $F(2,73) = 7.66, p = .001, \eta^2 = .17$  (see Figure 4.1). Bonferroni post-

hoc tests revealed that satisfaction was significantly lower in the control group ( $M= 4.86$ ,  $SD = 1.67$ ) than in either the active choice ( $M= 6.13$ ,  $SD = 1.03$ ,  $p = .001$ ), or default stick ( $M= 5.87$ ,  $SD = .86$ ,  $p < .001$ ), conditions, whilst the pairwise comparison between the active choice and default stick conditions was found to be non-significant ( $p= 1.00$ ).



*Figure 4.1.* Bar chart displaying the effects of choice type manipulations upon mean satisfaction ratings. Standard errors are represented in the figure by the error bars attached to each column.

These findings are interesting given that participants in the control group sampled the same chocolate as participants in the other two conditions, due to the matched yoked design. These results subsequently appear to highlight the value of simply being aware that other options are available to you, even if you don't then decide to exercise that choice (i.e. in the default-stick condition). These results also appear to be contrary to predictions that satisfaction would be increased if participants opted to stick with the default option, in comparison to the active choice condition, as no differences were found between active and default participants.

#### 4.6.2.2 Regret Analysis

A one way ANOVA revealed no effect of choice type upon regret:  $F(2,73) = .64, p = .53, \eta^2 = .02$ . Although regret levels were found to be slightly higher in the control group than in the active or default stick conditions ( $M_s = 2.29, 1.82, 1.80$  respectively), Bonferroni post-hoc tests revealed no significant differences in regret between conditions (all  $p$ 's  $>.05$ ).

#### 4.6.2.3 Counterfactual Analysis

Data from the counterfactual 'thought-listing' aspect of the questionnaire were then analysed in order to examine the prediction that inactive (default) choice participants would generate fewer counterfactual thoughts than active choice participants. A one way ANOVA revealed no effect of choice type upon the total number of counterfactuals generated:  $F(1,46) = 2.25, p = .14, \eta^2 = .05$ . Counterfactual generation was found to be similar in the active choice, and default stick conditions ( $M_s = .07, .25$ ). This appears to go against earlier predictions that participants in the default condition would generate fewer counterfactuals than participants who made an active choice. However the very low levels of counterfactuals generated overall (c.f. the counterfactual rates in Experiments 1 and 2 using the same method) parallels the earlier finding that there were no differences in satisfaction according to the active/default choice manipulation. These results may be due to the luxury nature of the products sampled. Specifically, if participants perceived the chocolates to be a generally pleasing, high quality selection then this may explain why little variation was found in the satisfaction ratings (with the exception of the control group).

#### 4.6.2.4 Behavioural Satisfaction

The behavioural satisfaction data relating to participants decisions to stick with cash as payment or switch to chocolates were then analysed using binary logistic regression. Once again results revealed no significant differences in decision to switch to chocolates according to condition:  $B = .23, p = .50$ .

Participants were just as likely to switch to chocolates in the active, default stick and control conditions ( $Ns = 6, 6, 4$ ). As such the active/inactive choice manipulation appears to have had no notable effects upon either psychological (stated) satisfaction, or upon behavioural (revealed) satisfaction. Experiment 5 was subsequently designed as a replication of the current experiment, but this time using relatively unpleasant, cheap chocolates, so that satisfaction levels would not be so (perhaps unrealistically) high from the outset, and subsequently perhaps more open to the influence of choice type manipulations.

#### 4.6.3 Discussion

The current experiment illustrated that the vast majority of the participants in the default condition opted to stick with the default option, providing support for previous research into the omission bias, and the effectiveness of default options (Baron & Ritov, 1994; Samuelson & Zeckhauser, 1988; Sunstein & Thaler, 2003). However, contrary to predictions, no differences in satisfaction (stated or behavioural) were found between the active and default choice conditions: in both conditions participants were found to be extremely happy with their choices. This is paralleled by the fact that there were no notable differences in counterfactual thought or regret between these two conditions.

It is possible that no effects of choice type were found either due to a) the luxury nature of the products sampled, or b) the fact that all of the chocolates

were labelled. Using luxurious chocolates meant it was possible that all of the choice outcomes were perceived as being particularly nice, or of a high quality, and these positive choice outcomes may have led to an overall reduction in CFT, as previous research has shown counterfactual thoughts may be cued more readily following negative outcomes (e.g. Sanna & Turley, 1996; Roese 1994; 1997). Further, the fact that the chocolates were labelled may have also reduced counterfactual thought as this may have meant the choice outcomes were more certain. Previous research has demonstrated that when decisions are uncertain people form expectations about potential outcomes, and that a key trigger for counterfactual thought is the mis-match between expectations and experience (Zeelenberg et al., 1998; 2000; Sanna & Turley, 1996). As all of the chocolates were labelled in this experiment, participants' expectations were likely to match their experiences, meaning they may have been less likely to generate counterfactual thoughts, and more likely to experience increased satisfaction with their choice outcome as a result.

The current experiment did highlight that the control group were significantly less satisfied than participants in either of the choice conditions. Due to the matched yoked design this was with exactly the same outcome, allowing us to establish that these noted differences in satisfaction were due to the choice type manipulations. These results appear to be in line with previous research which has shown the detrimental effects of no choice upon chooser well-being. For example, in Zuckerman et al.,'s (1978) experiment it was found that participants who were given a choice of which task they wanted to complete experienced increased intrinsic motivation and overall task performance, when compared to a control group who were told which tasks to undertake.

Subsequently, these results appear to demonstrate the value of choice, at least when the outcome of that choice is positive. By directly comparing the control group with the default group we can see there is an apparent value to participants of simply being aware that other options were available to them. Interestingly, even if participants didn't then decide to exercise that choice (i.e. the default-stick participants), satisfaction with the same outcome still increased by a whole point.

In all, the results from the current experiment raise some interesting points for further investigation. Participants were found to be equally satisfied with active or default choice, however as previously discussed this may have been the product of the luxury nature of the products sampled, or the fact that the product labels could have led to increased alignment between expectancy and experience. Subsequently Experiment 5 was designed as a partial replication of this experiment, but using less enjoyable, cheaper chocolates, and crucially, without labels, in order to manipulate outcomes so satisfaction levels weren't so high, and thus potentially encourage counterfactual thought. In this manner I hoped to then determine a) whether default options might yet lead to improved satisfaction in comparison to active choices, and b) whether the apparent value of choice identified in the current experiment would generalise to situations in which the outcome was less directly positive for the participant.

## 4.7 Experiment 5

### 4.7.1 *Rationale for Experiment 5*

Contrary to predictions, Experiment 4 failed to find a significant difference in counterfactual thoughts or satisfaction between default and active choice participants. It was suggested that this may have been because the outcomes were simply too positive to generate many counterfactuals at all – a suggestion

backed up by the low counterfactual rate (c.f. the counterfactual rates in Experiment's 1 and 2 using the same method). The current experiment therefore aimed to build upon the methodology used in Experiment 4, in order to investigate whether the predicted pattern might emerge when the choice outcomes were less directly positive for the chooser. Accordingly, the methodology used in Experiment 4 was altered in 4 main ways. Firstly, the valence of choice outcomes was changed. Frijda (1986) defines valence as the intrinsic degree of attractiveness vs. aversiveness of an object or situation. Subsequently following this definition, in Experiment 5 a cheaper, relatively unpleasant-tasting chocolate type was used. The particular brand was selected on the basis of pilot testing (details of which are provided in Section 4.7.3 below). Secondly, all labels were removed from the chocolates, in order to reduce the potential impact of increased alignment between expectations and experience.

Thirdly, following the procedure used by Mogilner et al., (2008), and the use of an objectively illusory choice in Experiment 3, all of the chocolates used in this experiment were identical to one another. This was done in order to remove any further potential impact of appearance on expectations and resulting satisfaction. Participants were informed the chocolates contained a selection of flavours, and were given a list of potential choice outcomes. However, as all the chocolates used were actually the same flavour, this allowed for a thoroughly controlled examination of manipulations in choice type alone upon satisfaction with the objectively same outcome (as per Experiment 3).

Finally, the behavioural measure of satisfaction used in Experiment 4 was also altered (see Appendix 4.10). This was altered because it was deemed that asking participants whether they would like cash or chocolates as payment for

participation may not have provided an accurate measure of satisfaction, as a substantial number of participants reported to have opted for the cash in order to keep their options open (as they could then buy the chocolates at a later stage). As such in this experiment, participants were simply asked whether or not they would like to take an additional chocolate home with them: *“As you know, payment for participating in the study is one participation point. As an extra thank-you for participating you have the option of taking an extra one of the chocolates you selected home with you. Would you like to take one of the chocolates you selected home with you?”* Participants Yes/No responses were then used as a behavioural indicator of satisfaction.

#### 4.7.2 Hypotheses

The same predictions followed as for Experiment 4. Specifically it was hypothesised that participants who made an active choice would be less satisfied with their choice of chocolate than participants who chose to stick with a default option, and that this difference would be the result of the increased counterfactual thought associated with active (extensive) choices.

#### 4.7.3 Method

##### 4.7.3.1 Pilot Test

A pilot test was conducted in order to determine the least preferred chocolate type from a selection of six of the cheapest, generally least preferred chocolates available from stores at that time. These were: coffee and orange flavoured chocolates, and whiskey, brandy and Cointreau liqueur chocolates (all from Poundland), and budget Turkish delight chocolate from Sainsbury's. 10 pilot participants (7 women and 3 men, mean age = 26, with a range of 19 to 46

years), recruited via a method of convenience sampling, sampled each of the chocolates in a randomized order, and rated their satisfaction with each sample. It was determined that the Cointreau liqueur chocolates were the least preferred chocolate type, therefore these were selected for use in the current experiment.

#### *4.7.3.2 Participants*

135 Psychology undergraduates (83 women and 52 men, mean age = 24, with a range of 18 to 55 years) at Plymouth University took part in the experiment in exchange for course credit.

#### *4.7.3.3 Materials*

Based on pilot testing, 24 cheap 'Cointreau' liqueur chocolates, from Poundland were used to form the extensive choice set.

#### *4.7.3.4 Procedure*

The procedure used in Experiment 4 was replicated, with the exception of the discussed alterations to a) the type of chocolates used, b) the visual presentation of the choice set (in terms of the illusory choice and removal of labels), and c) the questionnaire. Participants were informed that the experiment was investigating 'taste perception and individual differences' (Appendix 4.2), and that the selection of chocolates in the table in front of them contained "a variety of flavours including some liqueur chocolates, some fruit flavoured chocolates, some truffles, some caramels, and other assorted flavours" (Appendix 4.11). As before, participants were randomly allocated to one of three conditions: active choice, default choice or control. In the active choice condition were instructed to carefully consider all the options, and to "pick the one you most like the look of and subsequently would most like to sample" (Appendix 4.11). Participants in the default condition were presented with a default option, which they were informed

had been “pre-selected for them to sample”, and were given the opportunity to stick/switch from this default option to one of the other 23 chocolates presented to them (Appendix 4.12). Finally in the control group participants were again just presented with one chocolate, and were asked to sample that chocolate (Appendix 4.6). As all of the chocolates used were identical this time, this allowed for a thoroughly controlled investigation of the impact of choice type upon satisfaction with the same objective outcome.

Participants then ate their selected chocolate, and answered the same questionnaire as was used in Experiment 4 (see Appendices 4.7 and 4.8), which was designed to measure satisfaction with choice (DV1), using the following three key items adapted from Iyengar & Lepper (2000): ‘The chocolate I sampled was tasty’, ‘I was not satisfied with the chocolate I sampled (reversed)’, ‘I enjoyed the chocolate I sampled’. Each question called for ratings on a seven point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal consistency of the items was high once more ( $\alpha = .92$ ), and data from the three items is therefore collapsed to give a single satisfaction measure. The questionnaire was also designed to provide a measure of the counterfactual emotion of regret. This was done by asking participants in all three conditions: ‘Do you regret eating the chocolate you sampled?’ Again participants were required to answer using a seven point Likert scale ranging from 1 (*not at all*) to 7 (*very much*). In addition, participants in the active and default choice conditions were again asked to list reasons for their responses after each satisfaction item. These responses were later coded according to the same criteria established in Experiments 1 and 2 (and also used in Experiment 4), and used as an indicator of spontaneously occurring counterfactual thought. As control participants were

unable to answer this aspect of the questionnaire, they were given a shortened version of the questionnaire, which just called for the satisfaction and regret ratings (Appendix 4.8). In addition to this, as previously mentioned, all participants were also required to answer an alternative question designed to provide a behavioural measure of satisfaction (please see Section 4.7.1). Finally, participants were debriefed (Appendix 4.9) and reminded of their right to withdraw.

#### 4.7.4 Results

Only 5 participants in the default group (3.7% of all participants) opted to 'switch' to another chocolate type. They are subsequently excluded from further analyses, following the procedure used in Experiment 4. As such analyses now focus on data from the remaining 130 active, inactive (default-stick), and control group participants.

##### *4.7.4.1 Valence Manipulation*

An independent samples t-test revealed participants were significantly more satisfied overall in Experiment 4 than in Experiment 5 ( $M_s = 5.59$  vs.  $2.88$ ,  $t(204) = 11.41$ ,  $p < .001$ ), demonstrating that the manipulation of outcome valence was successful. Following this, the remainder of the analysis detailed below focuses upon data from the current experiment (5) only.

##### *4.7.4.2 Satisfaction Analysis*

A one way ANOVA revealed a significant main effect of choice type upon satisfaction:  $F(2,127) = 10.62$ ,  $p < .001$ ,  $\eta^2 = .14$  (see Figure 4.2).

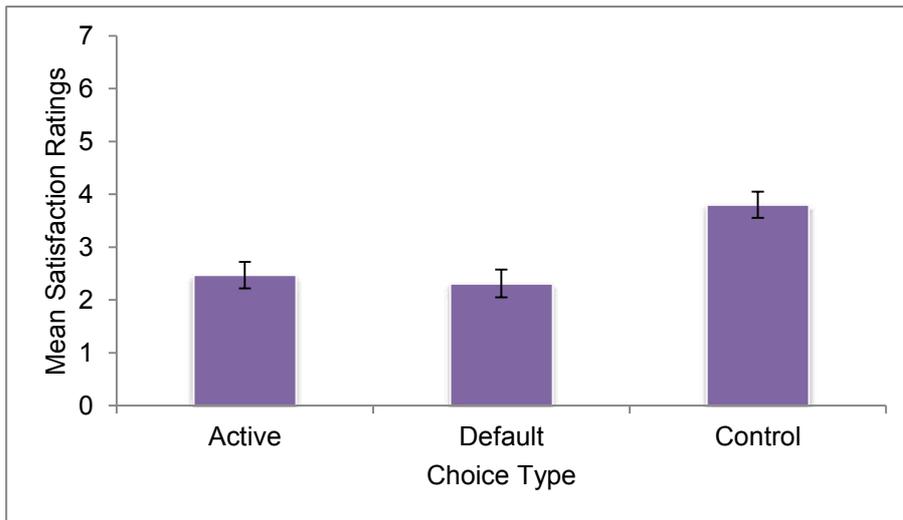


Figure 4.2. Bar chart displaying the effects of choice type manipulations upon mean satisfaction ratings. Standard errors are represented in the figure by the error bars attached to each column.

Bonferroni post-hoc tests revealed that satisfaction was significantly higher in the control group ( $M= 3.80$ ,  $SD = 1.85$ ) than in either the active choice ( $M= 2.47$ ,  $SD = 1.65$ ,  $p= .001$ ), or default stick ( $M= 2.31$ ,  $SD = 1.45$ ,  $p< .001$ ), conditions. Yet, once again there were no notable differences in satisfaction between the active and default choice groups ( $p = 1.00$ ). However, contrary to the results of Experiment 4, this time satisfaction in the control group (with the same outcome) was found to be over a point higher than satisfaction in the active and default conditions. This appears to suggest that when outcomes are negative for the chooser it may be best to have no choice, as both active and default choices (with an extensive number of options) appear to be equally detrimental to satisfaction.

#### 4.7.4.3 Counterfactual Analysis

Data from the counterfactual 'thought-listing' aspect of the questionnaire were then analysed in order to examine the prediction that inactive (default) choice participants would generate fewer counterfactual thoughts than active

choice participants. A one way ANOVA revealed a marginal effect of choice type upon the total number of counterfactuals generated:  $F(1,83) = 3.04, p = .09, \eta^2 = .04$ . The number of counterfactual thoughts generated was found to be marginally higher in the active than in the default stick condition ( $M_s = .31, .13$ ). This is in line with predictions that counterfactual thoughts would be generated more readily following action than inaction (i.e. sticking with a default) (for completeness, counterfactual analyses using the proportion of counterfactual responses generated are provided in Appendix 4.16). However, contrary to predictions, this marginal increase in counterfactual generation does not appear to have led to any notable differences in satisfaction. I will return to potential explanations for this apparent contradiction in findings during the discussion of this experiment (Section 4.7.5).

#### 4.7.4.4 Regret Analysis

Following the finding that participants in the control group were a whole point higher than either of the choice conditions in terms of satisfaction, the regret data were then explored. A one way ANOVA revealed a main effect of choice type upon regret:  $F(2,127) = 16.89, p < .001, \eta^2 = .21$ . Bonferroni post-hoc tests revealed that regret was significantly lower in the control group ( $M = 3.11, SD = 2.20$ ) than in either the active choice ( $M = 5.36, SD = 1.90, p < .001$ ), or default stick ( $M = 5.10, SD = 1.85, p < .001$ ), conditions. The pairwise comparison between the active and default stick conditions was not found to be significant ( $p = 1.00$ ). These findings subsequently appear to parallel earlier satisfaction analyses.

#### 4.7.4.5 Mediation Analysis

In order to investigate whether these differences in regret accounted for the differences in satisfaction according to the choice/no choice manipulation, a mediation analysis was then conducted. If my predictions are correct, then the decreased satisfaction associated with any (extensive) choice should be mediated by an increase in the experience of the counterfactual emotion of regret. As no differences were found between the active and default conditions in terms of either satisfaction or regret, data from these two conditions are now collapsed to give a single (extensive) 'choice' condition with which to compare the 'no-choice' control group for the purposes of the following mediation analysis.

Following Baron and Kenny (1986) a three step mediation model was conducted. Step 1 regressed choice level (choice vs. no choice) on satisfaction, Step 2 regressed choice vs. no choice on regret, and finally Step 3 regressed both choice vs. no choice and regret onto satisfaction. The results are summarised in Figure 4.3 with the results from Step 1 shown in brackets and those from Step 3 in italics.

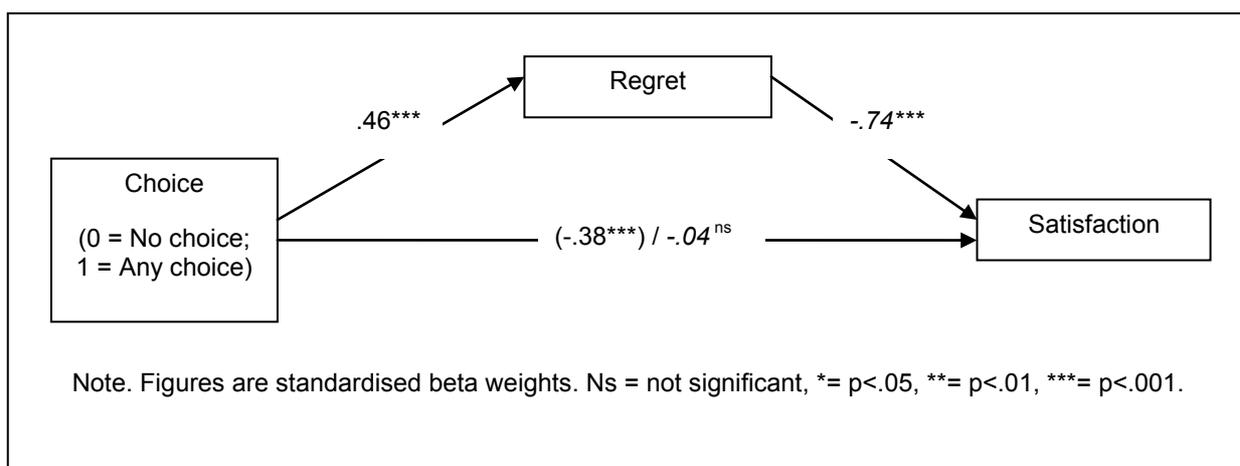


Figure 4.3. Mediation analysis showing the role of regret in mediating the effect of choice type (choice vs. no choice) on satisfaction.

Step 1 replicated the earlier finding that satisfaction with no choice was greater than satisfaction with any choice ( $M_s = 3.80$  vs.  $2.39$ ;  $\beta = -.38$ ,  $p < .001$ ). Step 2 also replicated the earlier finding that regret was significantly lower following no choice than any choice ( $M_s = 3.11$  vs.  $5.23$ ;  $\beta = .46$ ,  $p < .001$ ). Step 3 highlighted that regret negatively affected satisfaction irrespective of the choice/no choice manipulation ( $\beta = -.74$ ,  $p < .001$ ). More importantly the main effect of choice/no choice was no longer significant ( $\beta = -.04$ ,  $p = .56$ ) once regret was added to the model. A Sobel test confirmed that regret was mediating the effect of choice/no choice upon satisfaction ( $z = 5.18$ ,  $p < .001$ , two tailed).

#### *4.7.4.6 Behavioural Analysis*

Participants Yes/No responses to the behavioural question were then analysed using binary logistic regression. Results revealed no significant differences in participants' decisions to take a chocolate home with them according to condition:  $B = .08$ ,  $p = .73$ . Participants were equally likely to opt to take a chocolate home with them in the active, default stick and control conditions ( $N_s = 12, 8, 15$  respectively). Therefore, as per Experiment 4, the active/default choice type manipulation again appears to have had no notable effects upon either psychological or behavioural satisfaction.

#### *4.7.5*

#### Discussion

The current experiment replicated the finding of Experiment 4 that the vast majority of the participants in the default condition opted to stick with the default option. This provides further support for previous research into the omission bias, and the effectiveness of default options in guiding behaviour (Baron & Ritov, 1994; Samuelson & Zeckhauser, 1988; Sunstein & Thaler, 2003). Satisfaction in this experiment was significantly lower overall than in Experiment 4,

demonstrating that the manipulation of valence was successful. However yet again, no differences in satisfaction (either stated or behavioural) were found between participants in the active and default-stick conditions. This is contrary to predictions, highlighting that it does not appear to be possible to improve satisfaction with extensive choice by implementing a default option. Participants were found to be equally unsatisfied with their choice outcome whether it was selected via active choice, or whether they chose to stick with the default. This finding contributes towards the default literature in terms of the impact of defaults upon postdecisional satisfaction (c.f. Simonson, 1992; Luce, 1998), and also to the ECE literature by highlighting that people may be as satisfied with a default given to them by an experimenter, as if they had made the choice for themselves (at least, from an extensive number of options).

However, although no notable differences were found in terms of satisfaction, a marginal difference was found in terms of the extent to which participants were found to engage in counterfactual thought. Following previous research (e.g. Sanna & Turley, 1996; Roesse 1994; 1997), results from Experiment 5 demonstrate that counterfactual thoughts were more likely to be triggered when outcomes were more negative for the participant, and where expectations were perhaps violated to some extent (as the removal of chocolate labels may have meant participants' were less able to form accurate expectations about potential choice outcomes). As predicted, when counterfactuals were cued, I found evidence for an action effect – with participants in the active choice condition generating marginally more counterfactual thoughts than participants in the default-stick condition. This provides support for previous research (e.g. Kahneman & Tversky, 1982a; Luce, 1998), and for the rationale behind the use

of defaults as a potential method of improving satisfaction with extensive choice. However, following the results of Experiment 1, it was predicted that any decrease in counterfactual thought would also lead to an associated increase in satisfaction, but this was not found to be the case. Participants in the default-stick condition were found to be equally dissatisfied as the active choice participants. This suggests that something else other than counterfactual thought must have been driving down the satisfaction levels in the default-stick condition.

One potential explanation for this stems from the fact that previous research has shown that one reason people stick with defaults is because they feel the default is the suggestion, or recommendation of the experimenter (e.g. Johnson & Goldstein, 2003). As such, it may be the case that the negative decision outcome led participants to feel somewhat 'let-down' by the experimenter, perhaps driving down satisfaction to a level at which it became equivalent to that of active, extensive choice. One might expect that the experimenter has chosen that default for a reason, and in sticking with the default participants clearly trusted and followed that recommendation, perhaps feeling let down or cheated by the outcome as a result. Therefore it may be the case that if a default was provided which was an objectively 'better' option than the default provided in the current experiments, perhaps providing the participant with a more neutral taste experience, then satisfaction in the default-stick condition might yet increase alongside the associated decrease in counterfactual thought.

Whilst previous research has shown that for negative experiences people are often still happiest if this outcome is the result of inaction (e.g. Kahneman & Miller, 1986; Landman, 1987; Connolly et al., 1997), most of these experiments detailed are the result of participants reading about hypothetical scenarios, and

predicting how they would feel if either situation was to happen. However, we know that people are notoriously bad at predicting how future experiences will make them feel (Gilbert, Pinel, Wilson, Blumberg, & Whatley, 1998; Gilbert & Ebert, 2002; an extensive review of this literature is provided in Experiment 7), and subsequently it may be the case that with an outcome as tangible as a horrible tasting chocolate, people might feel equally bad in reality if they choose to stick with a default. With active choices this decreased satisfaction may be attributed to increased counterfactual thought, whilst for inactive choices this may be the result of potential feelings of betrayal following the recommendations of an expert. Subsequently defaults may still have the potential to improve satisfaction with extensive choice, on the basis that participants in the default-stick condition were found to engage in marginally less counterfactual thought than active choice participants. However, the negative outcome experienced as a result of this may have led to lower satisfaction levels than one might normally predict having stuck with a default. More research is therefore needed a) in real choice situations, in which the default option does not result in a directly negative experience for the chooser, and b) in which reasons for sticking with the default are directly assessed, in order to test the validity of this hypothesis, and determine whether defaults might yet lead to improved satisfaction with extensive choice in some instances.

Contrary to the findings of Experiment 4 in which the control group were found to be significantly less satisfied than the two choice conditions, in the current experiment the reverse pattern of results was found. Specifically, participants in the control group were found to be significantly more satisfied with the same objective outcome, than participants in either of the choice conditions.

This is contrary to previous research which has noted a value of some choice over no choice (e.g. Zuckerman et al., 1978). These results appear to suggest that when outcomes are negative for the chooser, there is actually a *cost of choice* – people are happier if they haven't had to choose the outcome for themselves. This finding is in line with the work of Botti and Iyengar (2004) who found that when faced with a choice between negative outcomes (in terms of unpleasant-sounding yogurt flavours such as sage, chilli powder, tarragon and celery seeds), no choice was preferable to any choice. However in Botti and Iyengar's (2004) experiment, participants were aware that the options presented to them were all negative at the moment of choice, whilst in the current experiment they were not aware of the valence of their choice outcome until the moment of tasting the chocolate. This perhaps makes the current experiment more similar to most real-life decision scenarios, in which people would rarely have to make a forced choice between obviously unappealing food flavourings. Also, furthering the findings of Botti and Iyengar (2004), the current experiment found evidence that this decreased satisfaction associated with any choice (over no choice) was the result of an increase in the counterfactual emotion of regret. When participants had no choice this reduced regret, leading them to experience increased satisfaction with the same objective outcome, lending explanation to the apparent *cost of choice* associated with negative outcomes.

Consequently, drawing upon the results of both Experiment 4 and Experiment 5 it appears that when outcomes are positive, there may be a value of choice, whilst on the other hand when outcomes are negative, there may be a cost of choice. However, it is not yet possible to draw a definite conclusion about this on the basis of the current data, as methodological differences between

Experiment 4 and Experiment 5 may mean that the results are not the product of manipulations in valence alone. For example, in Experiment 4, as well as tasting better, all of the chocolates looked different to one another, and were all labelled, whilst in Experiment 5 they looked identical and were not labelled. As such we might argue that expectations about predicted taste could have also had an impact on satisfaction. In addition, in both Experiment's 4 and 5 the choice and no choice control conditions were not identical to one another, as participants in the choice conditions answered a longer questionnaire designed to provide a measure of counterfactual thought, whilst participants in the control conditions answered a much shorter questionnaire by comparison. This might subsequently also go some way to explaining the increased satisfaction reported in the negative outcome control group. Therefore, Experiment 6 was designed as a replication of Experiments 4 and 5, but with a direct manipulation of valence (positive versus negative choice outcome), in which all of the chocolates in the respective conditions look identical to one another, are all without labels, and in which all participants answer the same questionnaire, in order to draw more definite conclusions about the potential cost/value of choice with different outcomes.

## 4.8 Experiment 6

### *4.8.1 Rationale for Experiment 6*

The current experiment aimed to build upon the methodology used in Experiments 4 and 5 in order to establish whether the apparent value of choice associated with positive outcomes, and cost of choice noted with negative outcomes, were robust effects, and as such whether they would replicate using an identical methodology for the two choice outcomes. The previous

methodologies were altered in three main ways. Firstly, as participants in Experiment 4 were presented with a selection of 24 different chocolates, whilst in Experiment 5 this choice was illusory, in the current experiment all positive vs. negative choice outcomes (i.e. the luxury vs. unpleasant chocolate types) were identical to one another (in respective conditions), and all labels were removed, thus removing any impact of appearance, and prior expectations based on labels. In this manner both groups of participants experienced an objectively equal illusory choice (as per Experiments 3 and 5), allowing for a thoroughly controlled examination of manipulations in valence and choice type upon satisfaction with the objectively same outcome(s).

Secondly, both in Experiment's 4 and 5 participants in the active and default choice conditions answered a different questionnaire to participants in the control conditions. This is because the active and default participants were required to list 'reasons for their responses', in order to gain a measure of counterfactual thought. This may have led to some differences in response between the choice conditions, and the control condition, who answered a much shorter questionnaire by comparison. Therefore in the current experiment, all participants answered the same shortened questionnaire as was initially answered by control participants in Experiment's 4 and 5 (Appendix 4.8), designed to measure satisfaction and regret, and without the counterfactual thought-listing aspect.

## 4.8.2

## Method

### *4.8.2.1 Participants*

135 Psychology undergraduates (76 women and 59 men, mean age = 23, with a range of 18 to 51 years) at Plymouth University took part in the experiment in exchange for course credit.

### *4.8.2.2 Design*

A 2 (outcome valence: 'positive' vs. 'negative') X 3 (choice type: active vs. default vs. control) design was used, whereby participants were randomly allocated to one of the six conditions.

### *4.8.2.3 Materials*

24 luxurious chocolates from Hotel Chocolat (all the same 'Dizzy Praline' flavour) and 24 different cheap Cointreau chocolates from Poundland were used to form the two extensive choice sets. Again chocolates were presented in individual paper cake cases (see Appendix 4.1).

### *4.8.2.4 Procedure*

Participants were informed that the experiment was designed to investigate 'taste perception and individual differences' (Appendix 4.2), and that they would be required to undertake a chocolate taste test before being asked a series of questions about their taste experience. Once again, participants in the active choice condition(s) were asked to carefully consider the 24 options displayed in front of them, and to "pick the option you most like the look of, and would most like to sample" (see Appendix 4.3). Participants in the default condition(s) were allocated a default option, and given the opportunity to stick with, or switch from the default option to a different chocolate (Appendices 4.4 and 4.5). Finally, participants in the control condition(s) were simply given a

chocolate to sample, with no mention of any other options, or any opportunity to change (Appendix 4.6).

After making their selections (choice conditions), participants were asked to sample their chocolate, and to then answer the questionnaire designed to measure satisfaction with choice outcome (DV1), and regret (DV2) (Appendix 4.8). Satisfaction was assessed using the same three items adapted from Iyengar and Lepper (2000): 'The chocolate I sampled was tasty', 'I was not satisfied with the chocolate I sampled (reversed)', 'I enjoyed the chocolate I sampled'. Each question called for ratings on a seven point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Once again the internal consistency of the items was high ( $\alpha = .95$ ), and as such data from the three items was collapsed to give a single satisfaction measure. Finally, regret was measured by asking participants 'Do you regret eating the chocolate you sampled?' on a scale of 1 (*not at all*) to 7 (*very much*). After answering this questionnaire participants were debriefed (Appendix 4.9), and reminded of their right to withdraw.

### 4.8.3 Results

For positive outcomes, only one participant opted to switch from the default option (1.3% of all positive outcome participants). For negative outcomes, no-one opted to switch from the default. Consequently, following the procedure used in Experiment's 4 and 5, data from the participant who opted to switch in the positive outcome condition is now excluded from further analysis.

#### 4.8.3.1 Satisfaction Analysis

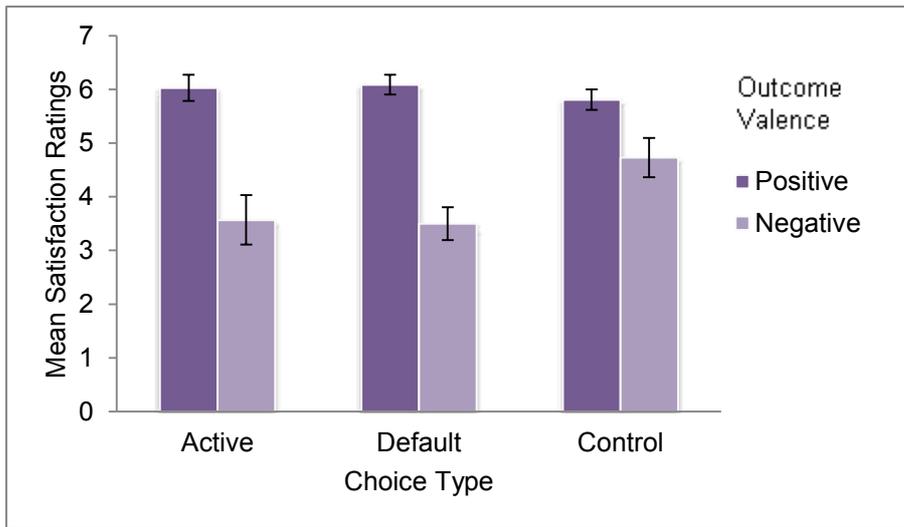
A 2 (valence: 'positive' vs. 'negative') X 3 (choice type: active vs. default vs. control) ANOVA and follow-up simple main effects analysis were carried out

(Table 4.1). This simple main effects analysis examined the effects of choice type upon satisfaction a) for ‘positive’ outcomes and b) for ‘negative’ outcomes.

Table 4.1. *Mean and standard deviations of participants’ satisfaction and regret ratings according to choice type.*

Choice Type	Positive Outcomes				Negative Outcomes			
	Satisfaction		Regret		Satisfaction		Regret	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Active	6.03	1.22	1.60	1.29	3.57	2.06	4.05	2.48
Default	6.09	.87	1.14	.47	3.50	1.36	3.25	2.29
Control	5.81	.99	1.48	1.05	4.73	1.64	1.70	1.26

There was a significant main effect of valence:  $F(1,128) = 72.29, p < .001, \eta^2 = .36$  (overall satisfaction was higher for ‘positive’ than ‘negative’ outcomes ( $M_s = 5.97, 3.93$ ), demonstrating that the manipulation of choice outcome valence was successful); but no main effect of choice type;  $F(2,128) = 1.80, p = .17, \eta^2 = .03$  (overall satisfaction was similar in the active, default and control conditions ( $M_s = 4.93, 4.86, 5.35$ )). In line with predictions, a significant valence/choice type interaction effect was also found:  $F(2,128) = 4.11, p = .02, \eta^2 = .06$  (see Figure 4.4).



*Figure 4.4.* Bar chart displaying the interaction between valence and choice type. Standard errors are represented in the figure by the error bars attached to each column.

A simple main effects analysis carried out upon this interaction revealed that for 'positive' outcomes there was no effect of choice type upon satisfaction:  $F(2,128) = .28, p = .76, \eta^2 = .004$ : satisfaction was similar in the active, default and control conditions(see Table 4.1). However, for negative outcomes, a significant effect of choice type was found:  $F(2,128) = 5.04, p < .01, \eta^2 = .07$ . Satisfaction was found to be significantly higher in the control condition than in the active or default choice conditions (Table 4.1). Breaking this down further, pairwise comparisons revealed that whilst no difference in satisfaction was found between the active and default conditions ( $p = .88$ , see Appendix 4.13), participants in both the active and default choice conditions were found to be significantly less satisfied than the control group ( $p$ 's = .009, .006 respectively, see Appendix 4.13).

These results subsequently demonstrate that the benefit of choice found in Experiment 4 did not replicate as predicted. This is supported by the regret data, whereby a simple main effects analysis revealed that for positive outcomes there

was no effect of choice type upon regret:  $F(2,128) = .54, p = .59, \eta^2 = .008$ .

Regret levels were found to be similarly low in active, default and control conditions (see Table 4.1). On the other hand, in line with predictions, the noted cost of choice found in Experiment 5 does appear to have replicated. Participants were once again found to be significantly more satisfied with the same negative outcome if they didn't have to choose it for themselves. This is also paralleled by the regret data which was substantially higher following negative than positive outcomes ( $M_s = 3.00, 1.42$  respectively). In addition, for negative outcomes, the simple main effects analysis revealed a significant main effect of choice type upon regret:  $F(2,128) = 11.41, p < .001, \eta^2 = .15$ . Breaking this down, pairwise comparisons revealed that whilst no difference in regret was found between the active and default conditions ( $p = .11$ , see Appendix 4.13), participants in both the active and default choice conditions were found to experience significantly more regret than the control group ( $p$ 's =  $< .001, .002$  respectively, see Appendix 4.13).

#### *4.8.3.2 Does Regret Mediate the Impact of Choice Type upon Satisfaction Following Negative Outcomes?*

In order to investigate the potentially mediating effect of regret upon satisfaction according to the choice vs. no choice manipulation for negative outcomes a mediation analysis was then carried out. Again following Baron and Kenny (1986) this analysis had three steps: Step 1) regressed choice vs. no choice on satisfaction, Step 2) regressed choice vs. no choice on regret and Step 3) regressed both choice vs. no choice and regret onto satisfaction (see Figure 4.5).

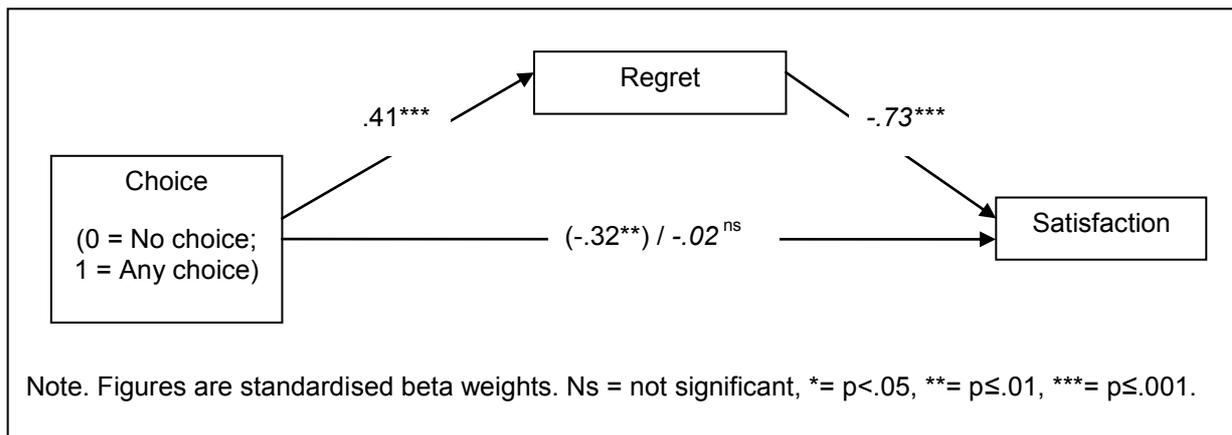


Figure 4.5. Mediation analysis showing the role of regret in mediating the effect of choice type (choice vs. no choice) on satisfaction for ‘negative’ outcomes.

Step 1 replicated the earlier finding that satisfaction with no choice was greater than satisfaction with any (extensive) choice ( $M_s = 4.73$  vs.  $3.54$ ;  $\beta = -.32$ ,  $p = .01$ ). Step 2 revealed that in line with predictions, regret was found to be significantly lower following no choice than any choice ( $M_s = 1.70$  vs.  $3.65$ ;  $\beta = .41$ ,  $p = .001$ ). Step 3 illustrated that regret negatively affected satisfaction irrespective of the choice/no choice manipulation ( $\beta = -.73$ ,  $p < .001$ ). Finally Step 3 also revealed that the main effect of choice/no choice was no longer significant ( $\beta = -.02$ ,  $p = .81$ ) when regret was added to the model, showing initial evidence of mediation. In line with predictions, a Sobel test confirmed that regret was mediating the effect of choice/no choice upon satisfaction ( $z = 3.10$ ,  $p < .001$  (two tailed)).

#### 4.8.4 Discussion

Across all 3 experiments detailed so far in this chapter I have failed to find any evidence that defaults result in higher levels of satisfaction than active choices with no defaults. This was found to be the case even though Experiment 5 found marginal evidence for a counterfactual action effect, with marginally more counterfactuals generated following active than default choices. It has been

suggested that this may be due to the negative task outcome leading to feelings of betrayal for following the recommendations of an expert, leading to lower satisfaction than one might otherwise have predicted following inactive choice (in this case, deciding to stick with a default). Notably however, this effect was marginal, and was not found to replicate in Experiment 6 in terms of the associated experience of regret, with both active and default choice participants reporting to experience similar levels of this counterfactual emotion. Nevertheless the experiments do replicate two important findings in the literature: a) the power of defaults in guiding choice and b) the valence effect for counterfactuals, since counterfactual generation was higher following either active or default choice when outcomes were negative than positive. In particular the current experiment (Experiment 6) brought together the findings from Experiments 4 and 5 into a single experiment enabling a direct comparison of the valence issues under a standardised methodology. These findings are now considered in greater detail.

Firstly, as the results of Experiment 6 demonstrate, once again the vast majority (98.7%) of participants in the positive outcome default condition, and 100% of participants in the negative outcome default condition, opted to stick with the default option. As this effect has now been replicated in three separate experiments, the current chapter provides substantial support for previous research into the omission bias, and the power of default options to both influence and guide behaviour (e.g. Baron & Ritov, 1994; Samuelson & Zeckhauser, 1988; Sunstein & Thaler, 2003). In addition, contrary to predictions, participants were found to be equally satisfied with both positive and negative decision outcomes whether they made the choice for themselves, or whether they were given a default, again demonstrating that extensive choice appears to

be of no further benefit to the consumer than making a decision to stick with the recommendations of an expert, or experimenter.

The 'value of choice' identified in Experiment 4 was not found to replicate. Participants were found to be equally satisfied with their chocolate whether they made an active choice, were given a default, or whether they were simply given one chocolate to sample. This is paralleled by the fact that in all positive outcome conditions participants reported very low levels of regret. This provides support for previous research showing that counterfactual thought, and the experience of regret is more likely following negative outcomes (Sanna & Turley, 1996; Roese, 1994; 1997). When outcomes were positive it didn't matter if participants made the choice for themselves, or if they had no influence upon the outcome, the positive experience resulted in low levels of counterfactual emotion, and subsequently high satisfaction. These results hint at the possibility that valence might moderate the ECE, due to its impact upon counterfactuals. One might not find an ECE when outcomes are directly positive for the chooser. However further research will be needed in which valence is manipulated and extensive choice is compared directly with limited choice (as opposed to no choice) in order to establish whether this is the case (see Chapter 5).

But why was the value of choice found in Experiment 4 not found to replicate? The mean satisfaction levels generated in Experiment 4 and Experiment 6 (positive outcome conditions) were extremely similar in both the active choice, and default choice conditions. In fact the main difference between the two studies stems from the fact that in Experiment 4 satisfaction levels in the control condition were much lower than in the 2 choice conditions, whilst in Experiment 6 all 3 positive outcome conditions reported similarly high levels of

satisfaction. Therefore something must have been driving satisfaction down in the control group in Experiment 4. One potential explanation for this relates to methodological differences between the 2 procedures. For example, as all of the chocolates were labelled in Experiment 4 but not in Experiment 6, it may be the case that participants in Experiment 4 experienced reduced satisfaction if they felt that the labels did not accurately match the chocolate flavour, potentially leading to reduced alignment between expectations and experience. In contrast participants in the control group in Experiment 6 had nothing to compare their experience to, potentially leading to respectively increased satisfaction. However, if this were the explanation then one might also have predicted satisfaction in the two choice conditions to be lower in Experiment 4 than in Experiment 6 (as the chocolates were labelled in all conditions in Experiment 4), but we know this was not the case. Consequently a second potential explanation stems from the fact that in providing labels in Experiment 4, there may have been an increased likelihood that participants realised they didn't like the flavour chosen for them prior to tasting. As neither group of control participants were given the chance to change the chocolate they sampled, participants in Experiment 4 may have already had a preconceived (negative) perception of the chocolate, and if they felt unable to change from something they perhaps didn't like the sound of this may have led them to experience reduced satisfaction. On the other hand in Experiment 6, participants had no idea what the flavour of the chocolate was going to be. Therefore upon tasting, the positive outcome (at tasting a chocolate that was generally liked) may have been perceived as a pleasant surprise, leading to increased satisfaction ratings. Or, at least even if participants didn't

enjoy the flavour that much there was no additional influence of perhaps expecting not to like the flavour, and yet having no chance to change it.

Conversely, the results from Experiment 5 were found to replicate. Participants in the two choice conditions were significantly less satisfied with the same outcome than participants in the control group. This demonstrates that the 'cost of choice' identified in Experiment 5 appears to be a fairly robust effect. When outcomes were negative participants were significantly more satisfied if they hadn't had to make any choice for themselves, and this effect was found to be mediated by the counterfactual emotion of regret. When outcomes were negative any choice led to a significant increase in regret. By removing choice altogether participants' capacity to experience regret was reduced, and their satisfaction levels improved.

This finding has potentially important implications with regard to the structure of public policy. It appears that when outcomes are negative it may be better to have no choice –perhaps controversially presenting a case for a paternalistic approach to choice architecture (c.f. Sunstein & Thaler, 1993). This notion finds support from Botti and Iyengar (2004) who found that when outcomes were negative, no choice was preferable to any choice. Research into medical decision making also provides support for this claim. For example, Degner and Sloan (1992) asked people who had recently been diagnosed with cancer whether they wanted to choose their treatment for themselves, or have a physician decide for them. These data were compared to the forecasting predictions of others asked to imagine their scenario. Whilst the majority of forecasters predicted they would want to choose their treatment for themselves were they in this situation, in actual fact the authors found that the majority of

participants in this situation preferred a physician to choose which treatment they would undergo. Whichever treatment participants underwent was likely to be a relatively unpleasant experience for the majority, and in this instance people preferred not to have to make the choice for themselves. Similarly, Ende, Kazis, Ash & Moskowitz (1989) found a negative correlation between illnesses severity and participants' desire to play an active role in decision making regarding their treatment.

Results from the current experiment are consistent with this, and also provide evidence for the mediating role of regret in this effect. Indeed, it appears that if a persons' experience of post-decisional regret is reduced by removing choice, then objectively negative outcomes perhaps have the potential to be experienced more positively. Therefore, the current experiment highlights both an important point of contention with economic theory, and an important point of consideration for policy makers, by providing evidence that a shift back towards a paternalistic approach to choice architecture when outcomes are likely to be less than positive for the chooser (for example in the field of medical decision making) may be most beneficial for the individual. In reality, however, removing choice altogether would be both ethically and practically unfeasible, as it would be seen as an attack on personal freedom (see Botti & Iyengar, 2006). Consequently, it would appear that policy makers may be wise to consider alternative means of reducing the counterfactual thought process during the construction of public policy. However, this is a point to which I will return in greater detail in the general discussion section of this chapter (Section 4.10), and again in Chapter 6.

In addition it is important to note that the findings of the medical decision making studies discussed above may to some extent reflect a desire to rely on

the expertise of a physician under circumstances with such potentially important consequences. As such it is not possible to determine whether the results of the current experiments, involving chocolate choices, would accurately generalise to more important real-life decision scenarios such as these. More research will therefore be needed using real-life decision scenarios with consequential outcomes, in order to establish whether this is the case.

In all 3 studies considered in this chapter it has been consistently demonstrated that people are equally happy if they make an active choice, or if they choose to stick with a default option. This contributes towards the default literature in terms of the influence of defaults upon postdecisional satisfaction, and to the ECE literature – by demonstrating that extensive choice appears to be of no further benefit to the consumer than opting to make no choice (and stick with the recommendations of the expert or experimenter). It has also been demonstrated in two experiments with negative outcomes (Experiments 5 and 6) that people were happiest with no choice whatsoever, in contrast to any (extensive) choice. However, the question remains as to whether peoples' pre-stated preferences regarding extensive choice and different choice types match these satisfaction judgements based upon actual experience. Experiment 7 was designed to investigate this issue.

## 4.9 Experiment 7 – Forecasting Study

### 4.9.1 *Introduction to Experiment 7*

This experiment was designed to examine whether participants were able to accurately predict how different manipulations in choice type would make them feel. Participants were shown a series of photographs of the experimental conditions, and were asked to select whether they would prefer to be in the active

(extensive) choice condition, the default (extensive) choice condition, or the no choice (control) condition. By determining whether peoples' experiences matched their pre-stated preferences I hoped to add to both the default and choice literatures, in terms of a) identifying whether participants' were aware they would most likely be equally satisfied if they stuck with a default or made an active choice, and b) identifying whether the forecasting bias would generalise to the 'problem of too-much-choice' (Fasolo et al., 2007), in terms of any recognition of the potentially decreased satisfaction associated with (any) extensive choice.

Previous research has shown that people are notoriously bad at predicting how different experiences will make them feel. For example, Schkade and Kahneman (1998) found that college students who lived in the Midwest of the USA predicted that students who lived in California would be happier with the climate, and more satisfied with life on the whole, than themselves. In actual fact, although the Californian students did like the climate, they were not more satisfied on the whole. This has been referred to as an 'affective forecasting bias' (Schkade & Kahneman, 1998; Gilbert & Ebert, 2002; Schwartz, 2004).

Similarly, in Gilbert et al.'s (1998) experiment, young college professors were asked to predict how they would feel after they were either awarded or denied tenure, both immediately after the decision, and five and ten years later. These predictions were then compared with the actual experiences of professors who were awarded or denied tenure. Those who predicted their future feelings said they expected they would feel extremely happy (or extremely sad), and that these feelings would somewhat dissipate over time. In actual fact when compared with actual experience these forecasts proved to be inaccurate – with those who were awarded or denied tenure actually experiencing no comparative

differences in their well-being over time. The forecasters mispredicted how good a positive decision would make them feel, and how bad a negative experience would make them feel. In another study, Loewenstein and Frederick (1997) asked participants to predict how various environmental changes would affect their well-being over the next decade. The authors found that forecasters predicted each of the changes to have an exaggerated positive or negative impact in comparison to the actual experiences of others who were asked to reflect back upon the same changes over the last decade.

Regarding the choice literature, Gilbert and Ebert (2002) asked participants to predict which experimental choice scenario would make them happiest – if they were allowed to change their minds once they had made their decision (reversible condition), or if this opportunity was denied (non-reversible condition). A large majority of participants voted that they would prefer to be in the reversible condition, when in actual fact those participants who were in this condition were found to be considerably less satisfied with their choices, in comparison to the non-reversible participants. In all, there is substantial evidence to suggest that people err systematically and substantially in making predictions about future events (Schwartz, 2004), and this mis-match between our expectations and experiences may be one reason why we come to experience disappointment and other negative affect with our decision outcomes (see, for example, Zeelenberg et al., 2000).

#### *4.9.2 Hypotheses*

Although previous research has shown that a) people may be happiest, or equally happy (Experiments 4, 5 and 6) if they choose to stick with a default option, than if they make an active choice for themselves, and b) that people may

be happiest with limited rather than extensive choice, it was nevertheless predicted that the majority of participants would opt to be in the active (extensive) choice condition, due to an affective forecasting bias (as discussed above). This forecasting data is then used to draw comparisons between participants' predictions and expectations with the actual satisfaction data generated in Experiments 4 – 6.

#### 4.9.3 Method

##### 4.9.3.1 Participants

45 participants (26 women and 19 men, mean age = 30, with a range of 18 to 54 years), recruited via a method of convenience sampling, took part in the experiment in exchange for a chocolate bar.

##### 4.9.3.2 Materials

Following the procedure used by Gilbert and Ebert (2002), participants were shown a series of three photographs of the three experimental conditions, based upon the choice sets and procedure used in Experiment 4 (i.e. luxury chocolates). These were of: 1) 24 different chocolates (active choice condition), 2) 24 different chocolates with one labelled as a default option (default choice condition), and 3) just one chocolate (control condition).

##### 4.9.3.3 Procedure

Participants were informed that the three photographs were of three different experimental conditions in a chocolate tasting experiment, and received the following instructions:

*“In Photo 1 (Condition 1), participants are given a choice of 24 different chocolates, and are asked to select which one they would like to sample. In Photo 2 (Condition 2), participants are given one chocolate, a default, and are*

*given the option of sampling this default, or switching to one of the other 23 chocolates. Finally, in Photo 3 (Condition 3) participants are given one chocolate, but this time have no opportunity to change, and are simply asked to sample this chocolate”.*

Participants were asked to imagine they were taking part in this experiment, and to select which condition they would rather be in (Appendix 4.14).

#### 4.9.4 Results and Discussion

Of the 45 participants asked, the vast majority ( $N= 34$  or 75.6%) said they would prefer to be in the active (extensive) choice condition. 8 people (17.8%) said they would opt to be in the default (extensive) choice condition, with only 3 people (6.7%) opting to be in the control (no choice) condition. These results are in line with predictions that people believe they will be happiest if they can make their own decision via an active (extensive) choice, and subsequently this appears to demonstrate an affective forecasting bias. In each of Experiments 4 – 6 it was shown that participants were equally satisfied if they made an active choice for themselves, or if they chose to stick with a default option. Thus the vast majority of participants were found to overestimate how much better they would feel had they made the choice for themselves.

In addition, only a very small minority opted to be in the (no choice) control condition. In actual fact, in both Experiments 5 and 6 it was shown that participants were significantly more satisfied if they were in this condition than in either of the two choice conditions. This demonstrates a second affective forecasting bias – participants mis-predicted how much better they would feel if given choice over no choice. Even when outcomes were positive (as in Experiment 6), participants were found to be equally satisfied if they were given a

choice, or if choice was removed altogether. This finding appears to be in line with research into medical decision making (e.g. Degner & Sloan, 1992; Ende et al., 1989), in which participants predicted that they would want to choose treatments for themselves, if presented with a hypothetical scenario. In actual fact when this was compared with the actual experiences of others in that situation, people were found to opt for no choice, preferring instead to hand over the responsibility for their decision to an expert. Results from the current experiment provide support for this, demonstrating that a) the same pattern of forecasting error is found within the context of the ECE (in terms of extensive choice vs. no choice), and b) that the push towards ever increasing choice within public policy may be misguided if based upon lay perceptions of what people believe will make them happiest. However I will return to a discussion of the applied implications of this forecasting experiment during the general discussion section of this chapter (Section 4.10).

In all it appears that the vast majority of participants may be unaware of the potentially detrimental consequences of (extensive) choice to their own post-decisional satisfaction. So why could this be the case? One explanation for this mis-match between predictions and experience relates to potential differences in the availability of counterfactual information in the two cases. This relates back to a possible distinction between predictors and experiencers as 'readers' and 'actors'. To illustrate, Girotto, Ferrante, Pighin and Gonzalez (2007) found that readers and actors engaged in different levels of counterfactual thinking, and attribute this to the increased availability and salience of information available to actors. In one experiment, participants were either asked to participate in a game in which they could win some chocolates (actor condition), or to read a scenario

describing a protagonist in the same situation (reader condition). The outcome of the game was pre-determined to be negative, and participants were asked to imagine how the outcome might have been different. The authors found that whilst readers were most likely to mentally undo the choice made by the protagonist, the greater amount of information available to actors in the same situation meant they were able to engage in a more detailed level of counterfactual thought. The actors more frequently reported aspects of the problem itself that might have led to a different outcome, for example, 'if I had had more time to solve the task'.

Subsequently this distinction may lend some explanation as to the mismatch between peoples' predictions and experiences. The predictors in the current experiment read about a scenario and were asked to predict which condition they would rather be in, meaning this condition was similar to Girotto et al.,'s (2007) hypothetical 'reader' condition. However in the current experiment, the predictors were not provided with negative postdecisional information about the outcome of their choice, something which previous research has shown to be important in eliciting counterfactual thought (Sanna & Turley, 1996; Connolly et al., 1997; Roese, 1994; 1997). As such, this lack of counterfactual information may have led the predictors to overestimate how satisfied they would feel following extensive choice. In contrast, the experiencers (akin to Girotto et al.,'s (2007) 'actors') judgements may have been influenced by more salient counterfactual information due to a) the availability of negative postdecisional information, and b) the greater amount of task information available to them as 'actors'.

This variability in the availability of counterfactual information may be one explanation as to why predictors frequently mispredict how they will feel in a variety of situations (e.g. Schkade & Kahneman, 1998; Loewenstein & Frederick, 1997; Gilbert et al., 1998). People have been shown to predict that they want choice in hypothetical scenarios (e.g. Degner & Sloan, 1992; Ende et al., 1989). In Gilbert and Ebert's (2002) experiment, participants predicted they would want the opportunity to reverse their decisions, presumably because this would allow them greater opportunity for corrective action post-decision (see Roese & Summerville, 2005). Nevertheless when faced with these situations in reality, the increased opportunity stemming from both choice and reversibility leads to an increase in the salience of counterfactual information, and the degree to which this is influential in determining satisfaction judgements is something which readers appear to be unaware of in advance, or upon consideration of a hypothetical situation.

#### 4.10 General Discussion

Based upon the counterfactual action effect, the experiments detailed in the current chapter were designed to investigate whether presenting a default option might improve satisfaction with extensive choice. In each of Experiments 4 – 6 the vast majority of participants presented with a default option opted to stick with that default, providing evidence for the omission bias, and the power of default options to influence and guide behaviour (e.g. Baron & Ritov, 1994; Samuelson & Zeckhauser, 1988; Sunstein & Thaler, 2003). Whilst no direct evidence was found that defaults could improve satisfaction with extensive choice, suggestions have been made for further research which means this possibility should not be ruled out entirely.

In Experiment 4, an apparent value of choice was identified – participants were found to be equally satisfied with active or default choices, but when that choice was taken away and participants were just asked to sample one of the same chocolates, satisfaction decreased by a whole point. This appeared to provide evidence for early research into the benefits of some choice (e.g. Zuckerman et al., 1978). However, this effect was not found to replicate in Experiment 6. Following research into counterfactual theory, Experiment 5 provided support for the notion that the high levels of satisfaction found in Experiment 4 (choice conditions) might have been attributable to the very low levels of counterfactual thoughts generated. By using negative outcomes, without labels, counterfactual thoughts were found to be more readily available, and in this instance evidence was found for a marginal action effect. This was in line with predictions, and supports previous research by showing not only that counterfactuals are cued more readily following action than inaction, but also that a key trigger for these counterfactual thoughts is a negative outcome, and some degree of violation between expectancies and experience (see also Zeelenberg et al., 1998; 2000; Sanna & Turley, 1996).

Contrary to predictions, however, this increase in counterfactual thought was not found to correspond with a decrease in satisfaction, in comparison to the inactive choice (default-stick) condition. This was unexpected given the findings of Experiment 1, and led to the suggestion that something else other than counterfactual thought must have been driving down satisfaction in the default-stick condition, lower than we might normally predict. The possibility that this might be attributable to feelings of betrayal following the recommendations of an experimenter has been discussed. As a result of this, further research will be

needed in order to determine the potential for default options to improve satisfaction with extensive choice. It is possible that in cases where the default option does not result in a directly negative experience for the participant, satisfaction might yet be improved in comparison to active (extensive) choices. This prediction stands on the basis that marginal evidence was found for a counterfactual action effect. However further research will be needed in which participants are asked directly about why they chose to stick with the default, and any potential feelings of betrayal, or being cheated or 'let-down' by the outcome, in order to determine if this is the case. On the basis of the current data I can only conclude that default options do not appear to improve satisfaction with extensive choice, but do still have the potential to do so in some situations, as they have been shown to reduce counterfactual thought. As a result, further research is needed in order to determine the potential value of default options in situations where the consequence of sticking with a default is a more neutral experience for the chooser.

Experiment 5 also demonstrated that contrary to the findings of Experiment 4, when outcomes were negative there was an apparent cost of choice. Participants were happiest with the same negative outcome if they hadn't had to choose it for themselves. Crucially this effect was found to be mediated by the increased experience of regret following any (extensive) choice. However in order to draw any definite conclusions about the potential role of valence in eliciting these apparent value and cost of choice effects Experiment 6 was conducted as a replication of Experiments 4 and 5 but using a between subjects design, and an identical methodology across conditions.

As previously mentioned, the value of choice identified in Experiment 4 was not found to replicate in Experiment 6. This appeared to be due to the reduced level of satisfaction found in the control group in Experiment 4, as similar levels of satisfaction were otherwise noted in the choice conditions (and Experiment 6 control condition) across the two experiments. This may have been due to methodological differences between the two experiments. Specifically, as previously discussed satisfaction levels may have been driven down in the Experiment 4 control group as the chocolates were labelled, meaning there was an increased chance participants could be aware they didn't like the flavour of the chocolate prior to tasting, which may have been heightened by the fact that participants were given no opportunity to change from this flavour. On the other hand in Experiment 6 participants were not aware of the flavour of the chocolate before tasting. Therefore they may have had a pleasant surprise upon tasting a chocolate flavour that was generally liked. Alternatively, even if they didn't enjoy the chocolate that much they were perhaps not influenced by any preconceived ideas about the flavour, or any potential pre-sampling resentment at trying a flavour they expected not to like, without being given any chance to change. Results from Experiment 6 subsequently contribute to the early literature into the provision of limited choice (e.g. Zuckerman et al., 1976). It appears that when an outcome is directly positive for the chooser then it doesn't matter whether they play an active role in their choice, or whether choice is removed altogether. Following previous research (Roese 1994; 1997; Sanna & Turley, 1996), and the findings of Experiment 4 we can assume that this is due to the fact that counterfactual thoughts are not readily cued following positive outcomes. Following this finding it appeared that a pattern was beginning to emerge

regarding the role of valence as a potentially key factor contributing to the elicitation of the ECE.

On the other hand the cost of choice identified in Experiment 5 was found to replicate, demonstrating that this is a robust effect, which was once again found to be mediated by regret. By removing the capacity to experience regret, by offering no choice at all, satisfaction with negative outcomes was found to improve. Therefore these results provide tentative support for a paternalistic approach to choice architecture where outcomes are negative. This follows on from research into medical decision making which has shown that in situations where the outcome of choice is likely to be negative, participants often prefer to hand over all responsibility for active decision making regarding treatment to an expert, possibly in order to shield themselves from the experience of negative counterfactual emotion (see Tykocinski & Pittman, 1981).

Indeed, this process is often referred to as 'anticipated regret' (Bell, 1981; McConnell, Niedermeier, Leibold, El-Alayli, Chin & Kuiper, 2000), or 'regret aversion' (Humphrey, 2004; Schwartz, 2004), whereby a substantial body of psychological research has shown that our desire to avoid this counterfactual emotion often plays an important role in guiding decision making. For example, in Bar-Hillel and Neter's (1996) experiment participants were given a lottery ticket, and then later asked if they would like to swap it for a different ticket, which they were informed had objectively better odds. The authors found that the majority of participants were unlikely to swap because they anticipated the regret they would feel if their original ticket won.

In addition, Simonson (1992) found that anticipated regret could lead decision makers to avoid choosing risky options, even if those options were

potentially better than the 'safe' alternative. Whilst Ritov and Baron (1990) found that parents who anticipated feeling regret if their child was to fall ill as a result of vaccination were less likely to have them vaccinated. Similarly, in Tykocinski and Pittman's (1981) experiment, participants who were informed that they had missed out on an attractive holiday package deal at a travel agents were found to be significantly less likely to take up a similar but less attractive (in terms of cost) package deal when the opportunity arose. The authors claim this *inaction inertia* occurs as participants' anticipate experiencing increased regret if they choose to act and take up an opportunity which was less attractive than the opportunity which was previously missed. Crucially, however, this was not found to be the case when participants were provided with negative feedback information regarding how the first holiday turned out: in these instances participants were found to be significantly more likely to take up the second opportunity. The authors claim this is because the negative feedback information "absolves one of anticipated regret" (pp. 615), thus removing the problematic feature that would otherwise have led to continued inaction.

Research has shown that in extreme cases anticipated regret can be so powerful that it can lead to decision paralysis, or decision avoidance; whereby decision-makers are so overcome with the anticipation of regret that they simply opt to avoid choosing altogether (Schwartz, 2004). Indeed, the findings from medical decision making appear to be consistent with this, with a large proportion of participants opting to take no active role in their decision making, where predicted outcomes are likely to be perceived to be viscerally negative, e.g. choices between potentially painful treatment options, or those with potentially adverse side effects (see, for example, Degner & Sloan, 1992; Ende et al., 1989).

In these instances the likelihood of participants choosing to avoid decision making altogether is typically increased, and this appears to be consistent with counterfactual and regret literatures demonstrating a desire to shield oneself from the experience of potentially harmful counterfactual thought and emotion. Indeed, as Botti and Iyengar (2006) state, people often “prefer eschewing decisions {related to health care} to avoid the negative emotions associated with feeling responsible for their own misery” (pp. 33).

However, as discussed in Section 4.8.4 above, it is also important to note that these findings from medical decision making may to some extent reflect a desire to rely on the expertise of a physician in decision circumstances with such potentially important consequences. As such, it is not possible to determine whether the results of the current experiments, involving chocolate choices, would accurately generalise to more important real-life decision scenarios such as these. However the contrast between the predictors and experiencers in Degner and Sloan’s (1992) experiment would suggest that this preference for deferring choice to an expert may not be due to a reliance on expertise alone – as otherwise one would expect predictors to also demonstrate a preference for this, when presented with a hypothetical scenario. Yet, as Degner and Sloan (1992) demonstrate, predictors forecasted that they would want to choose their treatment method themselves, were they ever in this situation. As such it would appear that there may be another process at work – and this could involve the different level of counterfactual thought that predictors and experiencers may be engaged in (see, Girotto et al., 2007). Specifically, Degner and Sloan’s (2007) forecasters’ may have demonstrated a preference for active choices due to the lack of salient counterfactual information available to them as ‘readers’ or

predictors. As such although it would appear that the same processes may be underpinning both the seemingly trivial choices presented in the current experiments, and more consequential choices in the field of medical decision making, more research will be needed in which the level of counterfactual thought participants are engaged in is compared in both situations, in order to establish whether this is the case.

Notably, the finding from medical decision making that people typically prefer to defer to choice where outcomes are likely to be negative (alongside the findings of Experiments 5 and 6) is in direct contrast with the current trend for policy makers to push towards increased patient autonomy (see Botti & Iyengar, 2006). It appears that in doing so, policy makers are perhaps mimicking participants' beliefs that this active role in decision making will make them happy. However as the current research (Experiment 7) and previous research (Gilbert et al., 1998; Gilbert & Ebert, 2002; Loewenstein & Frederick, 1997) have shown, people are subject to affective forecasting bias – and are particularly bad at predicting how future events will make them feel.

This contrast between the forecasting data and actual experience has potentially important implications for policy makers. It appears that not only should public policy be constructed bearing the results of ECE research in mind (e.g. Iyengar & Lepper, 2000; Iyengar et al., 2004; 2006; Mogilner et al., 2008; Shar & Wolford, 2007, Reutskaja & Hogarth, 2009; Chernev, 2003a; 2003b; results detailed in Experiments 1 and 3), as this has shown that expanding choice does not necessarily make the chooser better off (contrary to economic theories' contention), but should perhaps also not be constructed on the basis of peoples' own predictions of what they want, as this has been shown to be highly

inaccurate. In cases where outcomes are likely to be negative it may be most beneficial to the individual to play no active role in their decision outcome, as this is likely to shield them from the experience of harmful counterfactual emotion (see Tykocinski & Pittman, 1981). In cases where the outcome is likely to be more neutral for the participant than default options still have the potential to improve satisfaction, as these have also been shown to reduce counterfactual thought.

Realistically, however, it would be ethically unfeasible to remove choice altogether, as this would be seen as an attack on personal freedom (Botti & Iyengar, 2006). In addition, such a strategy would also be practically unfeasible, as in each instance the policy maker would need to ensure that the option given to the individual was the best available, and yet this would vary enormously based upon individual needs, tastes and priorities. Consequently, it would appear that policy makers should perhaps consider alternative means of reducing the counterfactual thought process during the construction of public policy. This could be done by a) offering limited choice, as opposed to no choice, or indeed extensive choice, b) potentially by offering default choice (although more research in this area is required), or c) by offering choice with the option of deferring responsibility to an expert. However more research will be needed in applied settings in order to determine any potential benefits of such strategies in improving individual well-being across a variety of real-life decision contexts.

In all, a striking pattern began to emerge from the results of the experiments discussed in the current chapter. This relates to the role of outcome valence in cueing counterfactual thoughts and regret (given Experiment's 5 and 6). Where outcomes were positive, no evidence was found for any detrimental

effects of extensive choice upon satisfaction. Conversely when outcomes were negative, evidence was found that no choice was preferable to extensive choice, and that this was the result of the increased regret associated with active extensive choices. As such this raised the question of whether valence might be an important factor contributing to the prevalence of the ECE. Previous research has investigated other such factors. For example, as previously discussed, Scheibehenne et al., (2009) identified choice justification as a moderator of the effect, and in Experiment 1 I identified that load moderated the effect through its impact upon counterfactual generation. In their meta-analysis, Scheibehenne et al., (2010) found no overall evidence for the ECE, however the authors describe how the large degree of variance in the choice literature meant a theory of choice was needed which could cover these divergent findings. It may be that outcome valence can go some way to explaining the variance in the previous choice literature. Following on from the results of the current experimental chapter, it certainly appears that valence may play a key role in eliciting the effect, due to the demonstrated impact of valence upon counterfactual thought. Yet, to date, the role of valence within the ECE has been largely overlooked.

The current experiments demonstrated an effect of valence when comparing extensive choice with no choice, and as such this may simply indicate that when outcomes are negative, people prefer no choice. The effect does not necessarily transfer to situations in which limited and extensive choice are compared. As such, further research is needed in which valence is directly manipulated, under conditions of limited versus extensive choice, in order to explore the potentially causal role of valence in determining the prevalence of the ECE, and potentially contribute towards an understanding of the divergence

of findings noted in the previous choice literature. Experiment 8, described in the next experimental chapter, was designed for this purpose.

## Chapter 5 – Investigating the Role of Outcome Valence in Determining the Prevalence of the Excess Choice Effect

### Introduction

#### *5.1 Chapter Overview*

In this chapter I describe an experiment which was designed to examine the role of outcome valence and subsequent counterfactual thought processes in influencing the prevalence of the ECE. The rationale for this initially followed from the findings reviewed in Chapter 4, in which the potential for default options to improve satisfaction with extensive choice was investigated. In that chapter I found evidence that choice type only appeared to be influential in determining chooser satisfaction levels when decision outcomes were negative. Further, this effect was found to be mediated by an increase in the counterfactual emotion of regret following any (extensive) choice. The current experiment aims to extend these findings directly to the ECE, by providing an examination of the role of valence in situations of limited versus extensive choice. Building upon the counterfactual literature which has shown that counterfactual thoughts may be cued more readily following negative than positive outcomes (e.g. Sanna & Turley 1996; Tsiras & Mittal, 2000; Gleicher et al., 1990; although see Roese & Olson, 1993), it was predicted that the valence of decision outcomes may be a key factor contributing to the prevalence of the ECE. A more extensive rationale is provided in Section 5.5 below, following an introduction to the choice and counterfactual literatures, and existing evidence for the role of valence within both of these.

## *5.2 Existing Evidence for Factors Contributing to the Prevalence of the Excess Choice Effect*

As previously reviewed, according to economic rational choice theory greater choice will deliver well-being by increasing the likelihood that individuals can satisfy personal preferences (Mas-Colell et al., 1995). Consequently, extensive choice has become a fundamental aspect of both consumer markets and public policy (Schwartz, 2000; 2004; Botti & Iyengar, 2006). Choice provision can be direct, e.g. letting patients choose hospitals (Fasolo et al., 2010), or indirect by increasing income and thus access to options (Dolan & White, 2007). Crucially, psychological research has begun to challenge the basic assumption that more choice leads to greater well-being. Building on work by Iyengar and Lepper (2000) a number of researchers have shown that while some choice is good, more choice can undermine satisfaction (Iyengar et al., 2004; 2006; Chernev 2003a; 2003b; Lee & Lee, 2004; Shar & Wolford, 2007; Reutskaja & Hogarth, 2009; Mogilner et al., 2008; Greifeneder et al., 2010). If widespread, this ECE may mean that policies aimed at increasing well-being via choice actually deliver the opposite of their objectives.

However, the universality of the ECE has been challenged. A meta-analysis of 50 studies found no overall effect either way: more choice neither consistently increased nor decreased well-being (Scheibehenne et al., 2010). Nevertheless, the large degree of variance in study outcomes led the authors to conclude that a theoretical explanation of when and why the ECE occurred was needed (see also, Scheibehenne & Todd, 2009). The current chapter attempts to address this by drawing on theories of counterfactual thinking (Epstude & Roese, 2008; Roese & Summerville, 2005).

Existing research has begun to investigate potential factors which might influence the prevalence of the ECE. For example, in Scheibehenne et al.,'s (2009) experiment, five potential moderators of the effect were examined. These were: option variety, prior preferences, cultural differences, further increases in choice set size and choice justification. Of these, only choice justification was found to moderate the effect. In situations where participants were required to justify their decisions participants were found to be consistently more satisfied with limited than extensive choice. When these justifications were not required the authors found no evidence for an ECE.

The current experiment was designed to investigate an alternative factor which to date has been largely overlooked as a potential moderator of the ECE, and yet which may be key to determining the prevalence of the effect. That is, choice outcome valence. As discussed in Chapter 4, valence has been defined as the intrinsic degree of attractiveness vs. aversiveness of an object or situation (Frijda, 1986). The current experiment therefore aimed to directly manipulate the valence of choice outcomes in order to determine the subsequent impact upon the prevalence of the ECE. The rationale for this follows directly on from the findings detailed in Chapter 4, during which a persuasive pattern began to emerge relating to the potential role of valence in determining the impact of choice upon satisfaction. Specifically, extensive choice was only found to impact upon satisfaction levels when choice outcomes were negative. If found to be true, this might potentially also help to explain some of the inconsistencies found in the previous choice literature (e.g. Scheibehenne et al., 2010). However I will return to this point in greater detail during the discussion section of this chapter (Section 5.9).

### *5.3 Choice and Valence*

Existing evidence regarding the role of outcome valence within the choice literature is relatively limited. To date, only one study (Botti & Iyengar, 2004), as far as I am aware, has attempted to examine the impact of varied choice levels where outcome valence was manipulated. In this experiment, participants were either given one yogurt to sample, or were asked to make a choice of which they would most like to try from a selection of 4 flavours. Outcome valence was manipulated so that participants either chose from positive outcomes (i.e. preferred flavours: cinnamon, mint, cocoa, and brown sugar), or negative outcomes (i.e. non-preferred flavours: sage, chilli powder, tarragon and celery seeds). The authors found that when outcomes were negative, participants preferred no choice. This is in line with the findings of Experiments 5 and 6 detailed in the previous chapter. The current experiment aims to extend this research directly to the ECE by applying a similar manipulation of valence to conditions of limited versus extensive choice. In addition, following the procedures used by Mogilner et al., (2008) and in Experiments 3, 5 and 6, the current experiment aims to build upon the methodology used by Botti and Iyengar (2004) by using an illusory choice, in which participants are not aware whether the outcome of their choice will be positive or negative prior to tasting. This may make the current research more relevant to the field of consumer decision making, as in reality people may rarely have to make a forced choice between obviously unappealing flavours. Crucially, the current experiment also aims to extend this research by applying counterfactual theory as a potential explanatory driving force behind the effect.

## 5.4 Counterfactual Theory and Valence

### 5.4.1 Evidence for the Effect of Valence in Eliciting Counterfactual Generation

Although existing evidence for the impact of valence upon choice satisfaction is relatively limited, a substantial amount of research has considered the role of valence within the counterfactual literature. As previously discussed, counterfactual thoughts represent imagined alternatives to past events and are mental simulations of 'what if' or 'if only' (Epstude & Roese, 2008). They are typically associated with negative emotions such as regret, shame and guilt which tend to reduce well-being (Niedenthal, et al., 1994; Roese, 1997). As the number of options and thus the number of alternatives foregone increases, the *opportunity* to generate specific counterfactuals also increases (Epstude & Roese, 2008).

Crucially, however, in several instances evidence has been found that counterfactuals may be cued more readily following negative than positive decision outcomes (Roese, 1997; Boninger et al., 1994; Sanna & Turley, 1996; Tsiros & Mittal, 2000). For example, in Sanna and Turley's (1996) experiment, participants were asked to read a vignette in which the protagonist, Pat (who either typically performed well or poorly in courses), had either passed or failed a recent exam. Participants were asked to retell the story into microphones, and the number of spontaneously generated counterfactuals was recorded (Study 1). The authors found that participants were significantly more likely to generate counterfactual thoughts where outcomes were negative, and in which prior expectations had been violated. This effect was replicated in a second study (Study 2), which examined the impact of outcome valence upon counterfactual generation following real-life exam performance. Specifically, as outcome valence

increased (i.e. outcomes became more positive), the number of spontaneously generated counterfactuals decreased.

Tsiros and Mittal (2000) found similar results. This experiment involved a hypothetical purchasing scenario in which the protagonist, Paul, wished to purchase a laptop computer. Participants were provided with either positive or negative feedback information about the outcome of his decision (Study 4). The authors found that participants were significantly more likely to generate counterfactual thoughts when the feedback information provided to them was negative. Further, in line with the overarching hypothesis of the current thesis, the authors found evidence that it was this increased tendency to engage in a process of counterfactual thought which drove the experience of regret, ultimately undermining satisfaction.

Other evidence for the effect of valence upon counterfactual generation is more indirect, stemming from the fact that a great deal of research on the relation between counterfactual thought and emotion has used negative outcome scenarios. For example, in Kahneman and Tversky's (1982a) original investment scenario, participants judged the actor to feel more regret than the non-actor, demonstrating the ability of actions to facilitate counterfactual generation, as discussed in Chapter 4. Crucially however, in both cases the result of the action or inaction was an equivalent negative outcome, a loss of money. Indeed following this, both Gleicher et al., (1990) and Landman (1987) used Kahneman and Tversky's (1982a) investment scenario, and only found evidence for an action effect when outcomes were negative. When outcomes were positive the action/inaction manipulation had a reduced impact upon affective reactions,

suggesting that counterfactual thoughts were more readily cued, and subsequently more influential in judgements pertaining to negative outcomes.

#### *5.4.2 Evidence Against the Effect of Valence in Eliciting Counterfactual Generation*

Other researchers have failed to find evidence of this effect. For example, in Roese & Olson's (1993) scenario based experiment, participants were asked to imagine that they had been asked to undertake a joint class project with another student, Pat (Study 1). The scenario was designed to include two salient actions for each actor, one positive and one negative. For example, participants read how Pat was unable to work on the project for the first week due to illness (negative action), yet had done extra work in the last week in terms of thoroughly checking the spelling and grammar of the project, ultimately improving its readability (positive action). Participants were asked to imagine that they personally had found a highly relevant textbook which helped to summarise the project (positive action), but that during the last week they had not had much time to work on the project due to an exam in another course (negative action). Outcome valence was then manipulated by informing participants that the joint grade received for the project was either well above average (A) or well below average (D). Participants were then asked to write down any ways in which the outcome of the project might have been different, and the number of counterfactual thoughts generated was recorded. The authors found no differences in the overall frequency of counterfactual thoughts according to outcome valence. This finding was replicated in a second study (Study 2) using an alternative scenario describing the success or failure of two tutors to teach mathematics to a student. Again the authors found that participants generated

counterfactual alternatives following positive and negative outcomes with equal frequency.

One potential explanation for these conflicting findings stems from the different methodologies used to measure counterfactual thought. Roese and Olson's (1993) study used a structured approach, in which participants were specifically instructed to generate counterfactual thoughts after reading the scenario(s). To do this, participants were asked to "list as many "what if", or "if only" thoughts that could have changed the outcome of this situation" (pp. 201). Consequently this methodology does not necessarily provide the reader with an indication of the natural prevalence of such thoughts following either a positive or a negative outcome. Participants were consciously trying to think of counterfactuals, which one might perhaps reasonably presume influenced the amount of thoughts generated on the whole, and may even have encouraged the generation of such thoughts in situations where they may not naturally occur.

On the other hand, both Sanna and Turley (1996) and Tsiros and Mittal (2000) used an open-ended method of measuring counterfactual thought. Participants in these experiments were simply asked to "write down any thoughts the protagonist may be having at that time" (pp. 411, Tsiros & Mittal, 2000), without any mention of 'what ifs' or 'if onlys' as starting points for their thoughts. As reviewed in Chapter 2, in this manner it has been argued that these open-ended measures may provide a more valid means of measuring the underlying construct of *spontaneously* occurring counterfactual thoughts, in terms of examining differences in the likelihood of their unprompted occurrence (e.g. Tsiros & Mittal, 2000; Crawford & McCrea, 2004). The current research subsequently aimed to extend this research, and examine the prevalence of

spontaneously occurring counterfactual thoughts according to manipulations in valence and choice level, using the open-ended methodology adapted from Crawford and McCrea (2004) and used previously in Experiments 1, 2, 4 and 5.

#### *5.4.3 Explanations for the Role of Valence in Eliciting Counterfactual Generation*

There are a number of potential explanations as to why counterfactuals may be less readily cued following positive than negative outcomes. For example, negative outcomes tend to promote exploration more so than positive outcomes (Wong, 1979), and may be remembered better than positive outcomes (Gilovich, 1983). In addition, Wong and Weiner (1981) found that negative outcomes elicit greater attributional search than positive outcomes, which in contrast are typically not subject to the same degree of scrutiny. This difference in the depth of processing following positive and negative outcomes may result from the fact that people are motivated to learn how to avoid negative events in the future, and yet are rarely motivated to 'un-do' positive events (Wells, Taylor & Turtle, 1987). Indeed, it is widely accepted that a basic function of counterfactual thought may be to provide motivation and guide future behaviour (Nasco & Marsh, 1999; Roese & Olson, 1995; Zeelenberg, 1999). Subsequently in the face of a negative outcome, a person is likely to naturally generate counterfactual thoughts with greater frequency than following a positive outcome, due to an underlying motivation to improve their behaviour, and avoid similar negative outcomes in the future.

#### *5.5 Predictions*

Subsequently, following what we know about the impact of valence upon counterfactual generation, it was predicted that the number of options would be relatively unimportant for satisfaction with the chosen option if an individual

experienced a positive outcome since they would be less likely to generate counterfactuals whether presented with few or many options. By contrast, for choices resulting in negative outcomes the number of options will be important because a) people will be more inclined to consider the alternatives foregone and b) the more alternatives foregone the more likely it will be perceived that one of those would have been a better choice.

### *5.6 Illusory Choice*

Participants completed two taste tests, one involving chocolates, and the second involving flavoured waters. In both cases, participants were required to make a choice from a limited or an extensive selection of options. In actual fact, following the procedures used by Mogilner et al., (2008), and in Experiments 3, 5 and 6, both choice sets were illusory as half the participants tasted exactly the same 'good' flavour and the other half a 'bad' flavour (determined through pre-testing, details of which are provided in Section 5.7 below). By using illusory choice in this manner it was then possible to provide a thoroughly controlled examination of the impact of choice level manipulations upon satisfaction with the objectively same outcome (as per Experiments 3, 5 and 6). It was predicted that in the 'negative' outcome conditions there would be an ECE and this would be mediated by increased counterfactual thought. Where outcomes were 'positive' it was predicted that there would be no differences in counterfactual thought and subsequently no ECE. These specific predictions will be explored in follow-up analyses.

## 5.7

## Method

### 5.7.1 Pilot Tests

#### 5.7.1.1 Participants

20 undergraduate Psychology students at Plymouth University (12 women and 8 men, mean age = 26, with a range of 22 to 51 years) each took part in 30 minutes of pilot testing, in exchange for course credit.

#### 5.7.1.2 Design

The pilot testing had a within subjects repeated measures design, with each participant asked to sample and rate each of 8 different drinks flavours, and 8 different chocolate flavours.

#### 5.7.1.3 Materials

Participants were presented with a selection of 8 different drinks, each in a clear plastic bottle, labelled Sample 1 – Sample 8, and 8 different chocolate types, each presented in individual paper cake cases, and labelled in the same manner. The piloted drinks consisted of 4 existing, popular flavoured water types: 1) Strawberry, 2) Peach, 3) Blackcurrant, and 4) Lemon and Lime. The other 4 waters were created by the experimenter by mixing tap water with food flavourings, in order to create 4 potentially 'negative' choice outcomes. The trialled 'negative' flavours were: 5) Rum flavouring (non-alcoholic), 6) Peppermint flavouring, 7) Elderflower flavouring and 8) Star Anise Flavouring. In order to create this last flavouring the experimenter boiled the star anise herbs for an hour, and then strained the water before bottling.

A similar selection of flavours was used in the chocolate sampling. Four popular flavours were trialled. These used were: 1) Lindt Milk Chocolate, 2) Cadburys, 3) Milka, and 4) Marks and Spencer's Swiss. In addition, 4 chocolates

which were deemed likely to be relatively unappealing to the majority were also trialled. These were: 5) Turkish Delight, 6) Sainsbury's own brand Dark Chocolate with No Sugar, 7) Lidl Dark 89% Cocoa, and 8) Lindt Dark Chilli Chocolate.

#### 5.7.1.4 Procedure

Participants were informed that the experiment was designed to investigate flavour preferences, with the aim of determining the most and least preferred flavours of drinks and chocolates. Participants were asked to sample a small amount of each of Samples 1 – 8 (presented in a randomized order) for both the drink and chocolate trials. Before beginning both trials participants were instructed to pour themselves a glass of plain mineral water to sip on in between samples. For the drinks trials participants were instructed to *"Pour a small amount of each sample, in turn, into one of the plastic cups provided. After trying each sample, please answer the respective set of questions on the questionnaire which relate to your enjoyment and taste perception of that sample. Please repeat this procedure until you have sampled and rated each of the 8 drinks flavours"* (Appendix 5.1). For the chocolate trials participants were given the same instructions, but were simply asked to eat, and then rate, each of the displayed samples in turn (Appendix 5.2).

The questionnaire was designed to measure satisfaction with sample flavour using three questions adapted from Iyengar and Lepper (2000). These were: "I enjoyed the drink/chocolate I just tasted", "The drink/chocolate was tasty", and "I regret drinking/eating the drink/chocolate" (reversed). Each of these questions called for ratings on a 7 point Likert-scale ranging from 1 (strongly disagree) to 7 (strongly agree). In addition to this, participants were also asked to

give each sample a rating out of 10 using the following item: “If I had to give the chocolate I just tasted a score from 1 – 10 with 1 being really unpleasant, and 10 being totally delicious I would give it a score of....” Participants were asked to respond to this item using a 10 point Likert-scale ranging from 1 (really unpleasant) to 10 (totally delicious).

Finally, participants were also asked about their familiarity with the different flavours and brands. This was an important methodological consideration, as I did not want to include any brands which may have been widely recognised in the final experiment, in order to ensure satisfaction ratings would be made purely following that taste experience, and would not be influenced by any potentially preconceived ideas about brand quality. Participants were asked: “To what extent were you familiar with the flavour of the drink/chocolate you just tasted?” again participants were asked to respond using a 7 point Likert-scale, this time ranging from 1 (not at all familiar) to 7 (extremely familiar) (see Appendix 5.3).

#### 5.7.1.5

#### Pilot Test Results

##### *Drinks pilot test*

Using average satisfaction ratings from the three Iyengar and Lepper (2000) adapted items, the most to least preferred drinks flavours were found to be: 1) Strawberry ( $M= 5.28$ ), 2) Blackcurrant ( $M= 4.75$ ), 3) Elderflower ( $M= 4.03$ ), 4) Lemon and Lime ( $M= 4.00$ ), 5) Peach ( $M= 3.93$ ), 6) Peppermint ( $M= 2.56$ ), 7) Star Anise ( $M= 2.00$ ), and finally 8) Rum flavouring ( $M= 1.75$ ). Similar results were found using the scores given for each sample of out 10. The most to least preferred flavours were found to be: 1) Strawberry ( $M= 6.90$ ), 2) Blackcurrant ( $M= 6.10$ ), 3) Lemon and Lime ( $M= 5.60$ ), 4) Elderflower ( $M= 5.20$ ), 5) Peach ( $M=$

4.95), 6) Peppermint ( $M= 3.70$ ), 7) Star Anise ( $M= 2.70$ ), and 8) Rum flavouring ( $M= 2.20$ ).

Data from the familiarity question were then examined. Drinks flavours ranging from most to least recognisable were: 1) Rum flavouring ( $M= 4.85$ ), 2) Lemon and Lime ( $M= 4.45$ ), 3) Strawberry ( $M= 3.95$ ), 4) Peppermint ( $M= 3.25$ ), 5) Blackcurrant ( $M= 3.20$ ), 6) Star Anise ( $M= 2.85$ ), 7) Elderflower ( $M= 2.75$ ), 8) Peach ( $M= 1.85$ ).

Consequently on the basis of this data, blackcurrant was selected as the preferred drinks/'positive outcome' flavour, as it consistently led to the second highest, and above average ( $M= 3.59$ ), satisfaction ratings. The most popular option of strawberry was not selected on the basis that it may have led to such consistently high satisfaction ratings, that participants may subsequently have been less vulnerable to the experimental manipulations (as per Experiment 4). In addition, strawberry was more easily recognised than blackcurrant, and so potentially more open to any preconceived perceptions about preferred flavours. Regarding the least preferred drinks flavour, on the basis of the satisfaction data and participants' comments post-sampling, peppermint was selected as the most appropriate 'negative outcome' flavour for use in the main experiment. This was selected as it was consistently disliked as a drinks flavouring, and yet was not as disliked as the star anise and rum flavourings. On this basis it was deemed that participants would still experience a negative choice outcome, and yet may still be open to manipulations of choice level. In addition, the rum flavouring was highly recognisable, whilst the peppermint was akin to the blackcurrant. As such it was deemed these two flavourings accurately represented the positive and negative ends of the preference scale, with both being approximately one point

above or below the average satisfaction rating, and neither being so extreme as to rule out potential openness to choice level manipulations.

### *Chocolate Pilot Test*

Data from the chocolate samples were then examined, firstly using average satisfaction ratings from the three Iyengar and Lepper (2000) adapted items. The top four chocolate flavours were found to induce relatively similar levels of satisfaction: 1) Cadburys ( $M= 5.50$ ), 2) Marks and Spencer's Swiss ( $M= 5.25$ ), 3) Milka ( $M= 5.10$ ), 4) Lindt Milk Chocolate ( $M= 5.05$ ). Whilst the four least preferred chocolates types were as follows (from most to least): 5) Lindt Dark Chilli Chocolate ( $M= 3.78$ ), 6) Sainsbury's own brand Dark Chocolate with No Sugar ( $M= 3.25$ ), 7) Turkish Delight ( $M= 3.18$ ), and 8) Lidl Dark 89% Cocoa ( $M= 2.43$ ). Once again this was found to be paralleled by the ratings given for each sample out of 10: 1) Cadburys ( $M= 7.40$ ), 2) Lindt Milk Chocolate ( $M= 6.95$ ), 3) Marks and Spencer's Swiss ( $M= 6.75$ ), 4) Milka ( $M= 6.70$ ), 5) Lindt Dark Chilli Chocolate ( $M= 5.05$ ), 6) Sainsbury's own brand Dark Chocolate with No Sugar ( $M= 4.95$ ), 7) Turkish Delight ( $M= 4.25$ ), and 8) Lidl Dark 89% Cocoa ( $M= 3.05$ ).

Data from the familiarity question were then examined. The most to least recognisable chocolate brands were found to be: 1) Cadburys ( $M= 5.45$ ), 2) Lindt Milk Chocolate ( $M= 4.75$ ), 3) Turkish Delight ( $M= 3.65$ ), 4) Sainsbury's own brand Dark Chocolate with No Sugar ( $M= 3.35$ ), 5) Marks and Spencer's Swiss ( $M= 3.30$ ), 6) Lindt Dark Chilli Chocolate ( $M= 3.20$ ), 7) Milka ( $M= 3.30$ ), 8) Lidl Dark 89% Cocoa ( $M= 2.30$ ).

On the basis of this pilot data, the Marks and Spencer Swiss Milk chocolate was selected as the preferred chocolate type/'positive' choice outcome. This was selected as it was consistently rated as being a preferred flavour, and

was above average ( $M= 4.19$ ) in terms of satisfaction scores, and yet was not as recognisable as some of the other preferred chocolate types. The Sainsbury's own brand dark chocolate (no sugar) was selected as the non-preferred/'negative' choice outcome. This was chosen in order to make the two options approximately equivalent to the positive and negative drinks flavours, with Marks and Spencer Swiss Milk chocolate being approximately a point above the mean satisfaction rating, and Sainsbury's own brand dark chocolate (no sugar) being approximately one point below. As such it was deemed that the options were liked or disliked to the same extent, and yet were not so extreme as to potentially become immune to the experimental manipulations.

### *5.7.2 Experiment 8*

#### *5.7.2.1 Participants*

96 participants (59 women and 37 men, mean age = 31, with a range of 19 to 67 years) from the Plymouth public, recruited via the University's paid participant pool, took place in the experiment in exchange for £4 payment.

#### *5.7.2.2 Design*

The experiment had a 2 (choice level: limited vs. extensive) X 2 (outcome valence: 'good' vs. 'bad') X 2 (task type: chocolate task vs. drinks task) between subjects design with repeated measures on the last factor. Participants were randomly allocated to one of the four conditions. The presentation of the order of tasks was counterbalanced in order to reduce any potential order effects.

#### *5.7.2.3 Materials*

Participants were supplied with mineral water to sip on in between tasks, and were also provided with 'Rich Tea' biscuits to eat in between tasks if they

perceived the residual flavours of the first task to be too strong to be removed purely with water.

### *Drinks*

As previously detailed, on the basis of pre-testing, one relatively preferred 'positive' drinks flavour (blackcurrant), and a relatively non-preferred 'negative' flavour (peppermint) were selected for use in the main experiment. By then adding food colourants to these flavours two identically looking choice sets of 24 different coloured drinks were created: a 'positive outcome' set which all tasted of blackcurrant and a 'negative outcome' set which all tasted of peppermint. Drinks were presented in clear plastic bottles labelled either A to F or A to X depending on choice condition (see Appendix 5.4).

### *Chocolates*

Also on the basis of pre-testing, one relatively preferred or 'positive', chocolate flavour (M&S Swiss), and a relatively non-preferred 'negative' one (Sainsbury's own brand – No Sugar) were selected. In order to make the choice set equivalent to the drinks choice set and create an illusion of choice with visually different alternatives, numerous bars of each chocolate type were melted down by the experimenter and then re-moulded into one of 6 different shapes. Once cooled the chocolates were then presented to participants in individual paper cake cases (see Appendix 5.5).

#### *5.7.2.4 Procedure*

Participants were informed they were taking part in an experiment on taste perception (Appendix 5.6) and were simultaneously presented with a selection of either 6 (limited choice) or 24 (extensive choice) drinks and chocolates. These were presented as 2 separate tasks at opposite ends of a large table (see

Appendix 5.7). Participants were placed in the same condition for both tasks in order to ensure they didn't reflect upon any potential costs or benefits they might associate with being given a different choice level for the next task.

For the drinks task, participants were informed that the selection of drinks in front of them contained a variety of either 6 or 24 different flavours. In both cases these flavours were listed to further emphasise the different options potentially available within the choice set (Appendix 5.8). The listed flavours were as follows: orange and mango, tropical fruits, blackcurrant, cherry, banana, white grape and pear, aniseed, plum, apple and raspberry, orange, blueberry, elderflower, red grape and lime, pomegranate, lemon and lime, summer fruits, peach, peppermint, raspberry, apple and pear, cranberry, blackberry and apple, strawberry and passion fruit. The actual flavours (i.e. blackcurrant and peppermint) were deliberately included in this selection to reinforce belief in the genuineness and accuracy of the flavour list, and to hopefully cause participants to reflect upon their choice in the context of what else they might have chosen. Participants were instructed to choose the drink they "most liked the look of, and would subsequently most like to sample". After making their choice participants were asked to pour some of their chosen drink into a plastic cup and to sample it.

For the chocolates task, participants were informed that the chocolates displayed in front of them contained a selection of either 6 or 24 different brands, which had been melted down and re-moulded into one of six shapes using plastic chocolate moulds (Appendix 5.9). Participants were informed that this had been done so as to remove any impact of brand identity upon subsequent perception of taste and quality. Once again the different brands were listed to validate this story and further emphasise the variety of different options potentially available

within the choice set. The listed brands were as follows: Asda own brand, Lindt, Nestlé, Morrisons own brand, Milka, Lidl own brand, Lake Champlain Chocolates, Tesco Finest, Green and Black's, Kraft, Meiji, Marks and Spencer own brand, Pearson's Candy Co., Godiva, Tesco value brand, Jacob's, Aldi own brand, Sainsbury's own brand, Mauxion Schokoladefabrik, Thornton's, Hotel Chocolate, IKEA own brand, Nicky Grant Cornish Patisserie, Co-op own brand. Once again participants were instructed to "look at the selection of chocolates in front of you and decide which one you most like the look of, and subsequently would most like to sample". Following this participants were told to "eat that chocolate (saving a little in case you need to refresh your memory of the taste whilst answering the questionnaire)".

For both tasks participants completed the same questionnaire designed to measure satisfaction with choice (Appendix 5.10). This was done using three items adapted from Iyengar & Lepper (2000): "I am happy I made the right choice from the selection available", "I believe my choice of drink prevented me from having an enjoyable taste experience" (reversed), and "I regret choosing the drink I selected" (reversed). Each item called for ratings on a seven point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). In addition, the questionnaire was also designed to provide a measure of spontaneously occurring counterfactual thought. Following the procedures used in Experiments 1, 2, 4 and 5, after each item participants were asked to give "*at least two* reasons why you responded in that particular way". Internal consistency among the satisfaction items was high for both the drinks task ( $\alpha = .90$ ) and the chocolates task ( $\alpha = .84$ ) so in both cases the items were collapsed to form single

satisfaction measures. Finally participants were debriefed and reminded of their right to withdraw (Appendix 5.11).

#### *5.7.2.5 Measuring Counterfactual Thought*

The responses to the open ended questions were coded and used as a measure of spontaneously occurring counterfactual thought (e.g. White & Lehman, 2005). Based on the coding framework developed in Experiment 1, statements were coded into five categories. 'Choice counterfactuals' involved the explicit comparison of the chosen option with foregone alternative(s), for example: "One of the other drinks may have tasted better". 'Positive drink appraisals' involved positive descriptions of the chosen drink, e.g.: "Tasty and refreshing". 'Negative drink appraisals' involved negative descriptions of the chosen drink, e.g.: "Too sickly". 'Positive Comparisons' involved a positive comparison between the chosen option and other options, e.g.: "Some of the other drinks look a bit weird". Finally 'Other Responses' included any response which did not fit into any of the five main categories, e.g.: "More of a smell than a taste". The first 25% of responses (134 statements) were double coded by two independent judges, and high levels of agreement were observed: Kappa = .88,  $p < .001$ . As inter-rater reliability was established, all 100% of responses as coded by the first judge were used for further analysis. Since I am primarily interested in the degree to which people considered other options, my key measure of counterfactual thinking was the total number of thoughts which were 'choice counterfactuals'. For the chocolates task this was 57 out of 534 statements, or 10.68%, whilst for the drinks task this was 106 of 537 total statements, or 19.74%. Following Experiments 1, 2, 4 and 5 the total number of counterfactual thoughts generated are reported in order to provide the reader with a clearer

indication of the overall prevalence of counterfactual generation (however for completeness, the counterfactual analysis was also run using the proportion of counterfactual responses generated, and details of this are provided in Appendix 5.12).

## 5.8 Results

### 5.8.1 Task Effects

The data from both tasks were analysed both combined and separately using a multivariate approach. This was done in order to not only get a detailed overview of the effects of choice level and counterfactual generation across the two tasks, but also to determine whether the two tasks appeared to have been equally successful methods of manipulating satisfaction with choice. For the first part of the analysis, a 2 (valence: positive vs. negative) X 2 (choice level: limited vs. extensive) X 2 (task type: drinks vs. chocolates) ANOVA with repeated measures on the last factor was carried out (Table 5.1).

Table 5.1. *Mean and standard deviations of participants' satisfaction ratings and counterfactuals generated across tasks, according to manipulations in valence and choice level.*

Task	Choice	Positive Outcomes				Negative Outcomes			
		Satisfaction		Counterfactuals		Satisfaction		Counterfactuals	
		Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Chocolates	Limited	5.47	(1.33)	.25	(.40)	5.00	(1.58)	.11	(.29)
	Extensive	5.41	(1.12)	.23	(.30)	5.01	(1.54)	.16	(.20)
Drinks	Limited	5.19	(1.66)	.29	(.43)	3.49	(1.77)	.38	(.40)
	Extensive	4.63	(1.44)	.24	(.28)	2.46	(1.45)	.58	(.38)

A main effect of valence was found across tasks:  $F(1,92) = 32.81, p < .001, \eta^2 = .26$ . In general, participants were more satisfied with the positive than negative choice outcomes ( $M_s = 4.00$  vs.  $5.17$ ), demonstrating that the valence manipulation appeared to be successful. A significant main effect of choice level was also found:  $F(1,92) = 3.90, p = .05, \eta^2 = .04$ . In general participants were found to be more satisfied with limited than extensive choice, replicating the ECE: ( $M_s = 4.79$  vs.  $4.41$ ).

However, a main effect of task type was also found:  $F(1,92) = 32.55, p < .001, \eta^2 = .26$ . Participants were found to be more satisfied overall in the chocolate task ( $M = 5.23$ ), than in the drinks task ( $M = 3.97$ ). There was no three way interaction between task, valence and choice level:  $F(1,92) = .35, p = .56, \eta^2 = .004$ . However, analysis did reveal a marginal interaction between task and choice level:  $F(1,92) = 2.96, p = .09, \eta^2 = .03$ , and a significant interaction between task and valence:  $F(1,92) = 11.14, p < .001, \eta^2 = .11$ . Follow-up analyses were then conducted on this interaction in order to determine if the manipulation of valence in either task did not appear to have worked as intended.

T-tests revealed that the manipulation of valence was not successful for the chocolates task. Contrary to the results of pilot testing, participants were found to be equally satisfied if they tasted the 'good' or 'bad' chocolate ( $M_s = 5.44$  vs.  $5.01, t(94) = -1.54, p = .13$ )(see Table 5.1). Supporting this, a 2 (valence: positive vs. negative) X 2 (choice level: limited vs. extensive) ANOVA revealed no main effect of valence ( $F(1,92) = 2.31, p = .13, \eta^2 = .03$ ), or of choice level for the chocolates task ( $F(1,92) = .006, p = .94, \eta^2 < .001$ ). In addition, no interaction was found between valence and choice level:  $F(1,92) = .02, p = .90, \eta^2 < .001$ . Subsequently data from this task are not subject to the following main analyses

(however, for completeness, the analysis for the chocolate task is provided in Appendix 5.13).

On the other hand, t-tests revealed that the manipulation of valence was successful for the drinks task. Participants were found to be significantly more satisfied if they tasted the 'positive' than the 'negative' drinks flavour ( $M_s = 4.90$  vs.  $2.99$ ,  $t(94) = -5.79$ ,  $p < .001$ ) (Table 5.1). Consequently the remainder of the analyses focuses on data from the drinks task only, as this was the only task in which the manipulation of valence worked as intended. No task order effects were identified:  $F(1,92) = 2.41$ ,  $p = .12$ ,  $\eta^2 = .03$ , suggesting that the counterbalanced procedure was successful, thus providing further justification for the exclusion of the chocolate task data in subsequent analyses.

### *5.8.2 Satisfaction Analysis*

A 2 (valence: positive vs. negative) X 2 (choice level: limited vs. extensive) ANOVA revealed a significant main effect of valence ( $F(1,92) = 35.77$ ,  $p < .001$ ,  $\eta^2 = .28$ ), and of choice level ( $F(1,92) = 6.03$ ,  $p = .02$ ,  $\eta^2 = .06$ ). In general participants were found to be more satisfied with limited than extensive choice ( $M_s = 4.34$ ,  $3.59$  respectively), once again replicating the ECE (Table 5.1). However, no interaction was found between valence and choice level:  $F(1,92) = .49$ ,  $p = .48$ ,  $\eta^2 = .005$ .

A simple main effects analysis was then conducted on this non-significant interaction (see Winer, 1971, for the justification of this procedure). This was done in order to examine specific predictions that the ECE would be apparent following negative but not positive outcomes. For negative outcomes, an ECE was found:  $F(1,92) = 4.89$ ,  $p = .03$ ,  $\eta^2 = .05$ . Participants were found to be significantly more satisfied with limited than extensive choice ( $M_s = 3.49$ ,  $2.46$

respectively). For positive outcomes, this effect of choice level was not significant:  $F(1,92) = 1.57, p = .21, \eta^2 = .02$ , with participants experiencing similar levels of satisfaction in the limited and extensive choice conditions ( $M_s = 5.19, 4.63$  respectively). These findings are consistent with predictions, and provide initial evidence that valence is to some extent influential in determining the prevalence of the ECE.

### 5.8.3 Counterfactual Analysis

T-tests revealed that the valence manipulation was also successful in terms of counterfactual generation. In line with previous research, participants were found to generate significantly more counterfactual thoughts following negative than positive outcomes ( $M_s = .48$  vs.  $.27, t(94) = 2.71, p = .01$ ). Supporting this, a 2 (valence: positive vs. negative) X 2 (choice level: limited vs. extensive) ANOVA revealed a significant main effect of valence on the number of counterfactuals generated:  $F(1,92) = 7.61, p = .01, \eta^2 = .08$ . No main effect of choice level was found:  $F(1,92) = 1.00, p = .32, \eta^2 = .01$ , however, a marginal interaction was found between valence and choice level:  $F(1,92) = 2.80, p = .09, \eta^2 = .03$  (see Figure 5.1).

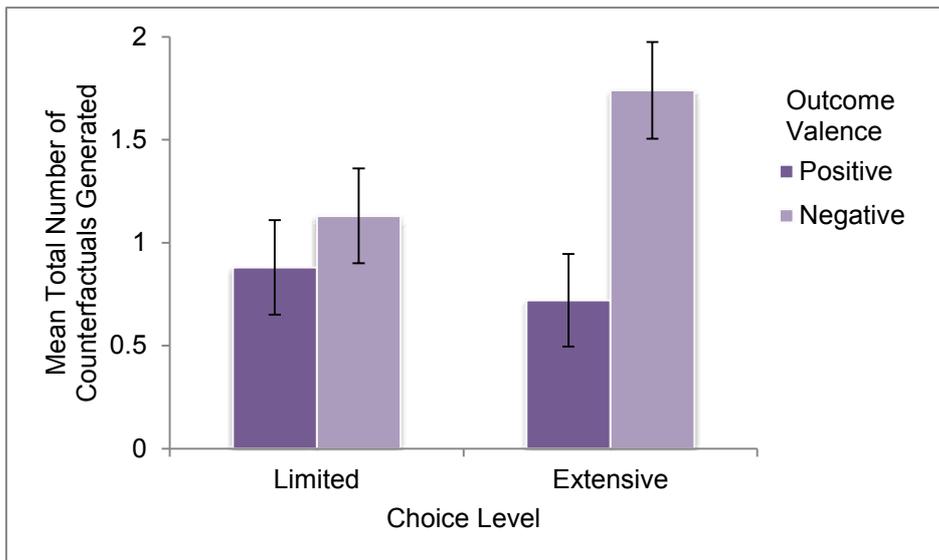


Figure 5.1. Bar chart displaying the marginal interaction between choice level and outcome valence on the total number of counterfactuals generated. Standard errors are represented in the figure by the error bars attached to each column.

A simple main effects analysis was then conducted to follow up the marginal interaction in order to examine specific predictions that participants would generate more counterfactuals under extensive than limited choice only where outcomes were negative. Results provided partial support for this prediction. Where outcomes were negative participants were found to generate marginally more counterfactuals under extensive than limited choice:  $M_s = 1.74, 1.13$ ;  $F(1,92) = 3.49, p = .07, \eta^2 = .04$ . Where outcomes were positive, this effect of choice level was not significant:  $F(1,92) = .23, p = .63, \eta^2 = .003$ , with similar numbers of counterfactuals being generated following extensive and limited choice ( $M_s = .72, .88$  respectively).

#### 5.8.4 Mediation Analysis

Two three-step mediation analyses were then conducted in order to examine specific predictions that counterfactual thought would mediate any ECE for negative but not positive outcomes. Again following Baron and Kenny (1986)

each mediation analysis had three steps. Step 1 regressed choice level (limited vs. extensive) on satisfaction, Step 2 regressed choice level on counterfactuals, and in Step 3 both choice level and counterfactuals were regressed onto satisfaction.

#### 5.8.4.1 Negative Outcomes

The results of mediation analyses using negative outcomes are summarised in the upper half of Figure 5.2 with the results from Step 1 shown in brackets and those from Step 3 in italics.

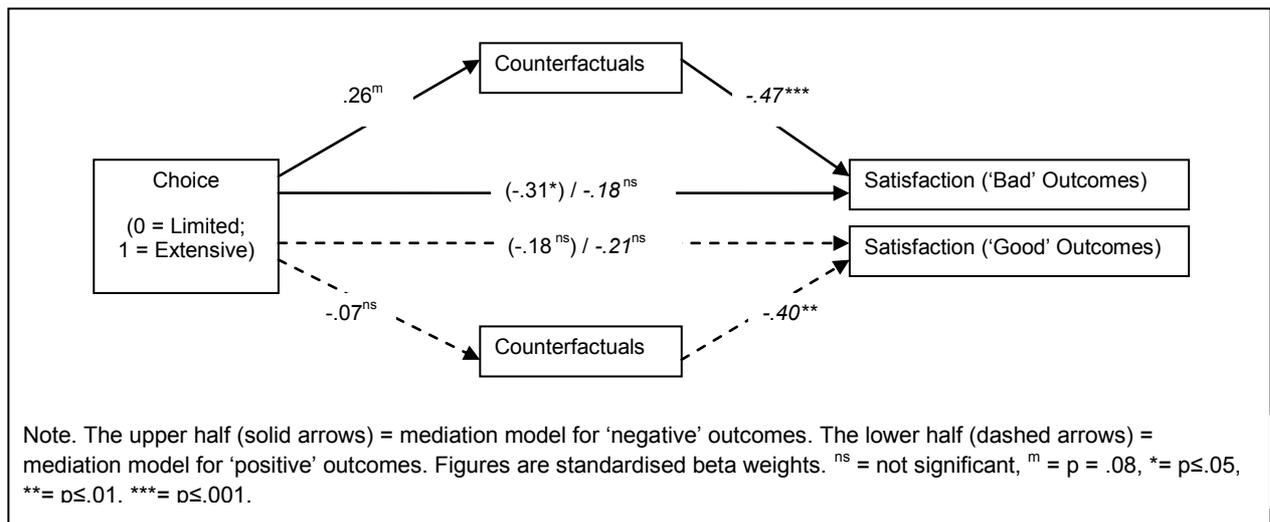


Figure 5.2. Mediation analysis showing the role of counterfactuals in mediating the effect of choice set size on satisfaction for 'negative' but not 'positive' outcomes.

Step 1 replicated the ECE with greater satisfaction in the limited vs. extensive choice condition ( $\beta = -.31, p = .04$ ). Replicating earlier counterfactual analyses, Step 2 found that counterfactuals were marginally less likely to be generated following limited than extensive choice ( $\beta = .26, p = .08$ ). Step 3 suggests that the number of counterfactuals generated negatively affected satisfaction irrespective of condition ( $\beta = -.47, p = .001$ ). More importantly, the

main effect of choice level was no longer marginally significant ( $\beta = -.18, p = .17$ ) once counterfactuals were added to the model. A Sobel test confirmed that counterfactuals were significantly mediating the effect of choice on satisfaction ( $z = 1.60, p = .05$ , one tailed).

#### 5.8.4.2 Positive Outcomes

The results of mediation analyses using positive outcomes are summarised in the lower half of Figure 5.2 with the results from Step 1 shown in brackets and those from Step 3 in italics. Supporting earlier analyses, there was no main effect of choice level on either satisfaction or counterfactual thinking and no evidence of mediation. Participants were just as satisfied if they had chosen a pleasant drink following limited vs. extensive choice ( $\beta = -.18, p = .21$ ) and generated just as many counterfactuals in the limited and extensive choice conditions ( $\beta = -.07, p = .62$ ). Again, demonstrating the importance of counterfactual thinking in general for satisfaction there was a strong negative relationship between them ( $\beta = -.40, p = .004$ ) but crucially in this case they did not mediate the effect of choice ( $z = .49, p = .31$ , one tailed).

## 5.9 Discussion

Although an increasing amount of evidence suggests that extensive choice may be associated with decreased satisfaction (e.g. Iyengar et al., 2004; 2006; Chernev 2003a; 2003b; Lee & Lee, 2004; Shar & Wolford, 2007; Reutskaja & Hogarth, 2009; Mogilner et al., 2008; Greifeneder et al., 2010), the excess-choice-effect is not always apparent. Indeed, a meta-analysis of 50 studies found no evidence either for or against the effect overall, leading the researchers to conclude that a theory of too much choice was needed which might help to explain the divergence of findings within the choice literature (Scheibehenne et

al., 2010). The current experiment aimed to address this by drawing on theories of counterfactual thinking. The role of outcome valence has been previously overlooked (Scheibehenne et al., 2009) as a potentially important factor contributing to the prevalence of the effect. Based upon the counterfactual literature, and the findings of Experiments 4, 5 and 6 it was hypothesised that the ECE might be more prevalent when decision outcomes were negative, due to the predicted impact of negative outcomes upon counterfactual thought. This was examined in 2 different choice tasks.

Results from the chocolate taste test were not found to be in line with predictions. However, analysis revealed this was because the manipulation of valence was not successful for this task: participants were found to be equally (highly) satisfied whether they tasted the 'good' or the 'bad' chocolate. This was a somewhat surprising finding given the results of pre-testing, and potential explanations for this are considered momentarily below. However, results from the drinks taste test, where the manipulation of valence was successful, were found to be broadly in line with predictions. Specifically, the ECE was only found to be prevalent where decision outcomes were negative, and crucially, this effect was found to be mediated by counterfactual thought. Where outcomes were positive there were no differences in satisfaction or counterfactual thought across choice levels. Subsequently the results from this task provide support for a) the counterfactual literature suggesting that a key trigger for counterfactual thought is a negative outcome (Roese, 1997; Sanna & Turley, 1996; Tsiros & Mittal, 2000), and b) the overarching hypothesis of the current thesis that counterfactual thought is a key driving force behind the ECE. Each of these claims is now

considered in turn, alongside implications for the existing choice and counterfactual literatures.

Firstly, the results of the drinks task provide evidence that outcome valence is an important trigger for counterfactual thought. Participants were found to engage in a significantly increased level of counterfactual thought when decision outcomes were negative, providing support for previous research (Roese, 1997; Sanna & Turley, 1996; Tsiros & Mittal, 2000). Subsequently, these results also hint at the possibility that previous experiments within the counterfactual literature which did not find any differences in counterfactual thinking according to manipulations in valence (e.g. Roese & Olson, 1993), may be attributable to certain methodological differences in procedures. Specifically, as previously mentioned, it may be the case that in Roese and Olson's (1993) experiment, the structured method of measuring counterfactual generation may have meant that participants felt obliged to generate counterfactual thoughts even in situations where they may not normally have done so (i.e. following a positive task outcome). Conversely, by using an open-ended measure of counterfactual thought, with no specific instructions of which type of thoughts to generate, the current experiment provides a perhaps more accurate representation of spontaneously occurring counterfactual thought. In doing this, the determining role of valence is supported, and the greater amount of counterfactuals found under negative outcomes further emphasises that a basic underlying function of counterfactual thought may be a source of motivation to guide behaviour, in an attempt to avoid similar situations in the future (see also, Nasco & Marsh, 1999; Roese & Olson, 1995; Zeelenberg, 1999).

By applying this aspect of counterfactual theory to the field of choice it was then possible to manipulate the prevalence of the ECE, providing further evidence for the causal role of counterfactual thought in driving the effect. Indeed, the ECE was replicated only when outcomes were negative, where the effect was once again found to be significantly mediated by counterfactual thought. Where outcomes were positive and counterfactual thinking was reduced, no ECE was found. Subsequently the current experiment highlights outcome valence as an important factor contributing to the prevalence of the ECE. This not only contributes to the choice literature which has examined moderators of the effect (Scheibehenne et al., 2009), but also raises a potentially important issue with this previous research. Specifically, Scheibehenne et al., (2009) identified justification as being a key factor required in order to elicit the ECE, which the authors claim fits with the assumption that justification becomes more difficult when options become more difficult to distinguish from one another. However, it could be the case that the justification process impacts upon satisfaction by acting as a trigger for counterfactual thought. As such, when extensive choice participants are encouraged to fully reflect upon their choices, their decreased satisfaction levels may in fact mirror an increase in the availability of counterfactual thoughts about the attractive qualities of unchosen options. The results from the current experiment provide support for this account, as marginally more counterfactual thoughts were found to be generated under extensive than limited choice (where outcomes were negative). In order to resolve this issue, and determine whether the justification process alone is required to elicit the ECE, a replication of Scheibehenne et al.,'s (2009) justification experiment could be conducted, but with an additional measure of counterfactual thought (as per the current

experiment). It would then be possible to determine whether it is the justification process or potentially the increased level of counterfactual thought this may encourage, which is a necessary factor contributing to the prevalence of the ECE.

Further support for the role of valence within the ECE would be offered if a review of previous studies revealed that only those which were associated with relatively bad outcomes led to the effect. Unfortunately this is virtually impossible since we cannot know *a priori* which outcomes were positive or negative for the individuals making the decisions. In some instances where the ECE was found, such as having to write an essay (Iyengar & Lepper, 2000, Study 2), choose jobs (Iyengar et al., 2006), pension schemes (Iyengar et al., 2004), or demonstrate creativity or artistic talent (Experiment 1) one might infer that the experience was a relatively negative one for many participants, but we cannot know this for sure. Similarly, several studies that seemed to have involved choices with a high chance of positive outcomes (e.g. chocolates, jelly beans, soda, restaurants and music; Berger et al., 2007; Kahn & Wansink, 2004; Arunachalam et al., 2009; Scheibehenne et al., 2009) also failed to find an ECE. Again, however, we can't be sure how these outcomes compared to other choices participants could have made since outcome valence was not directly manipulated.

More challenging for this account are studies that demonstrate the ECE using apparently positive (e.g. jams, chocolates, Iyengar & Lepper, 2000, Studies 1 & 3) or neutral (e.g. gift boxes or pens; Reutskaja & Hogarth, 2009; Shar & Wolford, 2007; Greifeneder et al., 2010) stimuli. However, just as with studies that seem to support my approach we simply don't know what the initial reactions of people were in these studies leaving open the possibility that they were relatively negative or at least more negative than researchers had expected.

Thus I am unable to 'retro-fit' my approach to the previous literature because although I may have intuitive beliefs about whether a choice set is likely to contain options which people will find relatively positive or negative I am unable to effectively and objectively determine this. The chocolates task used in the current experiment provides evidence for the unpredictability of choice outcome perception. Specifically, even though pilot testing revealed the 'negative outcome' chocolates to be unappealing, they were enjoyed in the main experiment, potentially explaining why no subsequent impact of choice level was found here. A discussion of possible explanations as to why the chocolate task may not have worked as intended is considered momentarily below. Consequently, a test of this explanation of the potentially important determining role of valence within the ECE will therefore depend on future studies which, like the current experiment, a) deliberately manipulate the valence of experiences of choice, and b) provide a manipulation check to determine that the choice outcomes were perceived as intended.

Regarding potential explanations for the chocolates taste test, analysis revealed that satisfaction with both the negative and positive chocolate types was equally high. Comparing average satisfaction ratings with those obtained during pilot testing it appears that the positive outcome ratings were consistent, and yet satisfaction in the negative outcome conditions increased by an average of 2 whole points, essentially making them equivalent to those obtained in the positive conditions. There are a number of potential explanations as to why this effect may have occurred. For example, it may be the case that participants enjoyed the 'negative outcome' chocolate more in the actual experiment than in the pilot test, as they may have drawn comparisons between that choice outcome and the

'negative outcome' for the drinks task. In other words, satisfaction with a horrible chocolate might have been improved by comparison after tasting a horrible drink. However, half of the participants tasted the chocolate first, so would have had no other negative outcome with which to compare their taste experience. In addition, as previously discussed no evidence was found for any task order effects. Therefore other factors may also have been contributing to the overall increase in satisfaction.

It may be the case that the valence manipulation wasn't as successful as the drinks task due to the different ways in which the tasks were described. Although 24 different potential outcomes were listed for both tasks, for the drinks task participants read a list of potential flavours, whilst in the chocolates task participants were given a list of brand names. As such it may be that for the drinks task, participants could easily determine from the outset that peppermint was likely to be one of the worst flavours, and may have been subsequently disappointed to have chosen this flavour from an extensive selection. However, with the chocolates task, it may have been more difficult to distinguish between the options according to brand name, thus meaning perception of variety within the assortment may have been reduced by comparison. As such satisfaction may have improved following a negative outcome, as information regarding the best and worst possible options may have been less readily available, or less easily brought to mind.

This explanation is to some extent consistent with research by Gleicher et al., (1990) who found that the salience of counterfactual information was influential in determining the level of affective response following choice. As reviewed in Chapter 4, in this experiment Gleicher et al., (1990) used a version of

Kahneman and Tversky's (1982a) original investment scenario, in which the valence of the protagonists' choice outcome and the salience of counterfactual information were manipulated. The authors found that when outcomes were negative, participants consistently attributed greater affective reactions to the actor than the non-actor, whereas when outcomes were positive, this effect only occurred when counterfactual information was made highly salient. The findings from the current experiment appear to be consistent with this research, demonstrating that when counterfactual information is not made salient (i.e. when participants have no easily comparable information on which to base their satisfaction judgements) then the level of affective response is reduced.

Indeed, the findings from the current experiment, alongside those in the previous chapter, extend this argument further, and show that an important factor in determining the perception of valence of choice outcomes may be some degree of comparison with other options. For instance, Gleicher et al., (1990) found evidence for an action effect when outcomes were negative regardless the degree of salience of counterfactual information. However, in their investment scenario participants read about a choice outcome which was undoubtedly negative (i.e. Mr. Paul loses money), where negative outcomes are known to cue for counterfactual thought (e.g. Sanna & Turley, 1996, Tsiras & Mittal, 2000). On the other hand, in the current experiment(s) participants may have required a degree of comparison with other choice outcomes in order to determine whether their choice outcome was relatively positive or negative. In cases where this isn't perhaps as obvious as losing money, it appears that a degree of comparison may be influential in determining perception of valence, and when this information is

not readily available then participants appear to experience reduced affective responses to that choice outcome.

Also consistent with this argument, it may be the case that in pilot testing, participants rated the 'negative outcome' chocolate lower than in the actual experiment as they may have been comparing it with the higher ranking chocolates. After tasting just that one chocolate in the main experiment it may have simply not seemed that undesirable. This also relates back to my theoretical account of availability of information about the best and worst possible options. During pilot testing, having the potential to draw direct comparisons with other chocolates may have driven satisfaction down, where in the actual experiment this information (although listed) may not have been so readily available. Conversely in the drinks task it may have been easier to continue to draw comparisons between potential options during the main experiment, and this degree of comparison may have allowed participants to make relative judgements of the valence of their outcome, leading to enhanced affective responses. However, at this stage this suggestion is largely speculative, and further research will therefore be needed in order to further examine how varying the salience of defining information regarding different choice alternatives may drive satisfaction following choice, due to the predicted impact of this upon counterfactual generation. Nevertheless following this, it may be that future experiments into the effects of valence may wish to ensure that any options listed are described in terms of more widely recognised characteristics, such as flavour, in order to ensure that participants are able to easily distinguish between options, thus enabling them to reflect upon the potential qualities that each may have whilst making satisfaction judgements.

On the other hand the manipulation of valence was found to be successful for the drinks task, allowing me to determine that valence did impact upon the prevalence of the ECE, and that in line with predictions, this was partially attributable to the effect of valence upon counterfactual thought. However as these findings were only found for one task, it is important to note that these effects may be task specific to some extent, as per Experiment 1. As such further research will be needed in order to fully explore whether the findings of the drinks task are replicable and would generalise across domains. Nevertheless if this were found to be the case, then these findings would have important implications with regard to the construction of choice architectures within public policy (Thaler & Sunstein, 2008). Specifically, the results highlight the importance of considering probable outcome valence when determining the most appropriate choice level(s) for satisfaction. If outcomes are likely to be positive then people are less likely to consider options foregone and thus more choice may help them find a match for their preferences and enhance outcomes. However, if immediate outcomes are likely to be viscerally negative, more choice may undermine satisfaction. For instance, people tend to dislike parting with current earnings to invest in pensions (Iyengar et al., 2004; Thaler & Benartzi, 2004) and thus presenting them with many options may be likely to lead to more counterfactual thinking, and less satisfaction with any given choice. Perhaps this is one reason why people tend to invest more when provided with a limited number of alternatives (Iyengar et al., 2004), or a default pension scheme (Thaler & Benartzi, 2004), as both lessen the need to compare many options. It is possible that a similar process occurs when people have to choose between a range of hospitals for an unpleasant medical operation (Fasolo et al., 2010), or between treatment methods following illness

(e.g. Degner & Sloan, 1992; Ende et al., 1989). In such cases it may actually be better to provide a more limited number of options in order to reduce counterfactual thinking, and thus potentially improve satisfaction with an objectively negative outcome. This is a point to which I will return in Chapter 6.

To conclude, Experiment 8 demonstrated that high levels of choice were only 'too much' when the person experienced a negative outcome, and that this ECE was mediated by an increased tendency to consider options foregone. Where outcomes were positive choice level was found to have a reduced impact upon counterfactual thought, and no evidence for any ECE was found. Following this, Chapter 6 subsequently aims to: a) consider the findings of this and all previous experimental chapters in light of the existing choice and counterfactual literatures, b) determine the potential implications of each of these findings for consumers, retailers and for the construction of public policy, and c) identify additional areas of research necessary in order to continue to further our understanding of the role that peoples' considerations of alternatives foregone plays in determining satisfaction and well-being following choice.

## Chapter 6: A Review and Interpretation of the Experimental Findings and Recommendations for Future Research

### *6.1 Chapter Overview*

The main aim of this chapter is to review and interpret the experimental findings reported in Chapters 2, 3, 4, and 5, and to relate these findings both to the current choice literature and to the theoretical counterfactual accounts that I have introduced in the previous chapters. Section 6.2 provides a recap of the experimental findings, and an interpretation of these findings in light of the existing choice and counterfactual literatures, alongside a discussion of potential areas for future research. Section 6.3 considers the role of counterfactual thought as an underlying causal explanation for the ECE in light of existing theoretical explanations for the effect. Section 6.4 considers the wider theoretical implications of the experimental findings. Section 6.5 provides a discussion of the applied implications of the current research for the psychology of choice, with particular regard to retailers, consumer well-being, and the construction of public policy. Then Section 6.6 considers additional potential areas for future research to explore. Finally, Section 6.7 provides an overall reflection on the findings of the current research.

### *6.2 Summary of Experimental Findings*

Modern society increasingly leaves people "spoilt for choice". That is, the presence of multiple options may be so extensive that enjoyment in the chosen alternative is "spoilt" in comparison to a situation with fewer options. Although the existence of the phrase suggests some awareness of this problem, people still tend to prefer more rather than less choice and the ability to undo their decisions once they have been made (Iyengar & Lepper, 2000; Iyengar et al., 2004; 2006;

Shar & Wolford, 2007; Reutskaja & Hogarth, 2009; Lee & Lee, 2004; Mogilner et al., 2008; Chernev 2003a; 2003b; Greifeneder et al., 2010; Gilbert & Ebert, 2002). This awareness of the dangers of choice alongside strong preferences for greater choice has been referred to as the "paradox of choice" (Schwartz, 2000; 2004).

Building on discussions of increased regret as an account for these findings (Schwartz et al., 2002; Schwartz, 2004; Roese & Summerville, 2005) the current research aimed to directly examine the potentially causal role of counterfactual thought in driving the ECE. Across 7 experiments I manipulated various factors in an attempt to influence the availability of counterfactual thoughts, and thus determine any subsequent impact upon the prevalence of the effect, whilst another experiment (Experiment 7) aimed to determine individuals' predicted affective responses to extensive choice. What follows now is a discussion and interpretation of the main findings of each experiment in turn, in light of the existing choice and counterfactual literatures.

### *6.2.1 Experiments 1 and 2*

In Experiment 1 the number of counterfactuals generated was monitored under conditions of limited vs. extensive choice, in which half of the participants rated their satisfaction with their chosen alternatives under high cognitive load. The aim of this load manipulation was to undermine the systematic generation of counterfactuals and thus 'undo' the normally deleterious effects of excess choice on option satisfaction. Experiment 2 used the same procedure to examine the paradox of reversibility. The number of counterfactuals generated under expectations of reversible vs. non-reversible choice whilst simultaneously under low vs. high cognitive load was monitored.

In line with the overarching hypothesis of the current thesis, in Experiment 1 the ECE was replicated under low load, and further, this effect was found to be mediated by counterfactual thought. The capacity to think about counterfactual alternatives was found to be reduced under high load, providing evidence consistent with research by Ward and Mann (2000; Müller et al., 2007; Beck et al., 2009; Johnson-Laird & Byrne, 1991; although c.f. Kahneman, 1995; Goldinger et al., 2003), that counterfactual thinking can be an effortful process which in some instances may be reduced via a secondary cognitive load task. Accordingly following this reduction in counterfactual thought, under high load the ECE was found to be reversed. This latter finding appears to be in line with economic theory, suggesting that people may indeed be happiest with increased choice, but only in cases where the associated detrimental post-decisional counterfactual thought process is reduced.

Results from Experiment 2 indicated that counterfactual thought also played an underlying role in the reversibility paradox. Specifically, under low load, an increased tendency to engage in a process of counterfactual thinking was found to partially mediate the impact of expected reversibility upon revealed satisfaction. Paralleling the findings of Experiment 1, under high load no relationship was found between reversibility and counterfactual thought. Thus, results from these two experiments provided initial evidence to suggest that counterfactual thought may play an important role in underpinning these two seemingly paradoxical findings within the choice literature. The findings from Experiments 1 and 2 are thus to some extent also consistent with the work of Dijksterhuis and colleagues (Dijksterhuis & van Olden, 2006; Dijksterhuis, Bos, Nordgren & van Baaren, 2006), who argue that satisfaction with complex

decisions can be improved if decisions are made in the absence of deliberative attention. In this case, excess choice and reversibility can be viewed as contributing to a relatively complex decision process, whereby satisfaction was subsequently found to increase if participants' attention was otherwise engaged under a high cognitive load.

### *6.2.2 Experiment 3*

Following the replication of the ECE in Experiment 1, Experiment 3 was designed to investigate a) the long term implications of the effect, b) whether the effect would transfer to the novel domain of health psychology, and c) to establish whether the ECE could impact upon physical, as well as psychological well-being. Participants selected a placebo treatment (a Bach's flower essence), which they then used every day for a period of two weeks. This essence was chosen from either a very limited (2), an intermediate (12), or an extensive (38) number of options. Both psychological and physiological satisfaction with choice, and a self-reported measure of counterfactual thought were monitored at the start and end of the two week period.

Results indicated that the ECE transferred to the domain of health psychology. In addition, consistent with previous research (e.g. Shar & Wolford, 2007, Reutskaja & Hogarth, 2009) satisfaction was found to be an inverted U-shaped function of the number of options available at the initial time of choice. Specifically, participants were found to be significantly more satisfied with their choice of essence if this was chosen from an intermediate number of options, than from a very limited or an extensive choice set. At the end of the two week period this initial ECE was found to be reduced, and psychological satisfaction levels were found to be equivalent regardless of initial choice level. This

appeared to be consistent with counterfactual theory, paralleling the predicted drop in the experience of counterfactual emotion over time. However the counterfactual self-report data were not found to support this, with high levels of positive correlation found between satisfaction and counterfactual thought at both times of testing. This finding was particularly counter-intuitive given the findings of Experiments 1 and 2, and suggested that the wording of the counterfactual question may have wrongly placed emphasis on how much participants considered other factual alternatives available to them at the time of choice, as opposed to providing a true indication of post-decisional *counterfactual* thought. As such it appears that this self-report measure may simply not have been a reliable method of measuring the underlying construct of counterfactual thought. Consequently, although the satisfaction data appear to be consistent with counterfactual theory, further research will be needed in order to gain empirical evidence for the claim that the reduced ECE exhibited over time is a direct consequence of an associated reduction in counterfactual thought.

In addition, the results of Experiment 3 also help to further understanding of the true extent of the 'problem' of extensive choice (Fasolo et al., 2007), by demonstrating that not only does extensive choice lead to detriments in short term satisfaction, but can also potentially impact upon the choosers long term well-being. Specifically, participants were found to experience a placebo effect to a greater extent if they initially chose their flower essence from 12 rather than 2 or 38 options. As such this appears to provide empirical support for Schwartz's (2000; 2004) claim that choice can have a long term impact upon well-being. However this is a point to which I will return in greater detail in Section 6.4.

Crucially, however, this experiment was conducted within the field of health psychology, and involved the use of a placebo treatment. As such further research will be needed in order to determine whether choice continues to impact upon choosers' well-being in a similar manner in both alternative, consumer-based choice domains, and in everyday situations where the chooser might not necessarily continue to reflect upon the results of their decision for any substantial length of time. Only then can we draw any definite conclusions about the potential generalisability of these results to everyday decision making. This is an avenue for future research to explore.

### *6.2.3 Experiments 4, 5 and 6*

Experiments 4, 5 and 6 were designed to build upon a third aspect of the counterfactual literature: the counterfactual 'action effect'. This refers to the finding that people may typically be more likely to generate counterfactual thoughts following acts of commission, or action, than acts of omission, or inaction (Gilovich & Medvec, 1995). This aspect of counterfactual theory was then applied to the ECE on the hypothesis that presenting participants with a default option might then help to improve satisfaction with extensive choice, as choosing to stick with a default may be viewed as being akin to inaction (see Ritov & Baron, 1992), and thus should reduce the detrimental post-decisional counterfactual thought process otherwise associated with extensive choice.

Across Experiments 4 – 6, the vast majority of participants presented with a default option were found to stick with that default, providing robust evidence for the omission bias, and for the immense power of defaults in guiding behaviour (Baron & Ritov, 1994; Samuelson & Zeckhauser, 1988; Sunstein & Thaler, 2003). Contrary to predictions, no evidence was found that default options led to

improved satisfaction with extensive choice: participants were found to be equally satisfied whether they made an active choice or stuck with a default.

Nevertheless, Experiment 5 revealed partial evidence for a counterfactual action effect: participants were found to generate marginally more counterfactual thoughts following an active choice, in comparison to those participants who chose to stick with the default. Subsequently, as previously discussed, this raises the possibility that the negative task outcome (i.e. eating an unpleasant-tasting chocolate) might have driven satisfaction down lower than one might normally predict in the default choice group, potentially through feelings of betrayal following the recommendations of an expert. As such, given the established link between counterfactual thought and the experience of negative affect (Kahneman & Miller, 1986; Niedenthal et al., 1994; Roese, 1997; Roese & Olson, 1995), these results suggest that default options may still have the potential to lead to improved satisfaction, in cases where the default option might result in a less directly negative experience for the participant. However further research will be needed in order to investigate this possibility.

In line with research by Sanna and Turley (1996) and Tsiros and Mittal (2000), Experiments 4 – 6 demonstrated that a key trigger for counterfactual thought is a negative task outcome and some degree of violation between expectation and experience (as demonstrated via the removal of chocolate labels). This is in line with the functional definition of counterfactuals as a source of motivation for guiding behaviour, with an overall emphasis upon improvement (see also, Markman et al., 1993; 1995; Nasco & Marsh, 1999; Roese, 1994; Roese & Olson, 1995). Following this, Experiments 5 and 6 also revealed that when decision outcomes were negative no choice was preferable to any choice

(see also, Botti & Iyengar, 2004; Degner & Sloan, 1992; Ende et al., 1989). The current experiments highlighted that this effect was due to an increase in the experience of the counterfactual emotion of regret following any choice. When the capacity to experience regret was reduced by removing choice then satisfaction with the objectively same negative outcome was found to improve. Conversely, in cases where decision outcomes were more positive for the participant, choice type was not found to have any impact upon satisfaction.

Once again this is seemingly contrary to economic theory, demonstrating that when outcomes are positive then extensive choice may be of no further benefit to the chooser beyond that of no choice whatsoever. Importantly, this was found to be due to the fact that any positive outcome was associated with a reduced tendency to experience the counterfactual emotion of regret. Consequently, the findings of Experiments 4, 5 and 6 highlighted the potentially important role of valence in determining the prevalence of the ECE. Active, extensive choices only appeared to be detrimental to satisfaction levels when the outcome of that choice was objectively predetermined to be negative. Experiment 8, discussed in Section 6.2.5 below, was subsequently designed in order to investigate whether this same pattern of results would transfer directly to the ECE.

#### *6.2.4 Experiment 7*

Experiment 7 revealed evidence for a forecasting bias in relation to the 'problem' of extensive choice (Fasolo et al., 2007). The vast majority of participants in this experiment were found to predict that they would rather be in the active, extensive choice condition than in the default or control conditions. In reality, not only were participants found to be equally satisfied with a default as if

they had chosen it for themselves, but were also either equally satisfied, or significantly more satisfied (Experiments 5 and 6) in the control group than in either of the two choice conditions. As previously discussed, results from these experiments appear to be in line with Girotto et al.,'s (2007) distinction between 'actors' and 'readers', and the different levels of counterfactual thought that either may typically engage in. The predictors in Experiment 7 made their judgements based upon the consideration of a hypothetical scenario, making them essentially akin to 'readers', who according to Girotto et al., (2007), must make judgements in the absence of salient counterfactual information. By contrast, the experiencers (similar to Girotto et al.,'s, 2007, 'actors'), would have made their judgements in light of an increased availability of counterfactual information based upon actual experience. Subsequently, this distinction appears to have led participants in Experiments 5 and 6 (at least where outcomes were negative) to experience decreased satisfaction with extensive choice, as per the ECE literature, whilst conversely in Experiment 7 this lack of salient counterfactual information led to an apparent reversal of the ECE, in terms of a preference for active, extensive choice.

These findings contribute to the current choice literature by highlighting that a focus on the past, a reflection upon an actual experience, may be another potentially important factor contributing to the elicitation of the ECE. It would be interesting to explore whether any ECE would be found if participants were asked to read a hypothetical scenario detailing a choice made from either a limited or an extensive number of options, and measure how satisfied they believe the protagonist would feel following that choice. Following on from the results of the current experiments it would seem likely that no ECE, or perhaps even a reversal

of the ECE, would occur. This is because participants would be making judgements as readers or predictors, in the absence of readily available counterfactual information. Supporting this, the results from Experiment 1 demonstrated that when the capacity to engage in counterfactual thinking was reduced via load, the ECE was reversed. Future research may subsequently wish to directly explore the prevalence of the ECE using hypothetical scenarios, and actual experience, in order to determine the extent to which reflection upon past experience is a necessary determining factor. Following this it would then also be interesting for future research to explore whether the ECE might then be more likely to occur following hypothetical scenarios if the chooser is provided with negative (as opposed to positive, or no) feedback information about the results of their hypothetical choice, due to the fact that negative outcomes may still act as a trigger for counterfactual thought (see for example, Sanna & Turley, 1996, Tsiros & Mittal, 2000; Experiment 8 below).

#### *6.2.5 Experiment 8*

Finally, following on from the results of Experiments 4, 5 and 6, Experiment 8 was designed to directly investigate the role of choice outcome valence in determining the prevalence of the ECE. This experiment used two choice tasks, a drinks taste test and a chocolates taste test, in which choice level and outcome valence were manipulated. For the drinks task, where the manipulation of valence was found to be successful, results were found to be largely in line with predictions. Specifically, the ECE was only found to be significant where outcomes were negative, and once again this effect was found to be mediated by counterfactual thought. Where outcomes were positive the influence of choice level upon counterfactual thought and satisfaction were no

longer significant. Subsequently these results provide further additional support for the overarching hypothesis that counterfactual thought is an important driving force behind the ECE.

It would be interesting for future research to continue to explore the link between valence and the ECE, perhaps by conducting a replication of Experiment 8 but using at even more 'extreme ends' of the preference scale. This would be useful as the lack of an interaction term in Experiment 8 suggests that the 'positive' outcomes were still subject to the influences of choice level to some extent. As such, although the manipulation of valence worked as intended, and no evidence for any ECE was found following positive outcomes, it is possible that by using even more extreme 'positive' outcome we might then find evidence for an interaction between outcome valence and choice level, as I would predict the influence of valence upon counterfactual thought to be even more pronounced.

The finding that the manipulation of valence in the chocolates task did not work as intended also appears to be consistent with counterfactual theory, specifically with Gleicher et al.,'s (1990) argument that the salience of post-decisional counterfactual information is important in determining the level of affective response following choice. As the chocolates were defined purely on the basis of brand names, this may have meant counterfactual information was less salient and thus less influential in subsequent satisfaction judgements, in comparison to the drinks taste test in which the options were defined on the perhaps more easily imagined characteristic of flavour. As such this lends some potential explanation as to why no evidence for any ECE was found for the chocolates task. Once again, where the capacity for engaging in a detrimental

process of post-decisional counterfactual thought is reduced, in this instance by defining options by less easily imagined characteristics, then the impact of choice level upon satisfaction is also found to be reduced.

These results are also consistent with research by Hsee and Zhang (2004) who argue that satisfaction ratings vary depending on whether judgements are made in joint evaluation mode (i.e. by drawing comparisons with other options), or in single evaluation mode (in which no comparison can be made). For example in their experiment, Hsee and Zhang (2004) asked participants to predict how they would feel if they had written a poetry book and either a) no-one bought the book, b) 80 people bought the book, c) 160 people bought the book, or d) 240 people bought the book (Study 1). Participants were either presented with all four possible outcomes and were asked to rate how they would feel after each outcome (joint evaluation condition), or were simply given one outcome, and were asked to rate how they would feel after experiencing that outcome (separate evaluation condition). The authors found that participants in the joint evaluation condition frequently over-predicted the difference in satisfaction they would experience between the latter three conditions. In actual fact, participants in the separate evaluation conditions reported similar levels of satisfaction regardless of whether 80, 160 or 240 people bought the book.

This also relates back to the contrasting findings noted between the drinks and chocolates task in Experiment 8. Specifically, following the evaluability hypothesis proposed by Hsee (1996; 1998; 2000) and Hsee, Loewenstein, Blount and Bazerman (1999), it is possible that the relatively difficult-to-imagine defining characteristic of brand name used in the chocolates task meant decisions were effectively made in single evaluation mode, i.e. without comparison with other

options. As such this may explain why no differences in satisfaction were found according to choice level for this particular task. On the other hand, for the drinks task, the fact that the options were defined on easy-to-imagine attributes (e.g. colours, flavours) may have meant these decisions were akin to joint evaluation mode, potentially further exaggerating the differences in satisfaction according to choice level.

However, it may also be argued that Hsee and Zhang's (2004) findings can be explained, at least in part, by counterfactual theory, and the varying salience of counterfactual information following comparisons. Indeed, it is possible that a lack of readily available counterfactual information regarding other options may explain the relatively small differences found between options judged in single-evaluation-mode. On the other hand, the greater differences found between options in joint-evaluation-mode may simply reflect the greater amount of counterfactual information available to participants whilst making their satisfaction judgements. This account is consistent with the findings of Experiments 5 and 6 wherein satisfaction with the same negative outcome was found to improve if choice was removed altogether, as this reduced the participants' capacity to experience the detrimental counterfactual emotion of regret. As such it may be the case that the single-evaluation-mode of judgement merely represents a means of reducing or removing the capacity for participants to engage in a process of post-decisional counterfactual thought.

However at this stage this suggestion is speculative, and further research will be needed in order to investigate this possibility. This could be done by conducting a replication of Hsee and Zhang's (2004) experiment, but with the addition of a measure of counterfactual thought, or perhaps more suitably, a

measure of regret, as per Experiments 4, 5 and 6 (as the removal of choice in the single-evaluation-mode conditions would not allow for the direct comparison of counterfactual thought). By then conducting a mediation analysis following the analytical procedure used by Baron and Kenny (1986), and in Experiments 1, 5, 6 and 8 it would then be possible to determine whether participants judged the same options to be more different in the joint-evaluation-mode than in the single-evaluation-mode due to an increased likelihood of experiencing postdecisional regret following comparative choice.

Therefore to summarise so far, the experimental findings discussed in the current thesis provide evidence which is useful in furthering our theoretical understanding of the ECE. Building upon largely speculative accounts provided by previous researchers (see, for example, Anderson, 2003; Gingras, 2003; Schwartz, 2004), and upon previous research which has noted a link between increased choice and regret (Iyengar & Lepper, 2000; Schwartz et al., 2002; Roese & Summerville, 2005), the current research provides direct empirical evidence that counterfactual thinking plays an important role in driving the ECE. Indeed, across 7 experiments in a variety of domains I have found evidence that dissatisfaction is only experienced following extensive choice when counterfactual thoughts are made readily available.

In each case where evidence was found for an ECE, the effect was found to be mediated, or partially mediated, by an increase in the experience of counterfactual thought or emotion. Further, when the capacity to think counterfactually was reduced, for example following the addition of a secondary cognitive load task, over time, or following a positive choice outcome, then extensive choice was no longer found to be detrimental to chooser satisfaction.

Finally, in another experiment (Experiment 7) the lack of counterfactual information available to readers considering a hypothetical choice was found to lead to a reversal of the ECE, in terms of a preference for active, extensive choice (paralleling the results of Experiment 1 under high load). Thus, in all, not only does this research provide substantial support for and replication of the ECE itself, but by linking the choice and counterfactual literatures is also the first of its kind to provide direct empirical evidence for an explanatory driving force behind the effect.

### *6.3 The Link between Counterfactual Thought and Existing Theoretical Explanations for the Excess Choice Effect*

This section considers the link between counterfactual thought and other factors established within the choice literature which are also believed to contribute to the prevalence of the ECE. For example, Scheibehenne et al., (2009) suggested that a post-decisional justification process was key to eliciting the effect (Study 2c). In this experiment, participants were asked to read a series of descriptions of either a limited (5) or an extensive (30) number of different restaurants. Participants were then asked to select whether they wanted to receive money for their participation, or a voucher to dine at one of the restaurants. The authors only found evidence for an ECE when participants were asked to justify their decisions: participants were found to be more likely to opt for cash over a voucher when presented with extensive choice. The authors state this may illustrate that when more options are available they become harder to distinguish from one another, and thus harder to justify.

Supporting this contention, Iyengar and Kamenica (2010) found that when presented with extensive choice, participants would often display a preference for

the simplest option available. In this experiment, participants were presented with a choice between either a limited or an extensive number of gambles, which included one all-or-nothing gamble (the simple option), with the rest being relatively more complex (i.e. involving winning a variable amount of money depending on the outcome of a throw of the dice). The authors found that when presented with a limited number of options, there was no difference in the percentage of participants opting for complex over simple gambles. However, when presented with an extensive number of options, participants were found to be significantly more likely to opt for the simple gamble. This ECE subsequently appears to be in line with Scheibehenne et al.,'s (2009) suggestion that extensive choice makes decisions harder to distinguish and justify, thus leading to a preference for simple choice.

However, it may be the case that the findings of both experiments can be explained, at least in part, due to counterfactual theory. As previously discussed, it may be that the justification process identified by Scheibehenne et al., (2009) as being key to eliciting the ECE, acts as a trigger for counterfactual thought. Specifically, when extensive choice participants are encouraged to reflect back upon their decisions, this may lead to decreased satisfaction due to an increase in the number of counterfactual alternatives they have to consider. This explanation could be tested for by conducting a replication of Scheibehenne et al.,'s (2009) research but with the inclusion of a measure of counterfactual thought. From this it would then be possible to determine whether it was the justification process, or the increased level of counterfactual thought that this may encourage, which is key to eliciting the ECE.

Similarly, regarding the findings of Iyengar and Kamenica's (2010) experiment, it may be the case that, rather than extensive choice decisions being harder to justify, participants may display a preference for simple options when presented with extensive choice in order to shield themselves from engaging in a potentially harmful post-decisional process of counterfactual thought. Specifically, by presenting one simple option alongside an extensive number of complex options, the construction of the choice itself is altered: it is no longer a choice between an extensive number of equivalent options, but a rather simpler decision – 'Do I opt for the simple option, or invest a substantially greater amount of time and effort choosing between the other more complicated options?' If participants opt for the simple option by default in this manner then this is likely to shield them from a process of counterfactual thought which may otherwise be triggered from the consideration of an additional extensive number of options (see, Tykocinski & Pittman, 1981).

On the other hand, when presented with only a limited number of options, participants are likely to feel better able to fully process all of the information they are presented with. As such, this is likely to lead to a reduced consideration of unchosen options post-decision. Consequently it may be a desire to shield oneself from a process of counterfactual thought which leads to this apparent preference for simple options. This explanation could be tested for simply by conducting a replication of Iyengar and Kamenica's (2010) experiment, but with an additional measure of spontaneously occurring counterfactual thought (following the procedures used in the current thesis). If the above account is correct, then one would expect to find an overall reduction in counterfactual

thought following limited choice, and following the selection of a simple option when presented with an extensive number of options.

Finally, by highlighting the impact of initial choice level upon chooser expectations (Experiment 3) the current research also illustrates a potential interaction between counterfactual thinking and other existing theoretical explanations for the effect. For example, it appears that if expectations are initially lessened by extensive choice (as shown the reduced tendency to experience a placebo effect) then this may be the product of an interaction between a limited cognitive capacity (Simon, 1956; Botti & Iyengar, 2006), an increased sense of responsibility following extensive choice (Iyengar & Lepper, 2000), and the demonstrated post-decisional counterfactual thought process. The former two of these three factors may have led participants to feel less able and simultaneously more pressured to cope with the vast array of options on offer, potentially leading to reduced expectations about whether they were able to pick the outcome most suited to their needs. Thus, both of these processes may play an important role in triggering the increased level of counterfactual thought demonstrated in the current experiments. Indeed, it is possible that an all-encompassing theory of too much choice which might help to fully explain the divergence of findings within the choice literature involves the interaction between each of these processes. Future research could investigate this possibility by directly asking participants (presented with limited vs. extensive choice sets) a) how able they felt they were to cope with, or fully process, all of the options to presented to them at the initial time of choice, b) how responsible they felt for picking an optimal outcome, c) about their expectations about the outcome of

their choice prior to sampling it, and d) about the level of post-decisional counterfactual thought participants engaged in whilst rating satisfaction.

#### *6.4 Wider Theoretical Implications of the Current Research*

##### *6.4.1 Choice, Load and the Decision Making Context*

This section provides a discussion of the wider theoretical implications of the experimental findings of the current thesis, in light of the choice and counterfactual literatures, and wider related areas of current psychological research. Firstly, the finding in Experiment 1 that load moderates the ECE hints at the possibility that the ‘paradox of choice’ (Schwartz, 2000; 2004) itself may in part be due to the different settings in which consumers and participants in research tend to make decisions. Usually, participants in laboratory experiments make choices under relatively low load situations where they are able to concentrate on their choices and have mental time and space to consider the alternatives foregone. In many real-world contexts decision makers may be more likely to be under high load resulting in less consideration of alternatives and possibly greater satisfaction with greater choice (as per Experiment 1). The potential implications of this for the psychology of choice and consumer well-being are considered in Section 6.5. However I now consider a discussion of two studies conducted in field settings which would appear to challenge this account.

Firstly, Iyengar and Lepper (2000) (Study 1) examined the likelihood of participants choosing to purchase jams in a real world supermarket according to manipulations in choice level. The authors found that participants were significantly more likely to purchase a jam if presented with a limited vs. an extensive array of options. Secondly, Iyengar et al., (2006) assessed the impact of the number of jobs pursued upon chosen job satisfaction. Again the authors

found evidence for an ECE – participants who pursued fewer jobs from the outset experienced significantly greater satisfaction with their chosen position than participants who pursued a greater number of opportunities.

In both cases, these results appear to challenge my account that low load settings may be necessary to elicit the ECE. However, interestingly the supermarket used in Iyengar and Lepper's (2000) experiment was described as being 'upscale' (pp. 996), or upmarket. As such, this may have been a more relaxing, less crowded, essentially low-load setting than one might expect to find in a typical shopping environment. Further, the kinds of people who stopped to consider luxury jams (i.e. rather than making their usual purchase) may also have been qualitatively different from the average customer. In addition, although Iyengar et al.'s (2006) job satisfaction experiment was also conducted in the field, the authors note that participants completed the follow-up questionnaires via email. As such we cannot know the extent to which participants were under either a high or a low load whilst rating their satisfaction. However, it perhaps seems reasonable to presume that participants found time when they could sit down and concentrate (to some extent) in order to write their replies. Consequently it may be the case that these participants were also in a relatively low load environment whilst rating their satisfaction.

As such, it appears that it may not be simply that typically low-load laboratory experiments are more likely to generate an ECE, but rather that the ECE is context dependent, and prevalent under any low load environment. We might expect for example, not to find an ECE in typical everyday decision scenarios in which the consumer may be more likely to be under a high load – i.e. crowded, noisy environments in which they may be trying to focus on more than

one thing at a time (e.g. talking to a friend whilst choosing a sandwich for lunch). Future research could aim to systematically explore these possibilities both in the laboratory and in the field to examine the degree to which the ECE is observed under different choice environments. The outcomes of this research might be of particular interest to retailers keen to understand the optimal conditions under which to generate customer satisfaction (e.g. relaxing low load environments for shops with few options but noisier, busy environments for shops with many options). However this is a point to which I will return in Section 6.5.

#### *6.4.2 Choice and Expectations*

As previously suggested, the finding in Experiment 3 that participants were more likely to experience a placebo effect when initially presented with an optimal choice of 10 options indicates that expectations may play an important role in determining satisfaction levels at the initial time of choice. This is because research has shown that expectations are key to eliciting a placebo effect (Kirsch, 1985; 2005; Morris, 1999). Subsequently, as participants were found to be significantly more likely to exhibit a placebo effect following an optimal choice level it appears that at the initial time of choice, presenting participants with a choice of 10 options may have led to optimal expectations about the potential results of their decisions. It appears that if participants felt able to cope with the number of options they were presented with, then they were better able to choose an option which satisfied their preferences, potentially leading to optimised expectations about the possible consequences of that choice. On the other hand, when presented with extensive choice, participants may have picked an option without feeling they were fully able consider all of the available alternatives, triggering the detrimental post-decisional counterfactual thought

process. In doing so, participants' expectations about the potential benefits of their chosen treatment appear to have been reduced, potentially explaining why participants who chose from an extensive number of options did not experience a placebo effect following two weeks of using the treatment.

It would be interesting for future research to explore the role of choice level upon initial expectations in greater detail. This could be done by conducting a replication of Experiment 3, and asking participants about their expectations at the initial time of choice, and whether they felt expectations had subsequently been met at the end of the two week period. Following the results of Experiment 3 one might expect to find that an optimal choice level of 10 options leads to optimal expectations about the result of that choice, in comparison to those participants who were presented with either a very limited or an extensive number of options, and further, that participants who felt these expectations had been met at the end of the 2 week period would be most likely to experience a placebo effect, consistent with existing placebo research (e.g. Kirsch, 1985; 2005; Morris, 1999).

#### *6.4.3 Choice and Valence*

As previously discussed, Experiment 8 found evidence that the ECE was most prevalent following a negative task outcome, due to the associated impact of negative outcomes upon counterfactual generation. More indirect evidence for the moderating role of valence within the ECE stems from the findings of Experiments 5 and 6, wherein manipulations in choice type were only found to impact upon chooser satisfaction where outcomes were negative. In these instances participants were found to prefer no choice over any (extensive)

choice, and crucially, this effect was found to be mediated by the increased experience of regret following extensive choice.

These findings subsequently have important implications for the earlier experiments discussed in the current thesis, specifically with regard to the role that valence played within Experiments 1 and 3. In both cases evidence was found for an ECE, and yet neither experiment was explicitly designed in order to provide the chooser with a negative task outcome. So why could this be the case? With regard to Experiment 1 it may simply be that the creative task did provide the chooser with a more negative choice experience than was initially intended. Specifically, it may be that asking participants to undertake a creative drawing, or sculpting task under (time) pressure, was not a particularly pleasant challenge for the majority of participants, who, being psychology undergraduates as opposed to art students or artists, may have felt they lacked a certain degree of artistic flair. This could be tested for by conducting a replication of Experiment 1, but with an additional measure of perceived task valence or enjoyment. Following the presence of the ECE and high levels of counterfactual thought found in Experiment 1 (low load condition) I would infer that the majority of participants viewed these creative tasks as relatively negative or un-enjoyable experiences on the whole.

On the other hand, for Experiment 3 the role of valence is a little more unclear. The presence of the ECE at Time 1 appears to suggest that the task was perceived in a negative manner. However, unlike in Experiment 1 (or Experiments 4, 5, 6 and 8) at Time 1 participants did not sample their chosen outcome at the moment of choice. As such it may simply be that participants were less clear about the potential valence of their chosen option, meaning

valence may subsequently have played a less of a determining role in this experiment than in the other experiments. In other words, the current research has shown that negative task outcomes may form a key trigger for the counterfactual thought process, leading to an increased tendency to exhibit an ECE, and yet the ECE may be so pervasive that it also persists in circumstances where the valence of choice outcomes is less clear.

This may be attributable to the increased likelihood of decision makers forming expectations where decision outcomes are less certain (see, for example, Zeelenberg et al., 1998; 2000). Specifically, as discussed in Section 6.4.2 above, it may be that extensive choice participants experienced overly heightened expectations at the moment of choice. In turn this may have triggered the counterfactual thought process following extensive choice, if participants felt unable to verify whether their chosen option could match these high expectations. However, at this stage the suggestion that expectations may play more of an influential role in triggering the counterfactual thought process under valence-uncertain circumstances is largely speculative, and further, although the satisfaction data generated in Experiment 3 are supportive of this account, the counterfactual data are equivocal, due to the imprecise measure of counterfactual thought used in this experiment.

More research will therefore be needed in order to assess the impact of choice level upon expectations, counterfactual thought and subsequent satisfaction levels using valence-uncertain starting points. It would appear that the ECE will perhaps be prevalent under any circumstance except one in which the participant is provided with a directly positive choice outcome (following the findings of Experiments 4, 5, 6 and 8), due to the impact of positive outcomes

upon counterfactual generation. This remains an interesting avenue for future research to explore. The presence of this ECE following valence- uncertain, as well as negative choice outcomes may subsequently also help to explain some of the divergence noted in the previous choice literature. However this is a point to which I will return in Section 6.4.4 (below).

#### *6.4.4 Discussion of Findings in Relation to Scheibehenne et al.'s (2010) Meta-Analyses*

The findings of the current thesis are now reviewed in the context of the meta-analyses conducted by Scheibehenne et al., (2010), who reviewed 50 published and unpublished experimental studies into the ECE, in order to examine the prevalence of the effect across the choice literature as a whole. The authors found no evidence for the ECE overall, yet the large degree of variance in study outcomes lead the authors to conclude that a theoretical account of too-much-choice which could help to cover these divergent findings was needed. As previously discussed, it may be the case that the counterfactual account discussed in the current research can go some way towards explaining some of the inconsistencies noted in Scheibehenne et al.'s (2010) review. For example, as discussed in Section 6.4.3 above, Experiment 8 only found evidence for an ECE when participants were faced with a negative task outcome, whilst in Experiments 4 – 6, extensive choice was only found to be detrimental to satisfaction where task outcomes were negative.

Following this, it is possible that some of the studies considered in the meta-analyses which did not find evidence for an ECE may have involved task outcomes which were directly positive for the participant, such as chocolates, jelly beans, soda, restaurants and music (Berger et al., 2007; Kahn & Wansink, 2004;

Arunachalam et al., 2009; Scheibehenne et al., 2009). Conversely, several studies which did find an ECE may have involved more negative or stressful experiences, such as writing essays, or choosing jobs or pensions schemes (Iyengar & Lepper, 2000; Iyengar et al., 2004; Iyengar et al., 2006). In addition, following the results of Experiment 3, where evidence was found for an ECE in the absence of direct information regarding the valence of choice outcomes, it would appear that decisions using valence-uncertain (or at least, less directly positive) starting points may also elicit an ECE, in some instances. Supportive of this are the findings of Reutskaja and Hogarth (2009), Shar and Wolford (2007), and Greifeneder et al., (2010), Lee and Lee (2004) who each found evidence for an ECE using valence-uncertain stimuli (e.g. gift boxes, pens and CD's), in which satisfaction with choice was assessed (i.e. either stated or via product demand) without previously having sampled, or trialled their chosen item.

However as previously mentioned, more challenging for this account are studies which found an ECE using apparently positive stimuli (e.g. chocolates and jams; Iyengar & Lepper, 2000). Unfortunately it is impossible to know a priori the extent to which these different choice outcomes were perceived by participants as being positive, negative or even valence-uncertain experiences at the time of choice. As such, we cannot know for sure the true extent to which outcome valence may explain the divergence of findings in these previous experiments. More research will therefore be needed in which the ECE is directly assessed following manipulations of task outcome valence, in order to fully test this explanation.

Only one study (Botti & Iyengar, 2004), as far as I am aware, has previously attempted to examine the impact of valence manipulations upon

satisfaction according to varying choice levels. This experiment is subsequently both relevant to the ECE and yet perhaps surprisingly not considered in Scheibehenne et al.,'s (2010) meta-analyses. Botti and Iyengar (2004) found that when decision outcomes were positive, choice was preferred to no choice, and yet when decision outcomes were negative, no choice was preferred to any choice. Subsequently this research appears to be consistent with my counterfactual account of the ECE, and for the impact of valence in determining the prevalence of the effect. When outcomes were positive, choice was not detrimental to satisfaction. Following the results generated in the current thesis (Experiments 4, 6 and 8) we can perhaps presume this may be because positive outcomes do not lead the chooser to engage in a process of counterfactual thought. On the other hand when outcomes were negative, increased choice was found to be detrimental to satisfaction (Experiments 6 and 8). Subsequently Botti and Iyengar's (2004) research indirectly provides additional support for my theoretical account that valence is a key trigger for counterfactual thought, which in turn is key to eliciting the dissatisfaction often experienced following increased choice.

Other studies which are also not included in the meta-analyses conducted by Scheibehenne et al., (2010), and yet which are both relevant to the ECE, and which appear to be consistent with my counterfactual account regarding the role of valence as a potential determinant of the effect, are based within the field of medical decision making. For example, both Degner and Sloan (1992) and Ende et al., (1989) found that participants were more likely to prefer no choice over any choice in terms of deciding their own medical treatment following serious illness. It is likely that the options presented to participants would have been regarded as

being potentially negative experiences by the majority (e.g. between potentially painful treatment options, or those with undesirable side-effects), and once again in these instances people were found to prefer no choice. These studies could have usefully been considered in the meta-analyses conducted by Scheibehenne et al., (2010), as each is relevant to the ECE, and may help to further our understanding of the effect across wider variety of domains.

In addition, as previously discussed, the findings of the current research also identified some studies which were included in the meta-analyses as providing evidence against the ECE, and yet which may not necessarily reliably demonstrate this. For example, Kahn and Wansink's (2004) experiment revealed that choice could influence consumption levels, and Scheibehenne et al., (2010) considered this to be evidence for a reversal of the ECE. However it may be unwise assume that increased consumption levels equate to increased satisfaction. This point was demonstrated by Reibstein et al., (1975) who conducted a similar experiment, and found that whilst more choice did indeed lead to increased consumption, crucially this did *not* equate to increased satisfaction. Consequently this raises doubt over the use of Kahn and Wansink's (2004) data as evidence against the ECE.

In addition, the meta-analyses also considers evidence from Scheibehenne et al.,'s (2009) charity study as evidence against the ECE. This experiment asked participants to choose whether to donate money to charity or keep it for themselves, and results revealed found no differences in likelihood of choosing to donate according to manipulations in choice level (Study 2a). However, in this experiment participants were either presented with a choice of 2 or 30 options, and, as the results of Experiment 3 demonstrate (see also, Shar

&Wolford, 2007; Reutskaja & Hogarth, 2009), in reality both extensive and very limited choice may be equally detrimental to chooser satisfaction levels. As such it may also be unwise to use an experiment which includes only these two extreme 'ends of the scale' as evidence against the ECE. A more intermediate level of choice must also be included in order to truly establish whether the ECE is prevalent or not.

Finally, the meta-analyses also considers evidence from Haynes (2009), Kleinschmidt (2008), and Scheibehenne (2008; jam study), as either for or against the ECE, and yet each of these experiments involved a comparison between a very limited choice set (3 options in each case), with an intermediate level of choice (either 10 or 12 options). As Experiment 3 in the current thesis, and results of previous research (e.g. Shar & Wolford, 2007; Reutskaja & Hogarth, 2009) demonstrate, intermediate choice is not comparable to extensive choice, and in fact may be most likely to lead participants to experience increased satisfaction with decision outcome. Consequently it is not possible to ascertain evidence either for or against the ECE in any of the above mentioned experiments, as no measure of true extensive choice is used for comparison with the very limited and intermediate choice sets. Nevertheless, each of these is regarded as relevant in the meta-analyses provided by Scheibehenne et al., (2010).

Therefore to summarise so far, there are numerous studies which perhaps could have been usefully included in the meta-analysis, and perhaps several others which should have been excluded as they do not necessarily relate to satisfaction levels according to relevant manipulations in choice. Notably some of these overlooked or excluded studies appear to be largely consistent with my

counterfactual account relating to the role of outcome valence as a potential determinant of the ECE. Unfortunately it is not possible to re-assess the studies included in the meta-analyses in terms of the valence of their task outcomes, as it is impossible to know for certain a priori the extent to which the different task outcomes were perceived as positive or negative at the time of choice. However, if a second meta-analysis were to be conducted, based upon replications of key experiments but with the inclusion of a standardised measure of task outcome valence, and which only included experiments which were directly relevant to appropriate manipulations in choice level, then it is possible that: a) we would not only get better understanding of the role that valence plays in determining the prevalence of the ECE, but b) that we might also get a clearer perspective of the pervasiveness of the ECE within the choice literature as a whole. Future research may wish to consider investigating this possibility.

#### *6.4.5 Choice, Counterfactual Thinking and Psychological Well-Being*

In Chapter 1 I reviewed evidence provided by the Centre for Economic Performance (2006) concerning the fact that life satisfaction has stayed constant in many western countries despite economic growth and expansions in choice. Further, in Chapters 1 and 3 I also reviewed the theoretical suggestions of Schwartz (2004) who argued that extensive choice may in fact lead to long term detriments to well-being, via its impact upon chooser expectations. Specifically, Schwartz (2004) argued that if faced with too many options one may experience heightened expectations about the potential results of that decision, and thus may be more likely to experience negative counterfactual thought and emotion when the results of that choice do not match up to these expectations, leading people to blame themselves for their perceived 'failures' (see Section 3.2).

As discussed in Section 6.4.2 above, empirical evidence provided by Experiment 3 appears to provide tentative support for this claim, demonstrating that participants were more likely to exhibit a placebo effect following 2 weeks of treatment, if initially presented with an optimal choice of 12 options, rather than an extensive choice of 38 options (or indeed, a very limited choice of 2 options). Given that previous research has shown that expectations are key to eliciting a placebo effect (see, for example, Kirsch, 1985; 2005; Morris, 1999), findings from the current research appear to be consistent with the suggestion that extensive choice may indeed impact upon long term well-being via impact upon expectations and the subsequent experience of counterfactual thought and emotion.

Indeed, this link between counterfactual theory and physiological and psychological well-being has previously been recognised within clinical psychology, where the link between rumination and major depressive disorder is well established. Conway, Csank, Holm and Blake (2000) define rumination as “repetitive thinking concerning ones’ present distress, and the circumstances surrounding the sadness” (pp. 404). Further, Papageorgiou and Wells (2004) state that ruminative thoughts relate to undoing the antecedents or nature of the negative mood. According to Nolen-Hoeksema, Wisco, and Lyubomirsky (2008; see also Nolen-Hoeksema, 1991; Nolen-Hoeksema & Morrow, 1993; Alloy, Abramson, Hogan, Whitehouse, Rose, & Robinson, 2000), higher ruminative tendencies lead to reduced motivation and initiative, and increasingly severe and numerous bouts of depression in those susceptible to major depressive disorder. Indeed this link has been demonstrated in a substantial amount of psychological research. For example, using data from the Temple-Wisconsin Cognitive

Vulnerability to Depression Project, Alloy and Abramson (1999), found that the interaction between negative cognitive styles and ruminative thoughts predicted the retrospective lifetime rate of major depressive episodes in those susceptible to the disorder. Similarly, Robinson and Alloy (2003) found that the same interaction predicted the onset and duration of major depressive episodes (see also, Davis & Nolen-Hoeksema, 2000; Joormann, 2006; 2010; Spasojevic & Alloy, 2001). Indeed, it is widely accepted that ruminative thoughts are not only a symptom of depression, but are also associated with vulnerability to the onset and recurrence of depressive episodes and with the maintenance of negative affect (see Nolen-Hoeksema et al., 2008).

Interestingly in this respect it might be argued that 'rumination' is akin to counterfactual thinking, and that those with depressive tendencies may in fact be more prone to naturally generate upward counterfactual thoughts in response to negative life events. This potential link between rumination and counterfactual thought stems from the fact that both thought processes appear to share a number of key defining structural attributes. For example, both processes involve a reflection upon past experience, and focus upon 'undoing' the past, to a certain extent. Secondly, both rumination and counterfactual thinking have been shown to draw upon the resources of working memory. In Joormann, Levens, and Gotlib's (2011) experiment, for example, participants diagnosed with depressive disorder were presented with a list of either emotional or neutral words, which they were asked to recite in reverse order. The authors found that rumination predicted the length of time required to sort the words only when participants were presented with negative words, not positive or neutral words. The authors conclude that this demonstrates that rumination and depression are associated

with deficits in cognitive control, meaning that individuals find it particularly difficult to remove negative material from working memory. It is suggested that this cognitive inflexibility with regard to processing negative information may explain why individuals prone to depressive disorder will often become effectively 'stuck' in a negative particular mindset (see also, Davis & Nolen-Hoeksema, 2000; Joormann & Gotlib, 2008). Similarly, there is consistent evidence that counterfactual thinking can be an effortful process, which also draws upon the resources of working memory to some extent. This link has been established in various aspects of developmental (Müller et al., 2007; Beck et al., 2009) and clinical (Gomez et al., 2005; McNamara et al., 2003) research, and was demonstrated in the current thesis by the finding that the systematic generation of counterfactuals could to some extent be inhibited using a secondary cognitive load task (see also, Ward & Mann, 2000).

Thirdly, rumination and counterfactual thinking are also similar in the respect that both processes are typically associated with the experience of negative affect (see for example Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008; Kahneman & Miller, 1986; Niedenthal et al., 1994; Roese, 1997; Roese & Olson, 1995). Indeed in some instances rumination has even been defined by an associated experience of negative counterfactual emotion. Tull (2009), for example, states that rumination is a preoccupation with thoughts about past occurrences which may result in feelings of anxiety, sadness, regret, shame, or guilt. The similarities between the two thought processes certainly appear striking in this respect.

The final similarity between the two processes stems from the suggestion that rumination is instrumental to the attainment of higher-order goals (Martin

&Tesser, 1989; 1996). This is akin to the definition of counterfactual thinking as a source of motivation for guiding and thus improving future behaviour (see Roese & Olson, 1995; Zeelenberg, 1999). However, Martin and Tesser (1989; 1996) note that rumination is not always beneficial in this respect, and does not always lead individuals to progress towards their desired goals, even though that may be its primary purpose or function. This is because, contrary to the counterfactual thought process, ruminative thinking is associated with the onset of a depressive episode, and as such once the individual becomes effectively 'stuck' in a typically negative mindset they may find it difficult to gain the motivation to act upon their ruminative thoughts and thus improve their behaviour. Nevertheless, it appears that a similar underlying process may be evoked in both instances, at least at the outset, even if the way in which the individual might then choose to cope with this information may be different.

In all, these striking similarities between rumination and counterfactual thought subsequently appear to lend support to the suggestion that one factor behind modern depression rates may be 'too much choice', and the fact that this may lead to overly heightened expectations, and thus encourage individuals to ruminate upon options foregone (see also Schwartz et al., 2000; 2004). Clearly however, further research will be needed in order to a) determine the extent to which counterfactual thought really is akin to rumination, and following this (and the findings of Experiment 3), to b) further investigate any potential link between extensive choice, expectations, and counterfactual thought with long term chooser health and psychological well-being. This remains an interesting avenue to future research to explore.

## *6.5 Applied Implications of the Current Research*

### *6.5.1 Retailers and Consumer Well-Being*

This section considers the applied implications of the findings of the current research, with particular regard to retailers, consumer well-being, and the construction of public policy. Firstly, as mentioned in Chapter 2, the finding that load moderates the ECE (Experiment 1) has potentially important implications both for retailers and general consumer well-being. For instance, shop owners who own upmarket, boutique-style shops are likely to be presenting their customers with a relatively relaxed, low-load environment. In this case they may be wise to restrict the variety of options on sale to a limited amount, as an extensive number of options is likely to induce a process of counterfactual thought, and lead to reduced satisfaction, and potentially unhappy customers. On the other hand, in busier, noisier shopping environments it would appear that choice level may have less of an impact upon chooser satisfaction, as the capacity to think about counterfactual alternatives is likely to be reduced. As such in these environments retailers may wish to consider presenting a wider variety of options, as choosers who are unable to think counterfactually may actually be more satisfied with increased choice (as per Experiment 1). Notably, however, in the current experiments participants were placed under load at the moment of reflection, not the moment of choice. As such it may be the case that load level at the moment of choice does not have the same impact as load at the moment of reflection. Consequently further research will be needed in which participants are placed under load at different stages of the decision making process in order to ascertain whether this is the case, and as such establish the validity of these potential implications for retailers.

In addition, we of course have to consider the fact that a large proportion of consumer decisions made in retail environments will involve essentially rehearsed choices, made between options which are already familiar to the consumer. Indeed, it is likely that the consumer will already have particular favourite brands and products, and so will simply aim to 'gather' these items, rather than making a carefully considered choice between the other available alternatives. For this reason, supermarkets often change the layout of their stores, in order to encourage consumers to look at products they may not otherwise consider buying (Cialdini, 2007). However, interestingly, it may be the case that switching the store layout is an additional means of placing the consumer under a form of high cognitive load. Specifically, rather than making simple rehearsed choices around a familiar layout, the consumer is forced to consider new brands and products, at the same time as recalculating the locations of items they originally came to purchase. As such, this form of 'load' may also help to improve satisfaction, by inhibiting the extent to which the customer is able to think counterfactually post-decision. This is consistent with the suggestion of Dijksterhuis and colleagues (Dijksterhuis & van Olden, 2006; Dijksterhuis, Bos, Nordgren and van Baaren, 2006), that satisfaction with complex decisions can be improved if decisions are made in the absence of deliberative attention. Once again this tactic is likely to be most beneficial in large stores containing extensive selections of options as this is where counterfactual thought levels are demonstrated to be highest, however further research will be needed in order to establish whether this is the case.

Following on from this, consumers may also wish to consider the role of load as a potential means of ensuring their own satisfaction and well-being. For

example, if one is facing an important decision from an extensive selection of options (particularly with potentially negative consequences) then it might actually be beneficial to make the choice, or at least to reflect upon the choice post-decision, under a high load in order to shield oneself from engaging in a detrimental process of post-decisional counterfactual thought. This potential for load to improve general consumer satisfaction within field settings, perhaps pertaining to real and consequential decisions is something future research may wish to explore.

### 6.5.2 *The Construction of Public Policy*

In addition, the finding that individuals may be happiest with no choice when outcomes are likely to be perceived as negative (Experiments 5 & 6) also has potentially important implications with regard to the construction of public policy. This is perhaps particularly relevant to the highly consequential fields of medical and financial decision making in which consumers are likely to be faced with relatively complex decisions between selections of options each with potentially viscerally negative outcomes. Indeed, it appears that the current data perhaps controversially present a case for a paternalistic approach to choice architecture in these instances (c.f. Sunstein & Thaler, 2003). This notion finds support from Botti and Iyengar (2004) who found that when outcomes were negative, no choice was preferable to any choice. Research into both medical (e.g. Degner & Sloan, 1992; Ende et al., 1989) and financial (Benartzi & Thaler, 2002; Iyengar et al., 2004) decision making also provides support for this claim.

However, as previously discussed, according to Botti and Iyengar (2006), the paradigm that has dominated the focus of policy makers within modern societies over the last 20 years is that of *increasing* choice and autonomy. For

example, within the field of financial decision making the number of employer-provided retirement plans in the USA has more than doubled in the last decade, from under 100,000 in the 1990's, to over 400,000 by 2002 (Mottola & Utkus, 2003). Whilst within the field of medical decision making there has been a dramatic shift away from the previous paternalistic approach which granted physicians the right to decide what was best for their patients. As Schwartz (2004) puts it, responsibility for medical care has "landed on the shoulders of the individual with a resounding thud" (pp. 30). People are now expected to play much more of an active role in deciding their own medical care, and while this may sound appealing in theory – explaining why people predicted they would prefer this in a hypothetical situation (Degner & Sloan, 1992; Ende et al., 1989), in reality people appear to be happiest with limited choice – if the responsibility for these decisions is handed back to an expert.

Supporting this contention, Strull, Lo and Charles (1984) conducted a survey of patient and physician preferences regarding responsibility for treatment decisions, and found that 47% of patients preferred that the physician made their therapeutic decision, 19% wished they could share the decision with the doctor, and only 3% reported that they would prefer to make the decision for themselves. Whilst the physicians consistently overestimated the degree of responsibility they believed the patient would prefer – believing 78% would want to share the decision making, and that only 22% would prefer the physician to make the decision for them.

Indeed, it appears by increasing choice policy makers are perhaps mimicking participants' beliefs that this active role in decision making will make them happy. However as the current research (Experiment 7) and previous

studies (e.g. Gilbert et al., 1998; Gilbert & Ebert, 2002; Loewenstein and Frederick, 1997) have shown, people are subject to affective forecasting bias – and are not especially good at predicting how future events will make them feel. As such it may in fact be more beneficial to the individual to consider the outcomes of psychological research into the effects of choice on well-being over personal stated preferences when considering the construction of choice architecture within public policy.

Further, by demonstrating the role of thoughts about unchosen options in driving the dissatisfaction associated with choice, the current research appears to provide empirical support for Botti and Iyengar's (2006) claim that people may "prefer eschewing decisions {related to health care} to avoid the negative emotions associated with feeling responsible for their own misery" (pp. 33) (see also, Beattie, Baron, Hershey, & Spranca, 1994; Botti & McGill 2006; Luce 1998). Supportive of this is the following testimony of Gawande (2002, pp. 221), reflecting upon his active role in deciding the best treatment method for his suffering premature daughter: "I wanted the doctors to decide—doctors I had never met before. The uncertainties were savage, and I could not bear the possibility of making the wrong call. Even if I made what I was sure was the right choice for her, I could not live with the guilt if something went wrong." Similarly, Botti, Orfali and Iyengar (2009) found that parents who made an active decision to discontinue their suffering premature infants' life support experienced a greater level of negative post-decisional counterfactual thought and emotion in comparison to parents in a similar position who had the same decision made for them by a physician.

Consistent with these accounts, in Experiments 5 and 6 it was shown that the same negative outcome has the potential to be experienced to some extent more positively if the individuals' capacity to think counterfactually is reduced via the removal of choice. Although the negative choice outcomes used in Experiments 5 and 6 were clearly less extreme than the choice scenarios described by Gawande (2002) and Botti et al., (2009), in both experiments it was nevertheless demonstrated that an increased level of regret mediated the impact of choice level upon post-decisional satisfaction following a negative outcome. As such, this would appear to suggest that the same underlying processes may be evoked following negative outcomes in the laboratory as appear to have been both evoked and reported in the field studies discussed above. In all instances, when choice is removed (potentially via deferral to an expert) then individuals may experience a negative event less negatively, and this may be due to the fact individuals are to some extent shielded from engaging in a typically detrimental process of counterfactual thought.

However, as previously discussed, it is also important to note that the findings of the current experiments, involving chocolate choices, may not necessarily generalise to more consequential decision scenarios, such as those described in the medical decision making studies above. This is because, in scenarios with important real-life consequences, the individual may choose to defer choice due to a desire to rely on the expertise of a physician. One would not predict this to have an effect in less consequential decision scenarios such as those presented in the current experiments. However the contrast between the predictors and experiencers in Degner and Sloan's (1992) experiment would suggest that this preference for deferring choice to an expert may not be due to a

reliance on expertise alone – as otherwise one would expect predictors to also demonstrate a preference for this, when presented with a hypothetical scenario. Yet, as Degner and Sloan (1992) demonstrate, predictors forecasted that they would want to choose their treatment method themselves, were they ever in this situation. As such it would appear that may be another process at work in these important decision scenarios – and following Botti and Iyengar’s (2006) claim, and the findings of the current experiments using negative choice outcomes, it is possible that this may involve the different level of counterfactual thought that predictors and experiencers may be engaged in. However, at this stage it is not possible to determine whether or not counterfactual thought may underpin this preference for choice deferral in important, as well as seemingly trivial decision scenarios. More research will therefore be needed using real-life decision scenarios with consequential outcomes, in order to establish whether this is the case.

If the findings of the current thesis are found to generalise to more important real-life decision scenarios, then this would have important implications with regard to the construction of public policy. Specifically, it would appear that if we can help to improve satisfaction by removing choice, then perhaps this may be a viable strategy for promoting consumer well-being? In reality however, this may be simply unfeasible, as removing choice altogether could be taken as an attack on personal freedom (Botti & Iyengar, 2006). Further, removing choice would mean policy makers would need to be able to ensure the chooser was always offered an optimal outcome, and yet this will vary greatly according to individual needs, tastes, and priorities. Some people would benefit from the removal of choice, and yet others could potentially suffer if the option wasn’t

suited to their needs. As such, it would appear policy makers keen to promote personal well-being should perhaps be encouraged to consider alternative means of reducing the post-decisional counterfactual thought process during the construction of public policy.

As the current research shows, a limited selection of options also reduces the level of counterfactual thought individuals engage in, in comparison to a more extensive number of options. As such it would appear that if policy makers wish to truly promote well-being amongst consumers, then limiting choice may be the answer. Research from the field of financial decision making provides further support for this idea. For example, as reviewed in Chapter 1, in Iyengar et al.,'s (2004) experiment it was found that extensive choice could jeopardise an individuals' long term financial health and well-being, by leading to a direct reduction in the likelihood that they would opt to invest in their own retirement. Once again this appears to reflect a tendency to want to shield oneself from experiencing the potentially detrimental counterfactual thought and emotion otherwise associated with an extensive number of options (Bar-Hillel & Neter, 1996; Simonson, 1992; Ritov & Baron, 1990; Schwartz, 2004; Tykocinski & Pittman, 1981).

Consequently, it appears that limiting choice may be the most appropriate and beneficial strategy for ensuring individual satisfaction and well-being. Policy makers may also wish to consider promoting an added option of 'deferring choice' to an authority figure, if the individual is satisfied with the limited selection of options available, and wishes instead to defer responsibility for that choice. Further, in cases where the choice outcome likely to be perceived as being relatively positive then it would still appear to be the case that extensive choice is

of no further benefit to the chooser beyond that of no choice, or a more limited selection of options (Experiments 6 & 8 respectively). As such, it would appear that the promotion of limited choice policies with the option of deferring choice would also be of no detriment to chooser well-being where outcomes are positive.

To summarise so far it would therefore appear that policy makers would perhaps be wise to consider counterfactual theory when considering the construction of choice architectures, particularly within the highly consequential fields of medical and financial decision making, as psychological (and potentially physiological) well-being may be improved if choice is restricted due to the impact of this upon post-decisional counterfactual thought levels. However, further research will be needed in order to a) identify real-life decision contexts likely to be associated with relatively 'negative' experiences, b) determine whether the findings of the current thesis generalise to these situations, and thus any potential benefits to well-being of limiting choice (with the added option of deferral) in these instances, and c) investigate any differences between limited (i.e. 4 or 6 options) and more optimal (i.e. 10 or 12 options) choice sets, and thus determine the most 'optimal' number of options that consumers should be presented with in order to maximize satisfaction across a range of different choice contexts.

### *6.6 Further Directions for Future Research*

The current research highlights that counterfactual thinking appears to play an important role in driving the dissatisfaction often associated with extensive choice. Indeed, across 7 experiments I have systematically manipulated the prevalence of the ECE, based upon key findings within the counterfactual literature (e.g. Kahneman & Tversky, 1982a; Kahneman & Miller, 1986; Gavanski & Wells, 1989; Gilovich & Medvec, 1995; Roese & Olson, 1995;

Byrne, 2005). Specifically, it has been demonstrated that extensive choice is only detrimental when participants are able to think counterfactually post-choice, and when the capacity for this is reduced, either using cognitive load, over time, or when participants were given a positive choice outcome (such as a pleasant tasting chocolate or drink to sample), then there is no evidence for any detrimental impact of extensive choice upon chooser satisfaction levels. In addition, the current research has also identified additional factors which appear to be influential in determining the level of counterfactual thought and thus satisfaction following extensive choice. Specifically, in Experiment 7 participants were found to exhibit a preference for active, extensive choice, when presented with a hypothetical scenario. It has been suggested that this may be attributable to the lack of counterfactual information readily available to participants as 'readers', leading to highly inaccurate (given the findings of Experiments 5 and 6) predictions of affective responses to active, extensive choice. Whilst in Experiment 8, no evidence for any ECE was found in a chocolate tasting task. One potential explanation for this stems from the type of information used to define the different options in this task (i.e. brand names) being less salient or easy to imagine than in a comparative task in which options were instead defined by flavour, thus leading to an overall reduction in counterfactual thought and subsequently reduced impact of (extensive) choice upon satisfaction.

It would be interesting for future research to continue to explore the boundaries of the relationship between choice and counterfactual thought, using the other 'fault lines' of reality identified in previous counterfactual literature. For example, as reviewed in Chapter 1, research has shown that people may also be more likely to generate counterfactuals following exceptional vs. routine events

(Kahneman & Miller, 1986; Gavanski & Wells, 1989; Kahneman & Tversky, 1982a; Lundberg & Frost, 1992), and following controllable vs. uncontrollable antecedents (Giroto et al., 1991; McCloy & Byrne, 2000; Markman et al., 1995). It would be interesting to apply these aspects of the counterfactual literature directly to the ECE in order to further explore the extent to which the prevalence of the effect may be determined by the level of counterfactual thought participants are engaged in. One aspect of this might involve the examination of satisfaction according to manipulations in choice level following exceptional versus routine choices. For example, choosing a flat to live in, which might be viewed as a relatively uncommon, or exceptional choice, versus choosing a sweet to eat, which may be viewed as comparatively more common or usual. One might predict that the ECE would be more prevalent following the exceptional choice, as this may be more likely to act as a trigger for counterfactual thought. However, notably in this situation one must also consider the fact that most 'exceptional' decisions would be made on the basis of hypothetical scenarios, in which participants are presented with a choice set consisting of descriptions of different flat, or house options, for example. This is because it would be difficult to assess the impact of choice level upon 'real life' exceptional choices such as these, as the choice set could not easily be standardised, and in each instance may contain outstandingly 'good' or 'bad' options, which may alter the choice process, and thus the number of options actually considered. As such it would appear that the best way to test for the impact of choice upon satisfaction following exceptional versus routine choices may be to ask both groups of participants to consider hypothetical choices, i.e. a hypothetical choice between flats to rent, or a hypothetical choice between sweets to sample. In both instances, following the

results of Experiment 7, and previous counterfactual research (see, for example, Girotto et al., 2007) one would expect an overall reduction in the level of counterfactual thought participants are engaged in. However, if participants in both instances are provided with negative feedback information regarding the outcome of their choices, then this may act as a trigger for counterfactual thought (see Section 6.2.4), allowing researchers to assess the extent to which the prevalence of the ECE appears to be affected by exceptional versus routine choices. Following on from the counterfactual literature (Kahneman & Miller, 1986; Gavanski & Wells, 1989; Kahneman & Tversky, 1982a; Lundberg & Frost, 1992) one might predict to find that the ECE would be most prevalent following exceptional versus routine choices, due to the predicted impact of exceptional circumstances upon counterfactual thought.

Secondly, the finding that counterfactual thoughts may be cued more readily following uncontrollable versus controllable antecedents (Girotto et al., 1991; McCloy & Byrne, 2000; Markman et al., 1995) may also be applied directly to the ECE. This could be done either using real experience, or using hypothetical scenarios. For instance, following the procedure used in Experiment 1 of the current thesis, participants could be asked to either make a choice of drawing implement (controllable condition) for use in a creative task (from a limited versus extensive selection of implements), or could be shown the selection of implements, and informed that one had already been selected for them to use by the previous participant (uncontrollable condition). Participants should then complete the creative drawing task, followed by measures of implement satisfaction and counterfactual thinking (as per Experiment's 1 and 2). One might predict that participants would be more likely to experience

dissatisfaction with an option selected from an extensive choice set if they chose the option for themselves, due to the predicted impact of controllable circumstances upon counterfactual generation.

Alternatively this could also be assessed using hypothetical scenarios, in which participants are presented with a (limited versus extensive) number of options detailing possible ways to spend a free day with a friend, such as going to the cinema, going shopping, staying in and watching a movie. Participants should either be asked to choose one of these options for themselves (controllable condition), or be informed that their friend made the decision for them (uncontrollable condition), and should then be provided with feedback that the option they chose turned out to be extremely boring and un-enjoyable. Participants should then be asked to rate how happy they were with the way they spent their day, and to list any thoughts they may have regarding the days' events, in order to generate a measure of spontaneously occurring counterfactual thought. As before, based upon the findings of the current thesis which has demonstrated the underlying casual role of counterfactual thought in driving the ECE, one would predict to find that the ECE may be more prevalent following controllable circumstances, due to the predicted impact of controllable versus uncontrollable antecedents upon the spontaneous generation of counterfactual alternatives.

Notably the latter of these experimental designs is similar to that used by Sagi and Friedland (2007) with two main methodological deviations: 1) using extensive versus limited number of options, as opposed to 2 versus 3 options, and 2) the inclusion of a measure of counterfactual thought. As previously discussed, Sagi and Friedland (2007) claimed it was unlikely that counterfactual

thought played a role in the ECE, due to the fact that the presence of additional inferior options also led participants to experience decreased satisfaction with their choice outcome. The current research has provided substantial empirical evidence to counter this claim, demonstrating that counterfactual thinking does play an important role in driving the ECE, and further, when this process can be inhibited, then the impact of extensive choice upon decision satisfaction is also found to be reduced. This proposed controllable versus uncontrollable experiment using a similar hypothetical scenario would provide further means of testing Sagi and Friedlands' (2007) claim, by providing a direct assessment of the role of counterfactual thought in driving the ECE within the specific choice context used in their original experiment, whilst simultaneously allowing us to assess the impact of controllable versus uncontrollable antecedents upon the prevalence of the effect.

### *6.7 Summary and Conclusions*

Therefore in conclusion, the current research is the first of its kind to provide direct empirical evidence for an explanatory driving force behind the ECE. In doing so, the current research hints at the possibility that the 'paradox of choice' (Schwartz, 2000, 2004) may not actually be that paradoxical after all. It has been demonstrated that the prevalence of the effect can be largely determined by the extent to which an individual is able to engage in a process of post-decisional counterfactual thought. As such, when considering a hypothetical scenario or predicting how one will feel following choice, it has been demonstrated that individuals are likely to show a preference for active, extensive choice. Lay beliefs that increased choice equates to increased happiness subsequently appear to persist. Crucially, in line with counterfactual theory this

appears to be because predictors make their choices without the availability of counterfactual information about unchosen options. Thus, the application of counterfactual theory would appear to render an individuals' initial attraction to more choice understandable, not paradoxical.

Further, our post-decisional affective response to choice also appears to be a direct consequence of counterfactual thinking. Specifically, as the current research demonstrates, individuals only appear to experience decreased satisfaction following extensive choice when counterfactual thoughts are made readily available. When the capacity to think about counterfactual alternatives is reduced for example via a high cognitive load, over time, following a positive outcome, or when information required to draw comparisons between options is made difficult to imagine, then no evidence is found for any detrimental impact of extensive choice upon (psychological) satisfaction levels.

Consequently, by gaining an insight into the underlying processes at work behind the ECE we can begin to deepen our understanding of the effect, and in doing so realise that our response to choice is perhaps not so paradoxical, but rather a rational, in the sense that the counterfactual imagination of possibilities is organized along the same principles as rational thought (Byrne, 2005), and in this respect largely predictable, response to the choice environment we are presented with. The implications of these findings for the psychology of choice, consumer well-being, retailers and for the construction of public policy have been discussed. Finally, areas for future research required in order to continue to further our theoretical understanding of a) the ECE, and b) the role that counterfactual thinking plays in determining individual satisfaction and well-being across a variety of different choice contexts have been identified.



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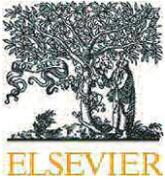
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## Spoilt for choice: The role of counterfactual thinking in the excess choice and reversibility paradoxes

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### ABSTRACT

Contrary to popular belief many choice options and the ability to reverse one's initial choice are sometimes associated with *decreased* chooser satisfaction. Two studies investigated the role of counterfactual thinking in explaining these paradoxes. Participants chose drawing implements from either a limited (6) or extensive (24) choice set (Study 1), or an expected reversible/non-reversible selection (Study 2). Following a drawing task, satisfaction with their chosen implement was rated under either high or low cognitive load to manipulate the availability of counterfactual alternatives. In Study 1 satisfaction was higher with limited vs. extensive choice under low load. The number of counterfactuals generated mediated this effect. Under high load the pattern was reversed. Participants in Study 2 generated more counterfactuals when reversibility was expected under low but not high load and this partially mediated the impact of expected reversibility on revealed satisfaction. Implications for theoretical understanding of these paradoxes are discussed.

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### Introduction

The notion that the provision of choice is advantageous for individuals and society is widely accepted (Schwartz, 2000, 2004). According to many psychologists, freedom and autonomy are essential to well-being, and choice is critical to freedom and autonomy (Ryan & Deci, 2001). Modern societies provide high levels of choice across a range of life domains which previously had limited choice including consumer goods (Schwartz, 2004), education and employment (Iyengar, Wells, & Schwartz, 2006), health care (Propper, Wilson, & Burgess, 2005), pensions (Thaler & Benartzi, 2004) and religion (Wolfe, 2001). Nevertheless, such unprecedented levels of choice are not necessarily associated with higher well-being. Life satisfaction, for instance, has stayed constant in many western countries despite economic growth and expansions in choice (Layard, 2005).

Psychological research is beginning to address this apparent paradox. One avenue involves the psychological effects of few vs. many choice options on satisfaction with the chosen alternative known as the 'excess choice effect' (ECE) (Arunachalam, Henneberry, Lusk, & Norwood, 2009; Iyengar & Lepper, 2000). Another involves the 'paradox of reversibility' where although many people would like the opportunity to undo earlier choices actually having this ability seems to undermine satisfaction with the initial choice (Gilbert & Ebert, 2002). Existing explanations include suggestions that excess choice may lead to an increased sense of responsibility (Iyengar & Lepper,

2000) and/or may force decision makers to make difficult trade-offs and experience increased regret (Schwartz, 2004). Meanwhile, reversibility may inhibit the psychological processes which would normally aid the manufacture of satisfaction (Gilbert & Ebert, 2002). However as empirical evidence in this area is limited, the precise nature of the processes involved remains unclear.

The present research explores the role of counterfactual thinking as a potential explanation for the increased regret associated with greater choice and opportunities for reversing decisions. We will begin by discussing the excess choice and reversibility effects in detail, before moving on to provide a more detailed rationale for the role that counterfactual thinking may play in supporting these paradoxes.

#### The "paradox of choice"

Economic theory suggests that increasing choice should, all else being equal, increase satisfaction with the chosen option because there is a greater chance of satisfying individual preferences (Dolan & White, 2007). However this is bounded and there appears to be an optimal threshold, at least for some domains, beyond which satisfaction with chosen options decreases as the option set increases (Reutskaja & Hogarth, 2009; Shar & Wolford, 2007). Iyengar and Lepper (2000), for instance, found that participants were more likely to purchase gourmet jams or chocolates or to undertake optional class essay assignments when offered a limited (6) rather than an extensive (24) array of options. Moreover, participants reported greater subsequent satisfaction with their selections or wrote better essays when their original set of options had been limited.

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A similar finding has been reported for more important choices. [Iyengar et al. \(2006\)](#) found that the presence of more choice is associated with lower chooser confidence and greater experiences of negative affect. Specifically, job seekers who pursued more job opportunities were found to achieve higher starting salaries and yet were also less satisfied with their accepted job offer and reported less commitment to their position than job seekers who pursued fewer job opportunities. This seems to indicate that even when more choices lead to seemingly objectively better outcomes, they may be perceived as worse subjectively.

There are several, not necessarily mutually exclusive, explanations for the ECE. From an economic perspective, as the number of options increases the marginal value of the chosen option may decrease because more of the rejected alternatives share positive attributes with the chosen option or may even have positive attributes that the chosen option lacks. That is, “opportunity costs”, i.e. the loss of benefits associated with the next best alternative foregone, tend to increase with option size reducing the satisfaction with the actual option chosen. However, while opportunity cost might explain a reduction in marginal satisfaction from a larger choice set it does not explain why people show less satisfaction in absolute terms when faced with more options. If one is a perfectly rational decision maker then the option chosen is still the best available and should provide the highest level of satisfaction under the circumstances and certainly no lower than selecting the same alternative from a smaller choice set.

Psychological research since [Simon \(1956\)](#) has demonstrated, however, that people repeatedly fall short of perfectly rational decision making due to limited cognitive capacity. Consequently, individuals are rarely able to fully process all the possible information that they would need to make an optimal choice ([Botti & Iyengar, 2006](#)); a problem that grows with choice set size ([Dhar, 1997](#); [Schwartz, 2004](#)). [Schwartz \(2004\)](#) argues that this can lead to an increased likelihood of regret, making decisions both harder to make in the first place (anticipated regret) and harder to enjoy (post-decisional regret). Supporting this suggestion a number of studies have found more self-reported regret for an option chosen from a larger option set ([Iyengar & Lepper, 2000](#); [Iyengar et al., 2006](#); [Schwartz, Ward, Monterosso, Lyubomirsky, White & Lehman, 2002](#)). Indeed, [Roese and Summerville \(2005\)](#) suggest that the top six biggest regrets in life involve those areas which offer the *greatest amount of choice* and opportunity; namely, education, career, romance, parenting, the self and leisure.

### *Choice and counterfactual thinking*

But how is it that we come to experience more regret as choice levels increase? Regret is defined as a counterfactual emotion, in that the experience of regret cannot occur without a prior counterfactual inference ([Kahneman & Miller, 1986](#); [Landman, 1993](#)). [Epstude and Roese \(2008\)](#) define counterfactuals as evaluative thoughts about imagined alternatives to past events, typically associated with various negative emotions (see [Kahneman & Miller, 1986](#); [Niedenthal, Tangney, & Gavanski, 1994](#); [Roese, 1997](#); [Roese & Olson, 1995](#)). They are epitomised by the phrase “what might have been” and may serve the important beneficial functions of behaviour and mood regulation. As the number of available options increases the range of alternative states of the world that did not actually occur, i.e. counterfactuals, also increases. As such it is suggested that previous research which has noted a link between increased choice and regret (e.g. [Iyengar & Lepper, 2000](#)) may have picked up on one aspect of a general increase in counterfactual thought. Supporting this contention, [Markman, Gavanski, Sherman, and McMullen \(1993\)](#) showed that generating counterfactuals heightened general feelings of dissatisfaction. Consequently we suggest that it is counterfactual thoughts concerning the realisation that better choice alternatives may have potentially been foregone which may drive the experience of regret and undermine satisfaction.

Previous research has linked other aspects of choice with counterfactual thought. For instance, using a hypothetical purchasing scenario [Tsiros and Mittal \(2000\)](#) found that counterfactuals were more likely to be generated in the face of negative rather than positive decision outcomes. In addition, [Walchi and Landman \(2003\)](#) examined the link between counterfactual thought and consumer affect and found that negative feedback led to greater levels of counterfactual thought and, importantly, increased regret. Concerning the ECE specifically, [Anderson \(2003\)](#) suggested that the mutability of alternatives; defined as the ease with which elements of reality can be altered to create a counterfactual statement ([Roese & Olson, 1995](#)); could directly impact upon decision-satisfaction as increased counterfactual thought is associated with increased regret. Further, [Gingras \(2003\)](#) found that participants were less satisfied with decisions made from diverse options, as opposed to more similar options, and attributed this difference to increased counterfactual thought.

However, despite this body of research, and the fact that the notion of counterfactuals appears to be at the heart of theorising about the ECE ([Schwartz et al., 2002](#)), it is somewhat surprising that no studies, as far as we are aware, have actually tried to measure their presence in conditions of more vs. less choice. Although we know of one paper ([Sagi & Friedland, 2007](#)) that has challenged the relationship between counterfactuals and regret with respect to increased choice there are a number of differences in the studies used in that research to the standard ECE paradigm and thus we leave further consideration of that research until the discussion section. In sum, we argue that people may be less satisfied with a choice made when faced with many options or under conditions of reversibility because a) people may be more likely to generate counterfactuals and b) these counterfactuals may lead to negative emotions which ultimately undermine satisfaction with the option chosen.

### *Excess choice and reversibility*

The present research aimed to directly explore the role of counterfactual thinking in two seemingly disparate phenomena – the excess choice and reversibility paradoxes. Such thoughts may play a key role in these two paradoxes because of the same “opportunity principle” ([Epstude & Roese, 2008](#); [Roese & Summerville, 2005](#)). Both situations may be perceived to provide the “opportunity” for corrective action following a suboptimal choice ([Epstude & Roese, 2008](#)). In terms of the ECE, the more choices there are the more opportunities are available and consequently the greater the number of counterfactual possibilities. In terms of choice reversibility the situation is perceived to be changeable compared to conditions where this opportunity is not available. Consequently the counterfactual alternative will remain salient even after an initial decision has been made. In short, both situations are characterised by a greater number of perceived opportunities for correct(ive) action and associated counterfactual thoughts. If our central hypothesis is correct then a) we should find more counterfactuals under extensive than limited choice, and for reversible than non-reversible decisions, leading to a decrease in satisfaction and b) reducing the ability to systematically generate counterfactuals should reduce the effects of excess choice and reversibility upon post-decisional satisfaction levels.

### *Manipulating counterfactual thought*

One possible way of undermining the systematic generation of counterfactuals is through the introduction of a cognitive load dual-task ([Ward & Mann, 2000](#)). Previous research (e.g. [De Neys & Schaeken, 2007](#)) has found that activities which involve effortful processing become harder when cognitive resources are burdened through a cognitive load dual-task. Although counterfactuals may vary in the degree to which their generation relies upon effortful

processing (see for example, Goldinger, Kleider, Azuma, & Beike, 2003; Kahneman, 1995), a point to which we will return in the discussion, there is consistent evidence that reasoning about counterfactual possibilities draws upon executive processes, including working memory. This has been shown repeatedly in developmental research where the link between working memory and counterfactual thinking is well established (see, for example, Beck, Riggs, & Gorniak, 2009; Müller, Miller, Michalczyk, & Karapinka, 2007) and has been shown to extend to judgements that are often considered to be influenced by the automatic activation of counterfactual thoughts (Morsanyi & Handley, 2008).

Thinking counterfactually depends upon considering multiple possibilities (Byrne, 2005), the representation of which is considered to draw upon the resources of working memory (Johnson-Laird & Byrne, 1991). For instance, Ward and Mann (2000) found that counterfactual thinking could be reduced under high cognitive load. In their experiment restrained and unrestrained eaters were given the opportunity to eat high calorie foods whilst under either a high or low cognitive load. Normally restrained eaters were found to consume more food when under a high cognitive load. The authors argue that this is because the load prevented participants from engaging in ‘monitoring’ behaviour – the process by which an individual compares their current state with the standard or ideal state (i.e. counterfactual thinking).

Consequently it was predicted that under low load, participants would generate more counterfactuals under extensive than limited choice, and that this would lead ‘extensive choice’ participants to experience decreased satisfaction with their decisions. However under high load, where the use of counterfactual thinking will become less systematic, the effects of extensive choice on decreasing satisfaction should be reduced. These hypotheses were tested in Study 1. Study 2 examines whether a similar process may account for the ‘paradox of reversibility’.

In summary the present research had three specific aims. First we aimed to examine the impact of counterfactual thinking on choice satisfaction by manipulating the potential for counterfactual generation during choice evaluation through cognitive load. Second, by investigating both the excess choice and reversibility paradoxes using the same empirical approach we were able to examine whether the same underlying process, i.e. counterfactual generation, underpins two quite seemingly different paradoxes. Third, as detailed below, we examined the paradoxes in a creative context whereby participants were asked to select drawing implements to complete a creative task (see also Chua & Iyengar, 2008). This allowed us to examine the evidence for ECE and reversibility effects beyond the more thoroughly researched domain of consumer choices and explore how excess choice affects satisfaction with means (i.e. implements to complete a task) as well as ends (i.e. consumed products).

## Study 1

Study 1 examined whether counterfactual generation was greater under limited vs. extensive choice and whether this may account for the excess-choice-effect. Participants were given a choice of drawing implements from an extensive/limited selection, and following completion of a creative drawing task rated satisfaction with their chosen implement. Participants were also asked to explain their reasons for their satisfaction, and from this ‘thought-listing’ measure we were able to record the number of spontaneously occurring counterfactual thoughts. In order to further explore the role of counterfactuals half of the participants evaluated their chosen option under normal circumstances and half evaluated it while simultaneously engaged in a secondary listening task. The aim of this task was to limit the ability of participants to systematically generate more or less counterfactual alternatives as a function of choice condition. If counterfactuals are important, and if the load manipulation affects

their systematic generation, then we should see the ECE under low but not high load.

## Method

### Participants

One hundred undergraduate students at the University of Plymouth took part in the experiment in exchange for course credit.

### Design

The experiment had a 2 (choice level: limited vs. extensive) × 2 (load level: low vs. high) × 2 (task: task one vs. task two) mixed factorial design with repeated measures on the last factor. Two tasks were used with the aim of testing whether results would generalise across tasks.

### Materials

Based on pre-testing, twenty-two different drawing implements were used in task one. These included a mixture of paint-roller pens, felt tip pens, twig pencils, wax crayons, and coloured chalks. No implements which participants had strong prior preferences towards such as bios were included. Twenty-two different sculpting materials were used in task two, including a mixture of coffee beans, string, mini pom-poms, cat biscuits and split-peas. A similar amount of each material type was placed inside a see-through plastic cup. Again no materials which participants had strong prior preferences towards, such as pipe cleaners were included.

*Load manipulation.* Participants listened to a recording of four musical instruments playing one note every two seconds, via headphones, and pressed a key every time a piano note was played. This task was similar to that devised by Knowles and Condon (1999), and was selected from three tasks used at the pre-testing stage as being the most effective means of manipulating cognitive load.

### Procedure

Participants were informed they would be taking part in an experiment on ‘individual differences in creativity’, to avoid focusing on the main issue of choice and randomly allocated to one of the four conditions. Before starting the experiment participants were given a short practice session of the cognitive load manipulation task in order to ensure they understood the instructions. Participants were instructed to listen to a recording of a series of musical notes, and to either press a buzzer every time they heard a piano note played (high-load conditions), or to simply ignore the musical distraction (low-load conditions).

Participants then began the first creative ‘drawing’ task. They were presented with a limited (6) or an extensive (22) selection of drawing implements, and were instructed to “select one implement which you feel would best allow you to interpret a basic cartoon image according to your own artistic preferences”. After making a choice they were presented with the cartoon image (a sheep in a field) and were given 1 min to study it. The image was then removed and participants were given 5 min to complete their interpretation. Upon completion they answered the questionnaire whilst under a high or a low cognitive load.

Choice satisfaction was measured using three items adapted from Iyengar and Lepper (2000) with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*): “I am happy that I made the right choice from the selection of implements available”, “I feel my choice of implement prevented me from expressing myself artistically” (reversed), “If I could start the experiment again I would select the same implement”. Although the latter of these items is a prefactual statement (which could have encouraged counterfactual thought), analysis revealed no differences in the number of counterfactual thoughts generated across the three items. In addition the internal

consistency of the three items was high ( $\alpha = .83$ ). As such data from the three items are collapsed to give a single satisfaction measure. After each item participants were asked to give “at least two reasons why you responded in that particular way”. These responses were later coded and used as evidence of counterfactual thinking.

Following this, participants were given a filler task to perform for 5 min, and then moved on to the second creative ‘sculpting’ task. Participants were asked to select one material to use to create a 3D model/interpretation of a cartoon image (a fish). Again, participants were given 1 min to study the image and a further 5 min to interpret it. They were then asked to complete a second questionnaire, which was identical to the first except that the phrase ‘drawing implement’ was replaced with the phrase ‘modelling material’. Again, internal reliability across the three items was high ( $\alpha = .89$ ) and the questions were answered either under low or high load. Finally, participants were debriefed and thanked.

#### Coding counterfactuals

Participants’ responses to the ‘thought listing’ aspect of the questions were coded by two independent coders prior to commencing with analyses. Six categories were generated. These were: ‘Choice Counterfactuals’, which involved the explicit comparison of the chosen option with foregone alternative(s), for example: “Maybe salt could be a better alternative”. ‘Problem Counterfactuals’, which involved a counterfactual consideration of how performance could have been improved, had an aspect of the task been different, e.g.: “I could have been more creative if I could have used more than one medium”. ‘Positive Implement Appraisals’, which involved positive descriptions of the chosen implement, e.g.: “I found the pen easy to use”. ‘Negative Implement Appraisals’, which involved negative descriptions of the chosen implement, e.g.: “Hard to hold comfortably”. ‘Positive Comparisons’, which involved drawing a comparison between the chosen option and other options, e.g.: “easier to use than some others”. Finally ‘Other Responses’ included any response which did not fit into any of the five main categories, e.g.: “I’m rubbish at drawing anyway so I can’t blame the implement”.

All statements were then coded by one of the original coders and a third coder who had not been involved in developing the coding framework. High levels of agreement were observed between the two judges:  $Kappa = .83, p < .001$ . As inter-rater reliability was established, the coded counterfactual responses from the first judge were used for further analysis. The category of response which is of particular interest for the purposes of this study is ‘Choice Counterfactuals’. Preliminary analysis found no substantive differences in results whether we used the absolute number of counterfactuals a person generated or the proportion of all statements which were counterfactuals. The analysis below therefore used the raw number generated to provide the reader with a clearer indication of overall counterfactual prevalence. Of all statements recorded 18% were counterfactuals, and of all counterfactuals recorded 89% were choice counterfactuals.

## Results and discussion

#### Does load moderate the excess choice effect?

To investigate whether load moderates the effect of choice level on choice satisfaction we conducted a 2 (choice: limited vs. extensive)  $\times$  2 (load: low vs. high)  $\times$  2 (task: picture vs. model) mixed factorial ANOVA (Table 1) with repeated measures on the last factor and two planned contrasts. These contrasts examined satisfaction between limited and extensive choice: a) under low load to examine the replicability of past findings and b) under high load to examine whether the choice effect continued to be robust under high load.

There were no significant main effects of choice level,  $F(1,96) = .54, p = .47, \eta^2 = .01$ ; load level,  $F(1,96) = .08, p = .78, \eta^2 < .01$ ; or task,  $F(1,96) = .60, p = .44, \eta^2 = .01$ . Overall, satisfaction was similar under limited vs. extensive choice ( $M_s = 4.60; 4.42$ ), under low vs. high load ( $M_s = 4.54; 4.47$ ) and for the drawing and modelling tasks ( $M_s = 4.60; 4.41$ ). Nevertheless, a significant interaction was found between choice and load level:  $F(1,96) = 12.84, p = .001, \eta^2 = .12$  (Fig. 1). The planned contrasts revealed that under low load, satisfaction was higher under limited vs. extensive choice ( $M_s = 5.05; 4.03$ ),  $t(48) = 3.41, p = .001$ . This finding replicates previous research into the ECE. Under high load, however, the effect of choice level was only marginally significant  $t(48) = -1.84, p = .07$ . Moreover it was in the opposite direction such that satisfaction was higher for extensive than limited choice ( $M_s = 4.80; 4.14$ ). These findings are more consistent with people’s stated preferences for more vs. less choice. The only other significant effect was an unpredicted interaction between task and choice:  $F(1,96) = 5.48, p = .02, \eta^2 = .05$ . This suggested that choice level was more important for Task 1 than Task 2 but since the effect was not further moderated by load we focus on the effect of the two tasks combined.

#### Is the moderating effect of load due to its effect on counterfactual generation?

To investigate whether counterfactuals accounted for the differences between the choice effects on satisfaction under high vs. low load we conducted two mediation analyses, one for low load and one for high load. If our predictions are correct then choice level should influence the generation of counterfactuals and thus mediate the satisfaction effect only under low but not high load. Since preliminary analysis found no important effects of task on counterfactual generation we again collapse across task in the following analyses.

Following Baron and Kenny (1986) each analysis had three steps: 1) regressing choice level on satisfaction, 2) regressing choice level on counterfactuals and 3) regressing both choice level and counterfactuals onto satisfaction. The results of the two analyses are summarised in Fig. 2 with the results from Step 1 shown in brackets and those from Step 3 in italics. The paths for low load are shown in the upper half of the figure and those for high load in the bottom half.

**Table 1**  
Mean and standard deviations of participants’ satisfaction ratings and counterfactuals generated.

Task	Choice	Low load				High load			
		Counterfactuals		Satisfaction		Counterfactuals		Satisfaction	
		Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
<i>Study 1</i>									
Picture	Limited	.48	(.92)	5.36	(1.56)	.64	(.86)	4.60	(1.91)
	Extensive	1.20	(1.26)	3.81	(1.49)	1.04	(1.40)	4.62	(1.67)
Model	Limited	.84	(.80)	4.73	(1.73)	1.00	(1.29)	3.67	(1.99)
	Extensive	1.28	(1.40)	4.24	(1.60)	.64	(.86)	4.98	(1.76)
<i>Study 2</i>									
Picture	Non-reversible	.19	(.51)	5.00	(1.53)	.52	(.79)	4.64	(1.34)
	Reversible	1.04	(.98)	4.46	(1.22)	.75	(.90)	4.42	(1.65)

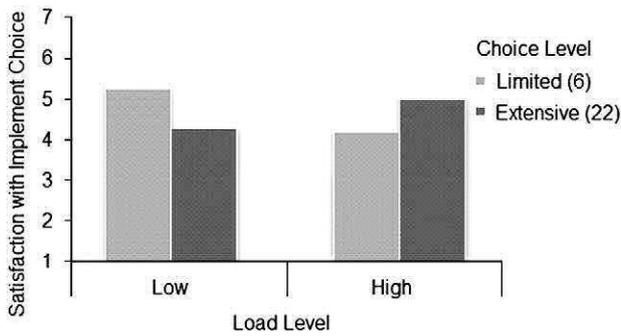


Fig. 1. Participants' mean stated satisfaction ratings as a function of choice set size and load manipulation in Study 1 (both tasks collapsed).

Step 1 replicated the above analyses such that the effect of choice on satisfaction is negative under low load ( $\beta = -.44, p < .001$ ), i.e. satisfaction is lower under extensive than limited choice, but positive under high load ( $\beta = .26, p = .07$ ), i.e. satisfaction is higher under extensive than limited choice. As predicted, Step 2 suggests that choice influences the number of counterfactuals generated under low ( $\beta = .33, p = .02$ ) but not high load ( $\beta = .01, p = .94$ ). The positive effect of choice under low load shows that more counterfactuals were generated under extensive than limited choice. Step 3 suggests that the number of counterfactuals generated negatively affected satisfaction under both low ( $\beta = -.37, p = .006$ ) and high load ( $\beta = -.50, p < .001$ ), but that there was only a drop in the effect of choice under low ( $\beta_s = -.44$  vs.  $-.32$ ) but not high load ( $\beta_s = .26$  vs.  $.26$ ). Sobel tests further supported the argument that counterfactuals were mediating the effect of choice on satisfaction under low ( $z = 1.85, p = .032$  (one tailed)) but not high load ( $z = .08, p = .47$ ). Further, Step 3 also shows that under high load, when taking counterfactual thinking into account, choice level became a significant predictor of satisfaction, but in the opposite direction to that noted under low load – specifically as choice level increased, so too did satisfaction ( $\beta = .26, p = .034$ ).

The experiment replicates previous research into the paradox of choice in the novel context of creativity. Although Chua and Iyengar (2008) demonstrated that high choice may limit creativity we believe this is the first study to show the excess-choice-effect for selection of tools to perform a creative task. Perhaps more importantly, we also demonstrated that the excess-choice-effect disappeared under high cognitive load, thus identifying load as another important moderator of the ECE (Scheibehenne, Greifeneder, & Todd, 2009, 2010). Given that many real-world decisions and choices may be made under conditions of high load (e.g. someone shopping in a noisy supermarket with their children) compared to the relatively low load conditions of an experimental lab (Iyengar & Lepper, 2000) this may

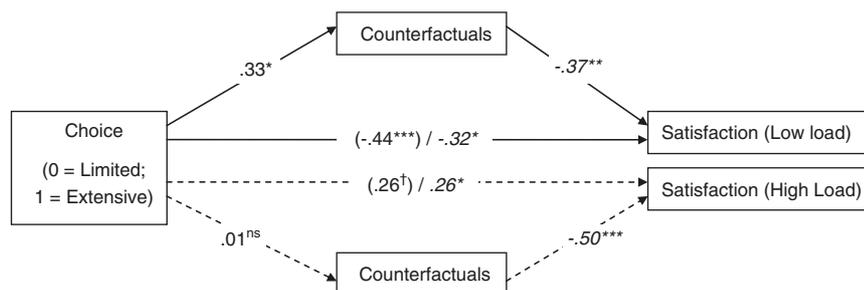
help to explain inconsistencies in previous research (Scheibehenne et al., 2009, 2010). In line with predictions there was also evidence that the reason why satisfaction was lower under high choice and low load was due to the number of counterfactuals generated. Irrespective of load, more counterfactuals meant lower satisfaction (Anderson, 2003) but only under low load did the number of options to consider, systematically alter the number of counterfactual thoughts generated.

An unexpected finding was that satisfaction with high choice was actually higher than low choice under high load. This reversal of the ECE is consistent with economic theory and lay perceptions that more choice makes people happier. Specifically it may be that the presence of many choice options is seen as a good thing and this perception is only “undone” if one is able to then systematically generate counterfactuals. Under high load systematic counterfactual generation is inhibited and thus the initial reactions are not overturned and satisfaction with extensive choice remains high. If true, then the ECE is not as paradoxical after-all if lay people are commenting on their preferences for extensive choice under normal everyday (high load) conditions whereas psychologists have explored these issues under relatively low load conditions with low ecological validity. Clearly more work is needed to investigate these possibilities further.

## Study 2

### The paradox of reversibility

Given that the ECE was found to be mediated by an increase in counterfactual thought in Study 1, Study 2 was designed to investigate whether increased CFT may also explain another paradox in the choice literature, which has been shown to have similarly detrimental effects upon chooser satisfaction: the ‘paradox of reversibility’. According to Schwartz (2004) having the opportunity to change your mind post-decision is highly valued amongst decision-makers as it lessens the burden of having to make a good decision first time around. However, research shows that simply having the option of changing your mind post-decision may actually lead to greater levels of dissatisfaction with your original choice. Gilbert and Ebert (2002) conducted a series of experiments which tested the effects of reversibility upon satisfaction in decision-making. Students in a photography course were asked to take two personally meaningful photos, and then choose one to keep. In the reversible choice condition participants were told that they would be able to change their minds about their choice at a later time, and in the non-reversible condition they were told that their decision was final. Results showed that whilst the vast majority of participants said they would opt to be in the reversible condition if given a choice, those participants who actually were in this condition were significantly less happy with their original choice than ‘non-reversible’ participants.



Note. The upper half (solid arrows) = mediation model under low load. The lower half (dashed arrows) = mediation model under high load. Figures are standardised beta weights. Ns = not significant, † =  $p < .10$ , \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ .

Fig. 2. Mediation analysis showing the role of counterfactuals in mediating the effect of choice set size on stated satisfaction for participants under low but not high load in Study 1.

Why does reversibility affect satisfaction in this manner? Research in this area is limited however Gilbert and Ebert (2002) suggest that having the opportunity to change your mind post-decision inhibits the psychological processes that normally aid the manufacture of satisfaction. In other words, if a person is able to change their mind post-decision then they will do less work psychologically to justify their decision, in terms of reinforcing positive aspects of the chosen alternative, and disparaging the rejected alternatives (Schwartz, 2004). Along similar lines, we suggest that reversibility may also affect satisfaction as a direct result of increased counterfactual thinking due to the opportunity of being able to change one's choice (i.e. the "opportunity principle", Epstude & Roese, 2008). Study 2 was designed to investigate this possibility and as with Study 1, examined satisfaction under conditions of both high and low cognitive loads.

It was predicted that when presented with a reversible choice, participants would engage in more counterfactual thinking than if they were told their decision was non-reversible. Further it was predicted that this increase in counterfactual thinking would lead 'reversible' participants to experience decreased satisfaction with their choice. In addition, if counterfactuals could be made less available under reversibility, through the addition of a high cognitive load, then this should lead to a subsequent increase in satisfaction levels.

### Method

#### Participants

Ninety-four undergraduate students at the University of Plymouth completed the experiment in return for course credit.

#### Design

The experiment had a 2 (reversibility level: reversible vs. non-reversible)  $\times$  2 (load level: low vs. high) between subjects design. Given the similarity in results across the two tasks in Study 1, only the drawing task was used here.

#### Materials

Since the aim of this study was to investigate the role of counterfactuals for choice reversibility rather than choice amount the same 10 options were provided to all participants. This number of options was selected based previous research into the optimal levels of choice for satisfaction (Reutskaja & Hogarth, 2009; Shar & Wolford, 2007). On the basis of pre-testing ten moderately preferred implements were selected, including a twig pencil, an oil pastel, a gel pen, a wax crayon, and a paint pen. The load manipulation was the same as for Study 1.

#### Procedure

The basic procedure was the same as in Study 1 with the following change. Participants were lead to believe they would have to complete two creative 'interpretations' of different cartoon images, when in actual fact they only had to complete one. This was done in order to create a choice context in which a manipulation of reversibility would be possible. Participants were presented with the selection of 10 drawing implements, and were instructed to "select one implement which you feel would best allow you to 'interpret' a cartoon image, according to your own artistic preferences". After having made this selection participants were instructed either that they would (reversible conditions) or would not (non-reversible conditions) be able to exchange the implement they had just selected later on in the experiment. Participants were deliberately given this information relating to reversibility after having made their choice based upon the recommendations of Gilbert and Ebert (2002), as prior knowledge may have elicited different decision making processes which may otherwise have impacted upon results.

After making a choice, participants completed the drawing task as in Study 1. They were then placed under either a high or a low

cognitive load to complete the satisfaction questionnaire. This was identical to the questionnaire used in Study 1 with one addition. Based upon previous research (Dijksterhuis & van Olden, 2006; Gilbert & Ebert, 2002) we felt it was also important to assess participants' "revealed satisfaction" (i.e. whether or not they wanted to change their original choice before starting the next task). With this in mind, participants in reversible conditions were instructed: "You now have the opportunity to change your implement choice before starting work on your next image 'interpretation'. Would you like to select a different implement for use in the next part of the experiment?" Whilst participants in the non-reversible conditions were instructed: "At this point in the experiment some participants are given the opportunity to change their choice of implement. Had you been placed in this condition would you have taken up the opportunity to select a different implement before starting work on image two?" (see also Gilbert & Ebert, 2002). Participants were required to give a simple Yes/No response. Participants were then told they wouldn't actually have to do a second drawing before being fully debriefed.

#### Coding counterfactuals

Participants responses to the 'thought listing' aspect of the questionnaire items were coded according to the same criteria established in Study 1 with the "Choice Counterfactuals" being the target of further analysis. Of all statements recorded 13% were counterfactuals, and of all counterfactual responses recorded 90% were choice counterfactuals. This pattern of response is very similar to that found in Study 1.

#### Results and discussion

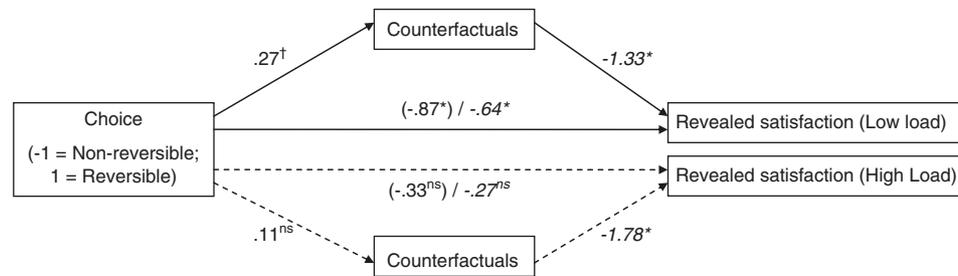
##### Does load moderate the choice reversibility effect?

As noted above, satisfaction in this study was examined in two ways: a) revealed satisfaction, i.e. whether the person would want to reverse their original choice if they could; and b) stated satisfaction based on the responses to the questions used also in Study 1. Revealed satisfaction results were consistent with the hypothesis that reversibility would be important under low but not high load. Under low load 87% of people who had initially expected that they could change their implement for the second task (reversible) opted to do so, whereas only 54% of people who did not originally expect this possibility (non-reversible) said they would like to change,  $\chi^2(1) = 6.04, p = .014$ . Under high load, the percentages opting to change were not significantly different,  $\chi^2(1) = 1.08, p = .30$  (reversible = 75%; non-reversible = 61%).

Stated satisfaction was examined using a 2 (reversibility: reversible vs. non-reversible)  $\times$  2 (load: low vs. high) between participants ANOVA (Table 1) with two planned contrasts. These contrasts examined satisfaction between: a) non-reversible and reversible options under low load to examine the replicability of past findings and b) reversible options under low vs. high load to examine whether the addition of load improved satisfaction. Contrary to predictions, there was no main effect of either reversibility,  $F(1,90) = .92, p = .41$ , or load  $F(1,90) = .01, p = .94$  and no significant interaction  $F(1,90) = .01, p = .94$ . Satisfaction was very similar between reversible ( $M = 4.44$ ) and non-reversible ( $M = 4.64$ ) conditions, and under low ( $M = 4.55$ ) vs. high ( $M = 4.52$ ) load. Neither of the planned comparisons were significant ( $t < .51, p > .60$ ). In sum load moderated the choice reversibility effect only for revealed but not stated satisfaction.

##### Is the moderating effect of load on revealed satisfaction due to its effect on counterfactual generation?

To examine the load effect on revealed satisfaction we again used a three step mediation approach. Binary logistic regressions were used in the steps predicting revealed satisfaction (yes = same choice; no = change choice). The results of the two analyses are summarised in Fig. 3 with the results from Step 1 shown in brackets and those from Step 3 in italics. Step 1 replicated the above analyses such that the



Note. The upper half (solid arrows) = mediation model under low load. The lower half (dashed arrows) = mediation model under high load. Figures are unstandardised Bs. Significance of paths to Revealed Satisfaction based on Wald tests. Ns = not significant, † =  $p = .06$ , \* =  $p < .05$ , \*\* =  $p < .01$ , \*\*\* =  $p < .001$ .

Fig. 3. Mediation analysis showing the role of counterfactuals in mediating the effect of reversibility of choice on revealed satisfaction for participants under low but not high load in Study 2.

effect of reversibility on revealed satisfaction was only significantly negative under low load ( $B = -.87$ ,  $p = .02$ ). That is people are less likely to stick with their original option if they were expecting to be able to change it, but not under high load ( $B = -.33$ ,  $p = .30$ ). Step 2 suggests that reversibility influences the number of counterfactuals generated more under low ( $\beta = .27$ ,  $p = .06$ ) than high load ( $\beta = .14$ ,  $p = .36$ ). Finally Step 3 suggests that the number of counterfactuals generated negatively affected revealed satisfaction under both low ( $\beta = -1.33$ ,  $p = .05$ ) and high load ( $\beta = 1.78$ ,  $p = .02$ ), but that there was only a drop in the effect of reversibility under low ( $\beta = -.87$  vs.  $-.64$ ) but not high load ( $\beta = -.33$  vs.  $-.27$ ). The mediation effect of counterfactuals was, based on a Sobel test, however only marginally significant,  $z = 1.38$ ,  $p = .08$ .

This experiment provides further support for the reversibility paradox (Gilbert & Ebert, 2002). Specifically, under low load participants were more likely to stick with their initial choice for a second task if the ability to reverse their option was unexpected (non-reversible) vs. expected (reversible). This finding is not simply due to the slight difference in instructions for the two conditions since it was not prevalent under high load. Moreover, the fact that 54% of those in the “non-reversible” condition said they would have liked to change if they could supports the notion that non-reversible participants easily understood the question. Rather, the difference seems to be at least partly caused by the propensity to systematically generate counterfactual thoughts under reversible vs. non-reversible expectations under low but not high load. Indeed, a comparison of Figs. 2 and 3 reveals a remarkably similar pattern of data for both high vs. low choice (Fig. 2) and reversible vs. non-reversible options (Fig. 3). In all conditions more counterfactuals were associated with lower satisfaction and the role of counterfactuals appeared stronger under low than high load.

In contrast to the revealed satisfaction results, however, no significant effects of reversibility were found for stated satisfaction levels. Although not initially predicted this result is nonetheless also consistent with the counterfactual opportunity principle (Epstude & Roese, 2008; Roese & Summerville, 2005). Specifically, when opportunities exist for corrective action then behaviour regulation, rather than affect regulation, tends to be the dominant focus of counterfactual thought. Consequently, in a situation like the present one where participants are expecting to be able to change their choice for a subsequent task their counterfactual thoughts may have been more focused on what they needed to do in terms of future behaviour, i.e. stick or change, than attempting to regulate any emotional outcomes.

## General discussion

Modern society increasingly leaves people “spoilt for choice”. That is, the presence of multiple options may be so extensive that enjoyment in the chosen alternative is “spoilt” compared to a situation with fewer options. Although the existence of the phrase suggests some awareness

of this problem people still tend to prefer more rather than less choice and the ability to undo their decisions once they have been made (Gilbert & Ebert, 2002; Iyengar & Lepper, 2000). This awareness of the dangers of choice alongside strong preferences for greater choice has been referred to as the “paradox of choice”.

Building on discussions of increased regret accounting for these findings (Schwartz, 2004) the current research directly examined the role of counterfactual thoughts in both the ECE and the reversibility paradox. In addition to monitoring the number of counterfactuals generated under conditions of limited vs. extensive choice (Study 1) and under expectations of reversible vs. non-reversible choice (Study 2) half our participants rated their satisfaction with their chosen alternatives under high cognitive load. The aim of this load manipulation was to undermine the systematic generation of counterfactuals and thus “undo” the normally deleterious effects of excess choice and expected reversibility on option satisfaction.

Results from Study 1 found that under normal (low load) conditions people were generally more satisfied with their chosen drawing implement when they had selected it from only a few (6) rather than many alternatives (22). This replicates the ECE found for jams, chocolates and essays (Iyengar & Lepper, 2000) in the novel, more creative, context of drawing, whilst extending this literature to include satisfaction with means (i.e. drawing implements used to create a picture) rather than the final outcome of a decisions itself (e.g. taste of a chocolate or performance on an essay). Given the difficulty in replicating the ECE elsewhere this was encouraging (e.g. Scheibehenne et al., 2010). Under high load however participants were more satisfied with their drawing implement when they had selected it from the extensive choice set. Crucially for our central hypothesis the effect of choice set size on satisfaction was mediated by the number of counterfactual alternatives generated under low but not high load. The number of counterfactuals generated was an important influence on satisfaction under both load conditions but only when load was low were these counterfactuals systematically related to choice set size.

The findings from Study 1 are to some extent consistent with the work of Dijksterhuis, Bos, Nordgren and van Baaren (2006) and Dijksterhuis and van Olden (2006), who argue that satisfaction with complex decisions can be improved if decisions are made in the absence of deliberative attention. In this case, excess choice can be viewed as a comparably complex decision, whereby satisfaction was found to increase if participants' attention was otherwise engaged under a high cognitive load. In addition, results are consistent with the work of Scheibehenne et al. (2009) who found no evidence of the ECE, except in their third study which asked participants to justify their decisions. In this case an ECE effect was found – the authors note that participants found it harder to justify their decisions when presented with increased choice. This mimics the current experiment which calls for justifications of the reasons behind decision making. Consequently, it seems the post-decisional justification process may be responsible for the increase in

counterfactual thinking which causes reduced satisfaction, and that if this can be reduced via the addition of a high cognitive load, then participants remain most satisfied with increased choice.

Results from Study 2 found that under low load people were less likely to want to change their original choice if this possibility was previously unexpected. According to our thinking, people in this condition would tend to generate less counterfactuals than those who were expecting the ability to reverse their original decision and this should account for their lower propensity to want to reverse their decision. Findings only partially supported this explanation, however. First, the number of counterfactuals generated in the reversible-expected condition under low load were only marginally more than those generated in the reversible-unexpected condition ( $p = .06$ ). Second, although adding counterfactuals to the mediation model reduced the direct effect of condition on satisfaction from significance to non-significance the Sobel test of mediation was also only marginally significant ( $p = .08$ ). Nevertheless, and as predicted, there was no systematic relationship between condition and counterfactual generation under high load. Moreover, as with Study 1 the number of counterfactuals generated under load was still related to satisfaction, it was simply that the load manipulation undermined their systematic generation as a function of whether the ability to reverse one's options was expected or unexpected.

Our studies suggest that excess choice and choice reversibility may both affect satisfaction via increased counterfactual thought. Whilst the claim that counterfactual thinking underpins levels of reported satisfaction in decision making contexts is common (see, for example, Anderson, 2003; Gingras, 2003; Schwartz et al., 2002), the present study provides direct evidence of a link between the number of counterfactual alternatives generated and reported satisfaction. However, as discussed earlier, the link between counterfactuals and choice satisfaction is not universally accepted. Sagi and Friedland (2007) have argued that counterfactual thinking does not contribute to judged regret in choice tasks. They showed that regret was related to the number of positive attributes possessed by the full set of non-chosen options and that this even extended to unpopular options that would rarely be chosen. As participants would be unlikely to generate a counterfactual for an unpopular option, they claimed that counterfactual thinking was unlikely to contribute to judgments of regret. There are a number of reasons why we believe these findings are not decisive regarding the role of counterfactuals in choice satisfaction. First, we would argue that evidence showing that the characteristics of non chosen options contributes to choice evaluation is in itself consistent with the idea that participants represent the non chosen items as counterfactual alternatives. We may often, for example, consider alternative choices in a fleeting and superficial manner before dismissing them or they may be considered in depth and ruminated upon. In both cases, however, these considerations will contribute, perhaps to differing extents, to our feelings regarding a decision. It is also worth pointing out that in contrast to the experiments presented here, Sagi and Friedland (2007) only examined decision contexts with a maximum of 4 options, a much more limited set than in the present studies. In addition, their study was scenario based and participants were presented with a chosen option at the outset which they were then asked to assign a level of regret. Whilst scenario based studies are common in research on counterfactual thinking (see, for example, Byrne, 2005), there is some evidence that they can be misleading regarding the cognitive processes underlying the evaluation of 'real' choices (see, for example, Feeney & Handley, 2006). Finally, Sagi and Friedland did not incorporate a direct measure of counterfactual thinking in their study, unlike the experiments presented here, and consequently there is no direct evidence that their participants were not engaging in a process of counterfactual thinking. Future research could usefully examine the role of counterfactual thinking in scenario based studies of this kind, perhaps by employing self report measures of the kind used in the present studies.

A key assumption underlying the approach taken in our experimental work is that evaluating choice satisfaction depends upon an effortful process of counterfactual generation and evaluation. Whilst there is some evidence that counterfactual thinking draws upon the resources of working memory and executive function (Johnson-Laird & Byrne, 1991; Ward & Mann, 2000) there is also evidence that intuitive biases in judgement often arise because of automatic activated counterfactual processes. For example, consider the case of an employee, Paul, who leaves work at the normal time and is involved in an accident that is demonstrably the fault of another driver. Compare this situation to one in which Paul leaves work early to watch a movie and the same outcome occurs. In which case would you assign greater levels of compensation? Typically in studies of this kind greater blame, responsibility and less compensation is assigned in the latter case, where counterfactuals are presumably more available because of the exceptionality of Paul's behaviour in the second scenario (see Byrne, 2005, for a review).

Recently Goldinger et al. (2003) have shown that a secondary load leads to an increase in the level of compensation and blame associated with the exceptional scenario, particularly for participants of lower working memory span. They claim that this finding shows that counterfactuals for the exceptional scenario are generated automatically. Those participants who have access to fewer available resources are less able to inhibit these counterfactuals and are consequently more affected by them. Whilst it is undeniably the case that some counterfactuals are so salient that they come to mind very rapidly, we would argue that counterfactuals will vary in the degree to which their generation depends upon controlled processing. The comparison of two scenarios, where one involves an exceptional event, may well make a counterfactual readily available. However, in the experiments presented here, we were careful to ensure that participants were making choices between similar options, where there was no single option with distinctively more attractive features. Consequently we would argue that the decision is a challenging one, where evaluating satisfaction would involve careful and considered evaluation of the features of alternative choices. Furthermore, Goldinger et al. (2003) used an approach which involved the evaluation of two different decisions scenarios, which is quite different to a task that involves making a single decision that has meaningful consequences for subsequent activity. It is quite possible that such scenario based judgments encourage a comparative process which may play a limited role in everyday counterfactual thinking (see, for example Feeney & Handley, 2006).

A greater understanding of the implications for real-world decision making will require further research. Nevertheless, our findings hint at the possibility that the paradox of choice may in part be due to the different settings in which consumers and participants in research tend to make decisions. Usually, participants in experiments make choices under relatively low load situations where they are able to concentrate on their choices and have mental time and space to consider the alternatives foregone. In many real-world contexts decision makers may be more likely to be under high load resulting in less consideration of alternatives and possibly greater satisfaction with greater choice (as in Study 1). Of course, Iyengar and Lepper (2000) did demonstrate the excess choice effect in a real world supermarket but interestingly the supermarket used was described as being upmarket (and possible a more calm atmosphere than other shopping locations) and the kinds of people who stopped to consider luxury jams (rather than making their usual purchase) may also be qualitatively different from the average customer. Future research could systematically explore these possibilities both in the lab and in the field to examine the degree to which the ECE is observed under different choice environments. The outcomes of this research might be of particular interest to retailers keen to understand the optimal conditions under which to generate customer satisfaction (e.g. relaxing low load environments for shops with few options but noisier, busy environments for shops with many options).

To conclude, the current research replicates **Iyengar and Lepper's (2000)** work showing that more options can lead to lower satisfaction and furthers previous research into the reversibility paradox (**Gilbert & Ebert, 2002**) by demonstrating that people are less likely to stick with their original choice if they believe they will be able to change their mind in the future. Importantly, however, these effects were only replicated under low load, i.e. the normal conditions in prior research. Under high load the effects disappeared. We account for this pattern by demonstrating that while under low load people generate more counterfactuals for the high and reversible than low and non-reversible conditions, consistent with the counterfactual opportunity principle (**Epstude & Roese, 2008; Roese & Summerville, 2005**). By contrast, there was no relationship between choice amount or reversibility and counterfactual generation under high load. Although it is too early to say exactly what implications our findings have for applied decision making we believe they point to the need for further research into decision making context and the role this may have on people's considerations of alternatives foregone.

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Appendix 2.1 – Sample Mathematical Worksheet used in Pilot Testing

1.  $20 \times 6 =$

13.  $8 \times 5 =$

2.  $75/15 =$

14.  $60/15 =$

3.  $677 - 524 =$

15.  $9 \times 7 =$

4.  $96/3 =$

16.  $66/3 =$

5.  $7 \times 6 =$

17.  $703 - 678 =$

6.  $32 \times 2 =$

18.  $52 \times 3 =$

7.  $777 - 309 =$

19.  $8 \times 8 =$

8.  $88/4 =$

20.  $45/5 =$

9.  $12 \times 5 =$

21.  $360 - 257 =$

10.  $60/12 =$

22.  $42/14 =$

11.  $34/7 =$

23.  $55 \times 2 =$

12.  $561 - 371 =$

24.  $6 \times 9 =$

## Appendix 2.2 – ‘Open – Ended’ Pilot Questionnaire

- Please look back at your responses to the questionnaire you have just answered. You will now be asked to think about, and explain, your reasons for responding in the way that you did.
- For each question on the questionnaire, please carefully consider the response that you gave (i.e. how satisfied you are with your interpretation of the image, and your choice of drawing implement), and then explain why you responded in that particular way (i.e. how you made your satisfaction judgement).

**Question 1:**

**Question 2:**

**Question 3:**

**Question 4:**

**Question 5:**

**Question 6:**

## Appendix 2.3 – ‘Semi – Structured’ Pilot Questionnaire

- Please look back at your responses to the questionnaire you have just answered. You will now be asked to think about, and explain, your reasons for responding in the way that you did.
- For each question on the questionnaire, please carefully consider the response that you gave (i.e. how satisfied you are with your interpretation of the image, and your choice of drawing implement), and then explain three reasons why you responded in that particular way (i.e. how you made your satisfaction judgement).

**Question 1.** Reason One:

Reason Two:

Reason Three:

**Question 2.** Reason One:

Reason Two:

Reason Three:

**Question 3.** Reason One:

Reason Two:

Reason Three:

**Question 4.** Reason One:

Reason Two:

Reason Three:

**Question 5.** Reason One:

Reason Two:

Reason Three:

**Question 6.** Reason One:

Reason Two:

Reason Three:

Appendix 2.4 – Pilot Satisfaction Rating Questionnaire

On a scale of 1 (strongly disagree) to 7 (strongly agree) please indicate how much you agree with the following statements, by circling the corresponding number:

**1. I *am* happy with my interpretation of the picture.**

*Strongly Disagree*

*Strongly Agree*

1            2            3            4            5            6            7

**2. If I could start the experiment again I would interpret the picture in a *different* style.**

*Strongly Disagree*

*Strongly Agree*

1            2            3            4            5            6            7

**3. I *am* happy that I made the right choice from the selection of implements available.**

*Strongly Disagree*

*Strongly Agree*

1            2            3            4            5            6            7

**4. I feel my choice of material *prevented* me from expressing myself artistically.**

*Strongly Disagree*

*Strongly Agree*

1            2            3            4            5            6            7

**5. I *am not* satisfied with my drawing.**

*Strongly Disagree*

*Strongly Agree*

1            2            3            4            5            6            7

**6. If I could start the experiment again I would select *the same* implement.**

*Strongly Disagree*

*Strongly Agree*

1            2            3            4            5            6            7

Appendix 2.5 – Final List of All Implements used in Drawing Task Limited and Extensive Choice Conditions, with Pilot Test ‘Effectiveness Rankings’

Effectiveness Ranking	Extensive Choice Implements	Average Effectiveness Rating 1 (most effective) – 24 (least effective)	Limited Choice Implements
1	Mini Felt – Tip	7.2	✓
2	Chunky Pencil Crayon	9.3	✓
3	Glitter Gel Pen	9.5	
4	‘Twist – Up’ Crayon	9.9	
5	Twig Pencil	10.1	
6	Oil Pastel	10.9	
6	Rainbow Pen	10.9	
8	Linea Pen Marker	11.9	
9	Gel Pen	12.3	
10	Wax Crayon	12.8	✓
11	Highlighter (Thin – Tip)	13.0	✓
12	Chunky Wax Crayon	13.1	
12	Paint Pen	13.1	
14	Easy Painter	13.4	
15	3 – D Bright Gel	14.0	
16	Mini Highlighter	14.8	
17	Glitter Pen	14.9	
18	Liquid Chalk Pen	15.4	
19	Chunky Highlighter	17.0	
20	Chalk	17.9	
21	Mini Pencil Crayon	18.9	✓
22	Giant Chalk	22.7	✓

Implements discarded from main experiment during Pilot Testing:

Effectiveness Ranking	Implement Type	Average Effectiveness Rating 1 (most effective) – 24 (least effective)
1	Felt - Tip	2.7***
2	Pencil Crayon	2.8***

Appendix 2.6 – Final List of All Implements used in Sculpting Task Limited and Extensive Choice Conditions, with Pilot Test ‘Effectiveness Rankings’

Effectiveness Ranking	Extensive Choice Materials	Average Effectiveness Rating 1 (most effective) – 24 (least effective)	Limited Choice Materials
1	Coloured Matchsticks	7.4	✓
2	Buttons	8.5	✓
3	Mini Pom – Poms	8.7	
4	Pasta Shells	8.9	
5	Split – Peas	9.1	
6	Glitter	9.6	
7	Sunflower Seeds	9.9	
8	Mini Star – Shapes	11.6	
9	String	12.8	
10	Rice	13.2	✓
10	Wool	13.2	✓
12	Blu – Tack	13.4	
13	Ribbon	14.4	
13	Coffee Beans	14.4	
15	Rainbow – Pearls	14.7	
16	Paper – Clips	15.0	
17	Shoe Laces	15.7	
18	Drawing Pins	15.8	
19	Sugar	16.1	
20	Cat Biscuits	16.5	
21	Cotton	17.9	✓
22	Salt	18.1	✓

Materials discarded from main experiment during Pilot Testing:

Effectiveness Ranking	Implement Type	Average Effectiveness Rating 1 (most effective) – 24 (least effective)
1	Plasticine	6.7***
2	Pipe – Cleaners	6.9***

Appendix 2.7 – Experiment 1 and 2 Final Questionnaire Design

Participant Number:

On a scale of 1 (strongly disagree) to 7 (strongly agree) please indicate how much you agree with the following statements, by circling the corresponding number. Please then use the spaces provided underneath to explain **at least two reasons why you responded in that particular way** – i.e. the reasons why you agreed or disagreed with each preceding statement.

**1. I *am* happy with my interpretation of the picture.**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**2. If I could start the experiment again I would interpret the picture in a *different* style.**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**3. I *am* happy that I made the right choice from the selection of implements available.**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**4. I feel my choice of implement *prevented* me from expressing myself artistically.**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**5. I *am not* satisfied with my drawing.**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**6. If I could start the experiment again I would select *the same* implement.**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

## Appendix 2.8 – Experiment 1 Brief

- This is an experiment designed to investigate individual differences in creativity, with particular reference to the ways in which different people often interpret the same image in many different ways.
- You will shortly be shown a basic cartoon image, which you will then be asked to 'interpret' in your own style.
- You will be given a selection of drawing implements, and will be asked to choose the implement that you feel will allow you to best interpret the image according to your own artistic preferences.
- Following this you will be asked a series of questions relating to how satisfied you are with your interpretation of the image. Whilst you are answering these questions, you will be required to listen to a musical recording/ and perform an associated reaction-time task (high load participants only)
- After this, you will complete the second creative task, which will require you to 'rate' a series of images in terms of how well you feel they portray feelings of tranquillity.
- Next, you will complete the third and final creative task, which will require you to produce a 3 – D model or interpretation of a second basic cartoon image.
- You will be given a selection of modelling materials, and will be asked to choose the material that you feel will allow you to best interpret the image according to your own artistic preferences.
- Following this you will be asked a series of questions relating to how satisfied you are with your interpretation of the image. Whilst you are answering these questions, you will be required to listen to a second musical recording/and perform an associated reaction-time task (high load participants only)
- You have the right to withdraw from the experiment now, or at any time later in the experiment, should you wish to do so.
- All data given will remain anonymous and confidential at all times.
- Do you have any questions?
- Are you happy to continue?
- If so please inform the experimenter.

Thank-you and enjoy the experiment

## Appendix 2.9 – Instructions for Practice Musical Task

### Version One – Low Load Participants:

- Later in the experiment, you will be required to listen to a musical recording whilst answering questions about your satisfaction with your performance at the creative task you will have just completed.
- The musical recording consists of a series of notes – one played every two seconds, on one of four musical instruments – the piano, the cello, the steel drums, and the guitar.
- You will be required to simply ignore the musical distraction whilst completing the questionnaires.
- You will now be given a short practice session of this musical task, so that you will be prepared when to complete it when required later in the experiment.

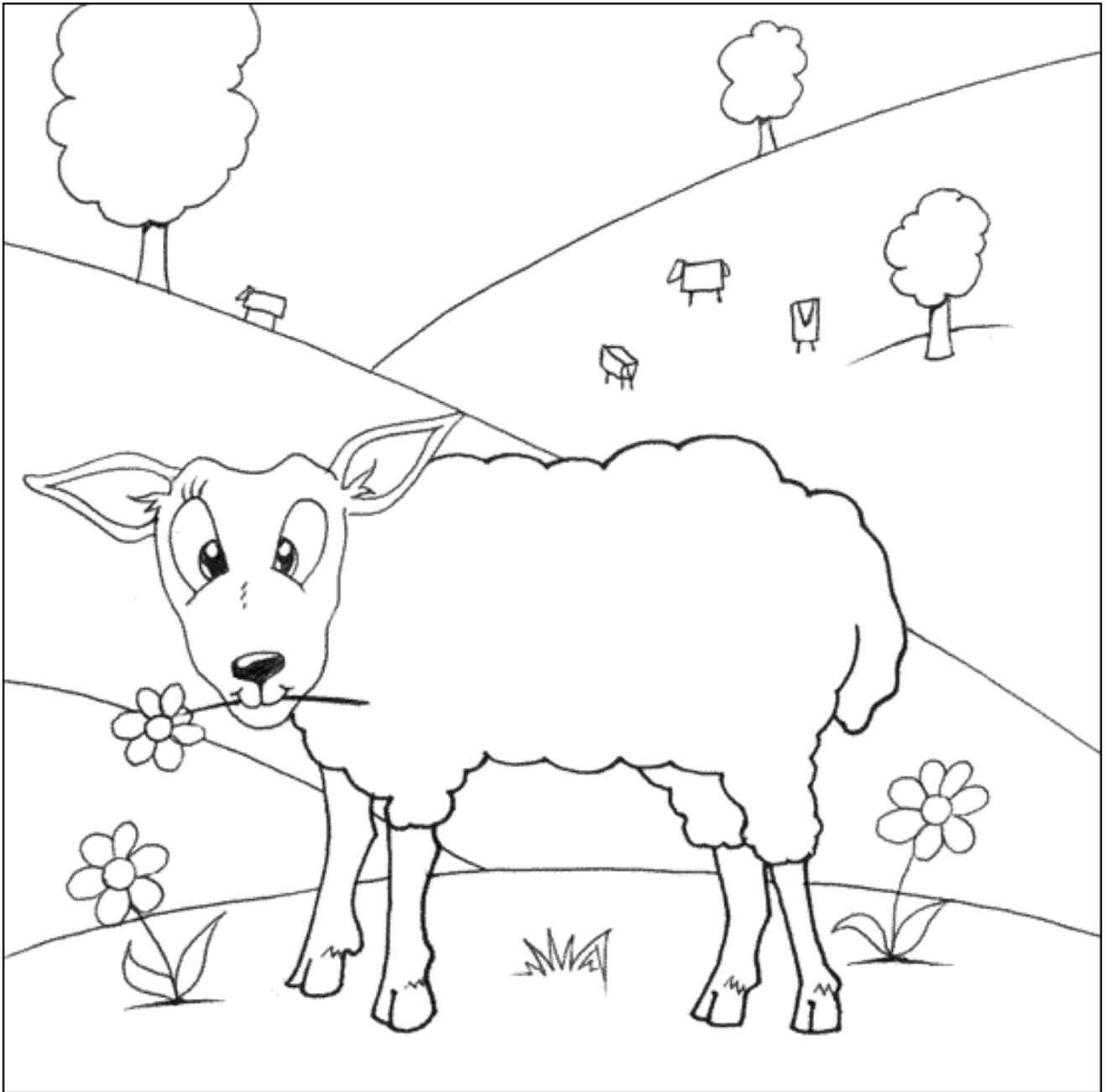
### Version Two – High Load Participants:

- Later in the experiment, you will be required to listen to a musical recording, and complete an associated reaction-time task, whilst answering questions about your satisfaction with your performance at the creative task you will have just completed.
- The musical recording consists of a series of notes – one played every two seconds, on one of four musical instruments – the piano, the cello, the steel drums, and the guitar.
- The reaction-time task will involve pressing the 'space' key on the keyboard every time you hear a piano note played.
- You will be required to undertake this reaction-time task whilst completing a questionnaire later in the experiment.
- You will now be given a short practice session of this musical reaction-time task, so that you will be prepared when to complete it when required later in the experiment.

## Appendix 2.10 – Instructions for Selecting a Drawing Implement

- You will shortly be asked to begin your first cartoon image ‘interpretation’.
- Please select the drawing implement that you would like to use for this part of the experiment from the selection on the table in front of you.
- Select the implement you feel would best allow you to interpret a cartoon image according to your own artistic preferences.
- Once you have made your selection, you will be given a set of instructions to guide you through the task.

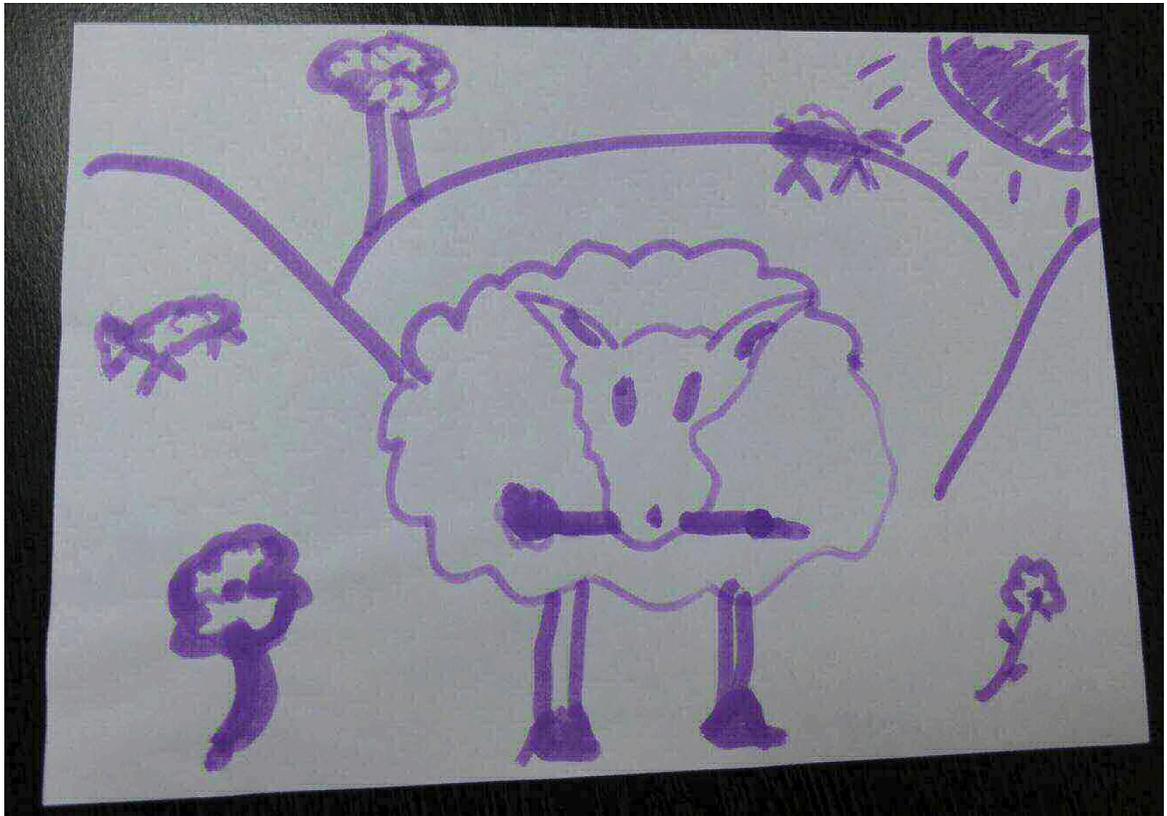
Appendix 2.11 – Cartoon ‘Sheep Field’ Image



## Appendix 2.12 – Drawing Task Instructions

- You will shortly begin the first creative task.
- Once you have finished reading these instructions please focus on the cartoon image on the piece of paper in front of you. You will be given a minute to study this picture, and to think about how you want to interpret it.
- The experimenter will inform you when this minute is up, and will then temporarily take the image away, so please note that you will not be able to refer back to it during the interpretation phase of the experiment.
- You will then be asked to begin your interpretation of the image.
- Please feel free to interpret the image in any style you wish. Remember this is an experiment on individual differences in creativity, so there are no right or wrong answers.
- You must interpret the image using the drawing implement you have just selected, and onto one of the blank pieces of paper provided.
- You will be given five minutes to complete your interpretation of the cartoon image, and the experimenter will notify you when this time is up.
- When the five minutes is up, you will be asked to complete a questionnaire relating to how satisfied you are with your interpretation of the image.
- Whilst you are completing this questionnaire, you will be required to simultaneously undertake the musical task, as practiced earlier.
- Do you have any questions?
- Are you happy to continue?
- If so, please begin the experiment.

Appendix 2.13 – Sample 'Interpretation' of Cartoon Sheep Field Image

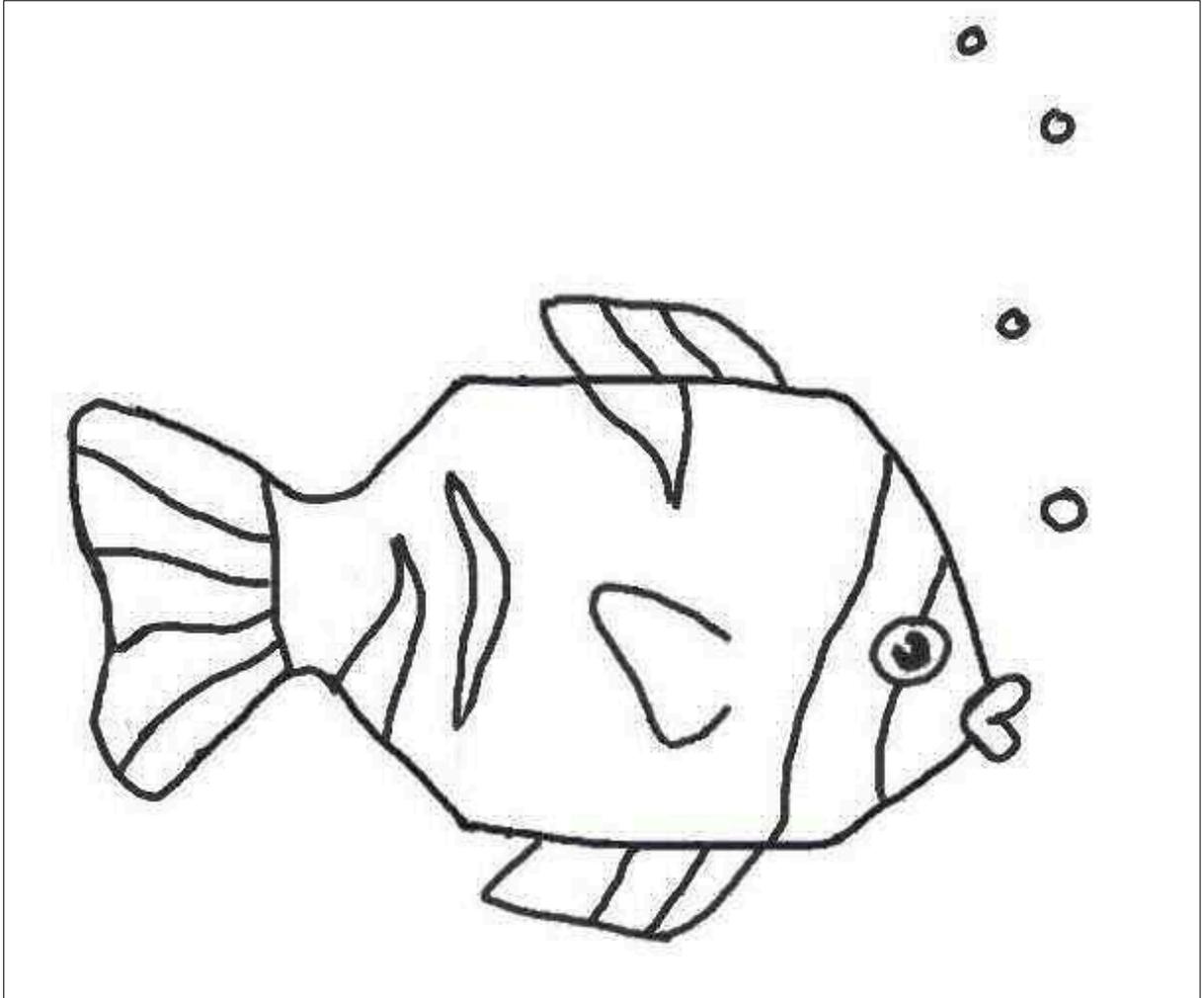


## Appendix 2.14 – Filler Task Questionnaire

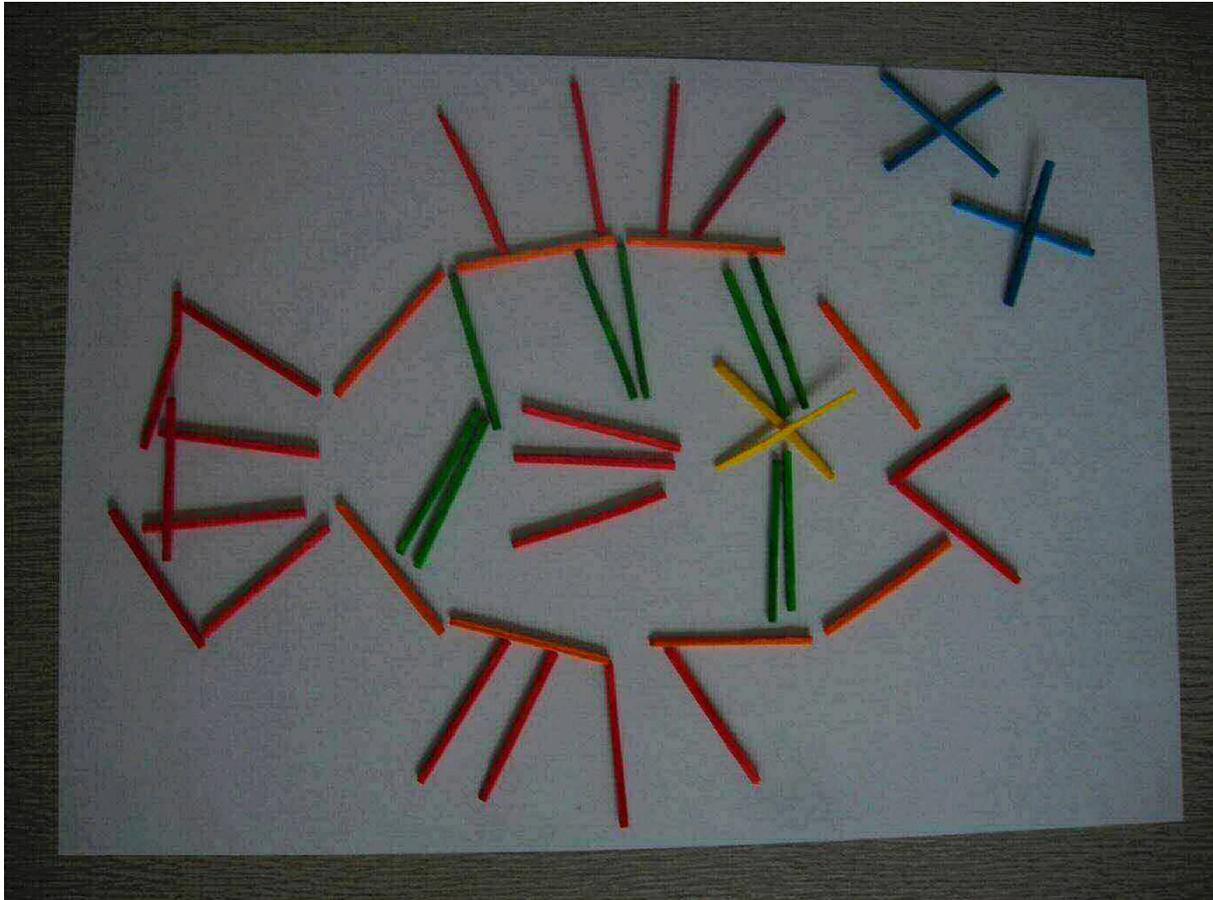
Please use the table provided below to rate each of the images in terms of how well you feel they portray feelings of **tranquillity**, using a scale of 1 (not at all tranquil) to 7 (extremely tranquil). Please circle the appropriate 'x' for each image in turn.

	Not at all tranquil		Moderately Tranquil			Extremely Tranquil	
	1	2	3	4	5	6	7
Image 1	x	x	x	x	x	x	x
Image 2	x	x	x	x	x	x	x
Image 3	x	x	x	x	x	x	x
Image 4	x	x	x	x	x	x	x
Image 5	x	x	x	x	x	x	x
Image 6	x	x	x	x	x	x	x
Image 7	x	x	x	x	x	x	x
Image 8	x	x	x	x	x	x	x
Image 9	x	x	x	x	x	x	x
Image 10	x	x	x	x	x	x	x
Image 11	x	x	x	x	x	x	x
Image 12	x	x	x	x	x	x	x
Image 13	x	x	x	x	x	x	x
Image 14	x	x	x	x	x	x	x
Image 15	x	x	x	x	x	x	x
Image 16	x	x	x	x	x	x	x
Image 17	x	x	x	x	x	x	x
Image 18	x	x	x	x	x	x	x
Image 19	x	x	x	x	x	x	x
Image 20	x	x	x	x	x	x	x
Image 21	x	x	x	x	x	x	x
Image 22	x	x	x	x	x	x	x
Image 23	x	x	x	x	x	x	x
Image 24	x	x	x	x	x	x	x
Image 25	x	x	x	x	x	x	x
Image 26	x	x	x	x	x	x	x
Image 27	x	x	x	x	x	x	x
Image 28	x	x	x	x	x	x	x
Image 29	x	x	x	x	x	x	x
Image 30	x	x	x	x	x	x	x

Appendix 2.15 – Cartoon Fish Image (used in Sculpting Task)



Appendix 2.16 – Sample 'Model/Interpretation' of Cartoon Fish Image (Sculpting Task)



## Appendix 2.17 – Experiment 1 Debrief

Participant Number:

The experiment has now finished. Thank-you for participating.

This study was investigating the effects of choice level on satisfaction in decision-making. Up to this point it has been necessary to withhold some of the information regarding the true aim of the experiment, so as not to bring conscious attention to the decision-making process, which could have otherwise affected the results. The main focus of the experiment was on your responses to the questionnaire, and your satisfaction with your choice of drawing implement, and modelling material.....not the picture you drew or the model you made. Previous research has found that people who are given an extensive choice are *less likely to be satisfied* with their choice than people who are given a limited choice (Iyengar & Lepper, 2000). Possible explanations for these findings include the fact that participants who are given an extensive choice may be more likely to feel an increased sense of responsibility for making a good decision, or to experience greater post-decision regret due to the fact that they had to turn down an increased number of alternatives (Schwartz, 2004).

However, this experiment was also designed to investigate the possibility that the dissatisfaction often experienced in such choice overload situations might in fact be caused by an *increased tendency to engage in counterfactual thinking*. As such, ability to engage in counterfactual thinking was manipulated using the music task, which placed participants under either a high or a low cognitive load (depending on their experimental condition). Those participants under a 'high load' carried out a reaction-time task, which involved pressing a buzzer every time they heard a piano note played. In contrast, those participants in the 'low load' conditions were simply told to ignore the musical distraction. It was predicted that those participants who were under a high cognitive load would be *less* able to engage in counterfactual thinking (as indicated by the reasons given on the questionnaires), and as such, that these participants would experience an *increase* in satisfaction levels, in comparison to participants who were placed under a low cognitive load.

In this study you were placed into one of four conditions. In condition one; participants were given a limited choice of six drawing implements/modelling materials, and were placed under a high cognitive load. In condition two; participants were also given a limited choice of six implements/materials, but were placed under a low cognitive load. In condition three participants were given an extensive choice of twenty-two drawing implements/modelling materials, and were placed under a high cognitive load, and in condition four; participants were also given an extensive choice of twenty-two drawing implements, and were placed under a low cognitive load.

It was predicted that those participants in the extensive choice conditions would be less satisfied with their choice of drawing implement and modelling material than those participants in the limited choice conditions. It was also predicted that participants who were placed under a high cognitive load would experience an *increase in satisfaction*, in comparison to the low-load participants, due to the fact that they would be less able to engage in counterfactual thinking.

I would like to remind you that all data has been kept completely anonymous and confidential throughout the experiment, and will be referred to in any future analysis by means of your participant number. You maintain the right to withdraw your data at any point after this experiment. Should you wish to do so please email me with your participant number which is at the top of this page.

Thank you for taking the time to participate in my experiment. If you have any further questions or concerns about your participation in the study please do not hesitate to contact me or Mat on one of the following:

[rebecca.hafner@plymouth.ac.uk](mailto:rebecca.hafner@plymouth.ac.uk)  
[mat.white@plymouth.ac.uk](mailto:mat.white@plymouth.ac.uk)

I would appreciate it if you would not discuss the background information relating to this study or its predictions with anyone, as this may affect data collection later on.

### References

Iyengar, S. S., & Lepper, M. R. (2000). When Choice Is Demotivating: Can One Desire Too Much of A Good Thing? *Journal of Personality and Social Psychology*, 79(6), 995 – 1006.

Schwartz, B. (2005). *The Paradox of Choice: Why More Is Less*. New York: HarperCollins Publishers.

## Appendix 2.18 – Experiment 2 Brief

- This is an experiment designed to investigate individual differences in creativity, with particular reference to the ways in which different people often interpret the same image in many different ways.
- You will shortly be shown two basic cartoon images, which you will then be asked to 'interpret' in turn, in your own style.
- You will be given a selection of drawing implements, and will be asked to choose the implement that you feel will allow you to best interpret the image according to your own artistic preferences.
- Following this you will be asked a series of questions relating to how satisfied you are with your interpretation of the image. Whilst you are answering these questions, you will be required to listen to a musical recording/ and perform an associated reaction-time task (high load participants only)
- After this, you will complete the second creative task, which will require you to 'rate' a series of images in terms of how well you feel they portray feelings of tranquillity.
- Next, you will complete the third and final creative task, which will require you to produce a 3 – D model or interpretation of a second basic cartoon image.
- You will be given a selection of modelling materials, and will be asked to choose the material that you feel will allow you to best interpret the image according to your own artistic preferences.
- Following this you will be asked a series of questions relating to how satisfied you are with your interpretation of the image. Whilst you are answering these questions, you will be required to listen to a second musical recording/ and perform an associated reaction-time task (high load participants only).
- You have the right to withdraw from the experiment now, or at any time later in the experiment, should you wish to do so.
- All data given will remain anonymous and confidential at all times.
- Do you have any questions?
- Are you happy to continue?
- If so please inform the experimenter.

Thank-you and enjoy the experiment

## Appendix 2.19 – Instructions for Experiment 2 Creative Task

- You will shortly begin your first cartoon image interpretation.
- Once you have finished reading these instructions please focus on the cartoon image on the A4 piece in paper in front of you. This is 'image one'. You will be given a minute to study this picture, and to think about how you want to interpret it.
- The experimenter will inform you when this minute is up, and will then temporarily take the image away, so please note that you will not be able to refer back to it during the interpretation phase of the experiment.
- You will then be asked to begin your interpretation of 'image one'.
- Please feel free to interpret the image in any style you wish. Remember this is an experiment on individual differences in creativity, so there are no right or wrong answers.
- You must interpret the image using the drawing implement you have just selected, and onto one of the blank pieces of paper provided.
- You will be given five minutes to complete your interpretation of 'image one' and the experimenter will notify you when this time is up.
- When the five minutes is up, you will be asked to complete a questionnaire relating to how satisfied you are with your interpretation of the image.
- Whilst you are completing this questionnaire, you will be required to simultaneously undertake the musical task, as practiced earlier.
- When this is completed you will be presented with the next cartoon image: 'image two', and will be asked to repeat the above procedure in order to complete your interpretation of this image.

'Reversible' participants were then instructed:

- PLEASE NOTE THAT YOU **WILL** BE ABLE TO CHANGE THE IMPLEMENT YOU HAVE JUST SELECTED BEFORE STARTING WORK ON 'IMAGE TWO', SHOULD YOU WISH TO DO SO.

Whilst 'non-reversible' participants were instructed:

- PLEASE NOTE THAT YOU **WILL NOT** BE ABLE TO EXCHANGE THE IMPLEMENT YOU HAVE JUST SELECTED AT ANY TIME DURING THE EXPERIMENT.
- Do you have any questions?
- Are you happy to continue? If so, please begin the experiment.

## Appendix 2.20 – Experiment 2 Extra Reversibility Question

### Version One – Reversible Conditions:

- You have the opportunity to change your choice of drawing implement before starting work on Image Two, should you wish to do so.
- Would you like to select a different implement for use in the next part of the experiment?
- Please tick the appropriate box.

**Yes**, I would like to select a different implement for the next part of the experiment.

**No**, I would like to use the same implement for the next part of the experiment.

### Version Two – Non-Reversible Conditions:

- At this point in the experiment some participants are given the opportunity to change their choice of drawing implement before starting work on Image Two.
- Had you been placed in this condition would you have taken up the opportunity to select a different implement for use in the next part of the experiment?
- Please tick the appropriate box.

**Yes**, I would have selected a different implement for the next part of the experiment.

**No**, I would not have selected a different implement for the next part of the experiment.

## Appendix 2.21 – Experiment 2 Debrief

Participant Number:

The experiment has now finished. Thank-you for participating.

This study was investigating the effects of reversibility on satisfaction in decision-making. Up to this point it has been necessary to withhold some of the information regarding the true aim of the experiment, so as not to bring conscious attention to the decision-making process, which could have otherwise affected the results. The main focus of the experiment was on your responses to the questionnaire, and your satisfaction with your choice of drawing implement....not the picture you drew! Previous research has shown that people who are given a reversible decision as *less likely to be satisfied* with their choice than people who are given a non-reversible decision (Gilbert & Ebert, 2002). It is suggested that this may be due to the fact that having the opportunity to change your mind post-decision results in people doing less psychological work to justify the decision they've made, in terms of reinforcing the chosen alternative, and disparaging the rejected alternatives (Schwartz, 2005).

However, this experiment was also designed to investigate the possibility that the dissatisfaction often experienced in reversible-decision scenarios might in fact be caused by an *increased tendency to engage in counterfactual thinking*. As such, ability to engage in counterfactual thinking was manipulated using the music task, which placed participants under either a high or a low cognitive load (depending on your experimental condition). Those participants under a 'high load' carried out a reaction-time task, which involved pressing a buzzer every time they heard a piano note played. In contrast, those participants in the 'low load' conditions were simply told to ignore the musical distraction. It was predicted that those participants who were under a high cognitive load would be *less* able to engage in counterfactual thinking (as indicated by the reasons given on the questionnaires), and as such, that these participants would experience an *increase* in satisfaction levels, in comparison to participants who were placed under a low cognitive load.

In this study you were placed into one of four conditions. In all conditions choice level was held constant, and all participants were presented with a choice between 10 implement options. In condition one: 'reversible/high load', participants were given a reversible decision (i.e. were allowed to change their choice of implement later on in the experiment), and were placed under a high cognitive load. In condition two: 'non-reversible/high load', participants were also placed under a high cognitive load, but were given a non-reversible decision (i.e. were not allowed to change their minds later on in the experiment). In condition three: 'reversible/low load', participants were given a reversible decision and placed under a low cognitive load, and in condition four: 'non-reversible/low load', participants were given a non-reversible decision and were placed under a low cognitive load.

It was predicted that those participants in the reversible choice conditions would be less satisfied with their choice of drawing implement than those participants in the non-reversible conditions. It was also predicted that participants who were placed under a high cognitive load would experience an *increase in satisfaction*, in comparison to the low-load participants, due to the fact that they would be less able to engage in counterfactual thinking.

I would like to remind you that all data has been kept completely anonymous and confidential throughout the experiment, and will be referred to in any future analysis by means of your participant number. You maintain the right to withdraw your data at any point after this experiment. Should you wish to do so please email me with your participant number which is at the top of this page. Thank you for taking the time to participate in my experiment. If you have any further questions or concerns about your participation in the study please do not hesitate to contact me or Mat on one of the following:

[rebecca.hafner@plymouth.ac.uk](mailto:rebecca.hafner@plymouth.ac.uk)  
[mat.white@plymouth.ac.uk](mailto:mat.white@plymouth.ac.uk)

I would appreciate it if you would not discuss the background information relating to this study or its predictions with anyone, as this may affect data collection later on.

### References

Gilbert, D. T., & Ebert, J. E. (2002). Decisions and Revisions: The Effective Forecasting Of Changeable Outcomes. *Journal of Personality and Social Psychology*, 82(4), 503 – 514.

Schwartz, B. (2005). *The Paradox of Choice: Why More Is Less*. New York: HarperCollins Publishers.

## Appendix 2.22 – Experiment 1 Counterfactual Analysis using *Proportions of Counterfactual Responses Generated*

The impact of choice level upon the *proportion* of counterfactual responses generated was examined using a 2 (choice: limited vs. extensive) X 2 (load: low vs. high) x 2 (task: picture vs. model) mixed factorial ANOVA with repeated measures on the last factor. Consistent with analysis using the total numbers of counterfactuals generated, results revealed no effects of choice level ( $F(1,96) = 1.58, p = .21, \eta^2 = .02$ ), load ( $F(1,96) = .003, p = .96, \eta^2 < .001$ ), or task ( $F(1,96) = 1.12, p = .29, \eta^2 = .01$ ), with similar proportions of counterfactual responses being generated under limited vs. extensive choice ( $M_s = .14, .18$ ), under low vs. high load ( $M_s = .16, .16$ ) and for the drawing and modelling tasks ( $M_s = .15, .17$ ).

In addition, a marginal interaction was found between choice and load:  $F(1,96) = 2.90, p = .09, \eta^2 = .03$ . Paralleling earlier satisfaction analyses once again there was no three way interaction between task, choice and load:  $F(1,96) = .99, p = .32, \eta^2 = .01$ , and no interaction between task and load:  $F(1,96) = .13, p = .72, \eta^2 = .001$ . However an unpredicted marginal interaction was found between task and choice:  $F(1,96) = 3.17, p = .08, \eta^2 = .03$ . Again this appeared to suggest that the impact of choice level upon the number of counterfactuals generated was more important for Task 1 than Task 2. Follow-up analyses were subsequently conducted on this marginal interaction in order to explore whether this was the case.

T-tests revealed that for the drawing task the impact of choice level upon counterfactual generation was broadly in line with predictions. Specifically, under low load counterfactual generation was significantly higher under extensive than limited choice ( $M_s = .20, .09; t(48) = -2.05, p = .05$ ), whilst under high load there was no impact of choice on counterfactual generation ( $t(48) = -1.00, p = .32$ ), with similar proportions of counterfactual thoughts being generated following extensive and limited choice ( $M_s = .18, .12$ ). However for the sculpting task, no effects of choice level were found upon counterfactual generation, with similar proportions of counterfactual responses being generated following extensive and limited choice under low ( $M_s = .21, .14; t(48) = -1.46, p = .15$ ), and high load ( $M_s = .13, .21; t(48) = 1.28, p = .21$ ). Again this appears to suggest that the impact of choice level upon counterfactual generation may be context dependent, to some extent. Nevertheless in order to get a balanced overview of the impact of choice level upon counterfactual generation across tasks I examine the effects collapsed across tasks during later counterfactual follow-up analyses.

Finally once again there was no interaction between task and load:  $F(1,96) = .13, p = .72, \eta^2 = .001$ , and no three way interaction between task, load and choice:  $F(1,96) = .99, p = .32, \eta^2 = .01$ . A simple main effects analysis was then conducted on the marginal interaction between choice and load in order to examine specific predictions that choice level would only influence the number of counterfactuals generated under low but not high load, collapsed across tasks. Analysis revealed that under low load the proportion of counterfactual responses generated was significantly higher following extensive than limited choice ( $M_s = .21, .11; F(1,96) = 4.37, p = .04, \eta^2 = .04$ ). Subsequently this provides support for predictions that under low load, more counterfactuals would be generated following extensive than limited choice. Under high load this effect of choice upon counterfactual generation was no longer significant ( $M_s = .15, .16; F(1,96) = .10, p = .75, \eta^2 = .001$ ).

In all there were no substantive differences in analyses using either the proportion of counterfactuals generated, or total numbers. The total numbers are therefore included in the main body text in order to give the reader a clearer overview of overall counterfactual prevalence.

## Appendix 2.23 – Experiment 2 Counterfactual Analysis using *Proportions* of Counterfactual Responses Generated

The impact of reversibility upon the *proportion* of counterfactual responses generated was examined using a 2 (reversibility: reversible vs. non-reversible) X 2 (load: low vs. high) between participants. In line with predictions, a main effect of reversibility was found:  $F(1,90) = .4.31, p = .04, \eta^2 = .05$ . The proportion of counterfactual responses generated was found to be lower overall in the non-reversible than reversible conditions ( $M_s = .10, .18$  respectively). However, contrary to predictions there was no main effect of load,  $F(1,90) = .10, p = .75, \eta^2 = .001$ , and no significant interaction,  $F(1,90) = .48, p = .49, \eta^2 = .005$ .

A simple main effects analysis was then carried out on the non-significant interaction (see Winer, 1971, for the justification of this procedure) in order to examine specific predictions that: a) under low load counterfactual thought would be greater following reversible than non-reversible choice, and b) under high load any impact of reversibility upon counterfactual generation would be reduced. Under low load the number of counterfactuals generated was found to be significantly higher following reversible than non-reversible choice:  $M_s = .20, .09; F(1,90) = 3.84, p = .05, \eta^2 = .04$ , consistent with predictions. In addition, under high load this effect of reversibility upon counterfactual generation was no longer found to be significant:  $F(1,90) = .96, p = .33, \eta^2 = .01$ , with similar proportions of counterfactual thoughts generated following reversible and non-reversible choice:  $M_s = .16, .11$  respectively.

In all, once again there were no substantive differences in analyses using either the proportion or total number of counterfactual responses generated. The total numbers are therefore presented in the main body text following the procedure used in Experiment 1, and in order to give the reader a clearer overview of overall counterfactual prevalence.



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### Appendix 3.3 – Additional Analyses for Time 2 Data

Preliminary analyses conducted using the 57 participants who did complete the Time 2 (Day 7) questionnaire revealed no evidence of an ECE:  $F(2,54) = .64$ ,  $p = .53$ ,  $\eta^2 = .02$ . Similar levels of satisfaction were found across the 2, 12 and 38 option conditions ( $M_s = 3.78, 3.40, 3.83$  respectively). This provides preliminary evidence in line with predictions that the ECE noted at the initial time of choice does not persist over time, and may reduce as little as 7 days after the initial time of choice.

### Appendix 3.4 – Additional Analyses for Time 3 Drop-Out Group

13.3% of participants failed to complete the Time 3 (Day 14) questionnaire. As this was considered a fairly significant drop-out rate, additional analyses were conducted in order to determine whether these 11 participants differed in any way from the remaining participant group. A one way ANOVA revealed that the drop-out group were significantly less satisfied at Time 1 (Day 1) than the remaining participants:  $F(1,81) = 13.02, p = .001, \eta^2 = .14$  ( $M_s = 3.36$  vs.  $4.86$  respectively), further justifying the exclusion of this data in the remaining analyses.

In addition, a chi squared test was then carried out in order to determine whether the 11 drop-outs were more likely to have been in any particular condition. However, analysis revealed no such effects:  $\chi^2(2, N = 83) = 3.09, p = .21$ . The drop outs were found to be equally likely to have been in the 2, 12 or 38 option conditions ( $N_s = 5; 4; 2$ , respectively).

Appendix 3.5 – Full Tables of Means for Chapter 3 Satisfaction (Table 1) and Counterfactual (Table 2) Analyses

Table 1. *Mean and standard deviations of participants' satisfaction levels according to choice level.*

Choice	Time 1		Time 3	
	Mean	(SD)	Mean	(SD)
2	4.38	1.36	3.94	1.81
12	5.28	1.13	3.55	1.66
38	4.70	1.20	3.44	1.53

Table 2. *Mean and standard deviations of participants' mean reported level of counterfactual thought according to choice level.*

Choice	Time 1		Time 3	
	Mean	(SD)	Mean	(SD)
2	4.81	1.60	2.13	1.50
12	4.72	1.60	2.66	1.91
38	5.22	1.40	2.85	1.79

### Appendix 3.6 – Time 3 Symptom Analyses minus Covariate

A similar pattern of results was found when the covariate was taken out of the Time 3 symptom analyses. A marginal main effect of choice level upon reported symptoms was found:  $F(2,69) = 3.00, p = .056, \eta^2 = .08$ . Participants reported experiencing fewer symptoms if they initially chose their essence from 12 rather than 2 or 38 options ( $M_s = 2.69$  vs 3.44, 3.63 respectively), and planned contrasts revealed this difference to be significant:  $F(1,69) = 5.36, p = .02, \eta^2 = .07$ .

Participant Number: Appendix 3.7 – Experiment 3 Debrief

The experiment is now over. Thank you for participating.

This experiment was looking to explore the long-term effects of choice level on satisfaction in decision making. For this experiment you chose a Bach's Flower Essence which you were then asked to use every day for a period of two weeks.

In this experiment you were placed into one of three conditions: in Condition One, participants were given a choice of 2 flower essences. In Condition Two, participants were given a choice of 12 flower essences, and in Condition Three, participants were given a choice of 38 different flower essences.

After making your choice of essence you were then asked to rate how happy you were with your decision. This satisfaction measure was then also repeated at the follow-up stages 7 and 14 days after the initial time of choice, via email.

Following on from the previous Excess-Choice-Effect (ECE) literature (e.g. Iyengar & Lepper, 2000; Shar & Wolford, 2007; Reutskaja & Hogarth, 2009), it was predicted that participants would be most satisfied with their choice if they chose from 12, rather than 2 or 28 options initially. The current experiment also aimed to extend this research by examining the extent to which this effect may be attributable to an underlying process of counterfactual thought.

Following this, it was also predicted that these differences in satisfaction according to choice level would reduce over time, due to the predicted reduction in counterfactual thought and emotion over time. This was assessed using the follow-up questionnaires on Day 7 and Day 14.

In addition, as well as assessing the long term impact of choice on psychological well-being, this research was also interested in exploring whether initial choice level could have any impact upon physiological well-being. In this manner, the research was based in the field of health psychology, and involved the use of Bach's Flower Essences. Importantly, these flower essences were selected as although many people believe them to be an active treatment, research has shown them to be no different from placebo (Armstrong & Ernst, 1999; Hyland, Geraghty, Joy & Turner, 2006; Walach, Rilling & Engelke, 2001). As such it was predicted that those participants who chose from 12 options initially may be more likely to experience a placebo effect over time, in terms of reported improvement in your physical symptoms over time, in comparison to those participants who chose from 2 or 38 options.

I would like to remind you that all data has been kept completely anonymous and confidential throughout the experiment, and will be referred to in any future analysis by means of your participant number. You maintain the right to withdraw your data at any point after this experiment. Should you wish to do so please email me with your participant number which is at the top of this page. Thank-you for taking the time to participate in my experiment. If you have any further questions or concerns about your participation in the study please do not hesitate to contact me or Mat on one of the following:

[rebecca.hafner@plymouth.ac.uk](mailto:rebecca.hafner@plymouth.ac.uk)

[mat.white@plymouth.ac.uk](mailto:mat.white@plymouth.ac.uk)

I would appreciate it if you would not discuss the background information relating to this study or its predictions with anyone, as this may affect data collection later on.

References:

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Appendix 4.1 – Experiment 4 chocolates, presented in individual paper cake cases



## Appendix 4.2 – Experiment 4, 5 and 6 Brief

- This is a market research study designed to examine people's flavour preferences, in order to provide feedback to a new up-and-coming chocolate company.
- To begin the experiment you will take part in a chocolate taste test.
- When you have finished reading this brief please read the instruction sheet on the table in front of you. This instruction sheet will guide you through the taste test.
- When you have eaten the chocolate please answer the questionnaire which is also on the table in front of you. This will relate to your experiences during the taste test.
- You have the right to withdraw from the experiment now, or at any time later in the experiment, should you wish to do so.
- All data given will remain anonymous and confidential at all times.
- Do you have any questions?
- Are you happy to continue?
- If so please begin by reading the instruction sheet on the table in front of you to start the chocolate taste test.

#### Appendix 4.3 – Experiment's 4 and 6 'Active Choice' Condition Instructions

- You will shortly be asked to sample one of the chocolates displayed on the table in front of you.
- When you are ready, please pick the chocolate you most like the look of, and most want to sample.
  
- Please now eat the chocolate you have selected.
- Once you have eaten the chocolate please complete the questionnaire provided.

#### Appendix 4.4 – Experiment's 4 and 6 'Default Choice' Condition Instructions

- The chocolate on the table in front of you has been pre-selected for you to sample.
- **Are you happy to sample this chocolate or would you like to switch to another chocolate type? (Please record your answer by ticking one of the two boxes below):**

Yes I am happy to try the pre-selected chocolate

No I would like to switch to another chocolate type

- If you have chosen to try the pre-selected chocolate please now eat the chocolate.
- Please then answer the questionnaire provided.
- If you have chosen to switch to another chocolate type please turn over the instruction sheet marked 'switch' on the table in front of you.

#### Appendix 4.5 – ‘Switch’ Instructions

- If you have chosen to switch to a different chocolate type, please carefully consider all of the options displayed in front of you.
- When you are ready, please pick the chocolate you most like the look of, and most want to sample.
- Please now eat the chocolate you have selected.
- Once you have eaten the chocolate please answer the questionnaire provided, which relates to your taste experiences.

## Appendix 4.6 – Control Group Instructions

- You will now be asked to begin the chocolate taste test.
- A chocolate has been placed on the table in front of you.
- When you have finished reading these instructions please eat the provided chocolate, and then answer the questionnaire provided which relates to your taste experiences.

Appendix 4.7 – Active and Default Conditions Questionnaire

- On a scale of 1 (strongly disagree) to 7 (strongly agree) please indicate your responses to the following questions and statements, by circling the corresponding number.
- Please then use the spaces provided underneath to explain **at least two reasons why you responded in that particular way** – i.e. the reasons why you agreed or disagreed with each preceding statement.

**1. The flavour of the chocolate I sampled was unusual**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**2. I enjoyed the chocolate I tasted**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**3. I was NOT satisfied with the chocolate I sampled**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**4. The chocolate I sampled was tasty**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**5. I regret choosing the chocolate I selected(active choice conditions)/ I regret choosing to stick with/switch from (delete as appropriate) the default chocolate(default choice conditions)**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**6. As you know, payment for participating in the study is £3 cash. You can now choose between getting £3 cash, or alternatively you can have a box of six chocolates that is worth £3. Which one would you like for participating in the study? Please tick one answer:**

Cash

Chocolates

## Appendix 4.8 – Control Group Questionnaire

On a scale of 1 (strongly disagree) to 7 (strongly agree) please indicate your responses to the following questions and statements, by circling the corresponding number.

### 1. The flavour of the chocolate I sampled was unusual

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

### 2. I enjoyed the chocolate I tasted

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

### 3. I was not satisfied with the chocolate I sampled

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

### 4. The chocolate I sampled was tasty

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

### 5. Do you regret eating the chocolate you tasted?

*Not at all*

*Very much*

1                      2                      3                      4                      5                      6                      7

## Appendix 4.9 – Experiment 4, 5 and 6 Debrief

Participant Number:

The experiment is now over. Thank you for participating.

This experiment was designed to investigate the action/inaction effect within the field of decision making. Up to this point it has been necessary to withhold some of the information regarding the true aim of the experiment, so as not to bring conscious attention to the decision-making process, which could have otherwise affected the results. The main focus of the experiment was on your responses to the questionnaires, and your satisfaction with your choice of chocolate in relation to which of three experimental conditions you were placed in.

In condition one, participants were asked to make an active choice of which chocolate they would like to sample, from an extensive (24) set of options. In condition two, participants were given a default option, and were asked whether they would like to stick or switch to a different chocolate type. In condition three (the control group) participants were simply given one chocolate with no option to change. Previous research has shown that extensive choice may be associated with decreased post-decisional satisfaction (e.g. Iyengar & Lepper, 2000). The current research attempted to address this via the application of counterfactual theory. It has been demonstrated that counterfactual thinking may be cued more readily for actions rather than inactions (e.g. Kahneman & Tversky, 1982a; Landman, 1987; Gilovich & Medvec, 1994). As such the current experiment was designed to see whether satisfaction with extensive choice might be improved via the addition of a default option, due to the predicted impact of this upon counterfactual thought.

I would like to remind you that all data has been kept completely anonymous and confidential throughout the experiment, and will be referred to in any future analysis by means of your participant number. You maintain the right to withdraw your data at any point after this experiment. Should you wish to do so please email me with your participant number which is at the top of this page.

Thank you for taking the time to participate in my experiment. If you have any further questions or concerns about your participation in the study please do not hesitate to contact me or Mat on one of the following:

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[mat.white@plymouth.ac.uk](mailto:mat.white@plymouth.ac.uk)

I would appreciate it if you would not discuss the background information relating to this study or its predictions with anyone, as this may affect data collection later on.

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Appendix 4.10 – Behavioural Indicator of Satisfaction used in Experiment 5

**As you know, payment for participating in the study is one participation point. As an extra thank-you for participating you have the option of taking an extra one of the chocolates you selected home with you. Would you like to take one of the chocolates you selected home with you? Please tick one answer:**

Yes please

No thanks

#### Appendix 4.11 – Experiment 5 ‘Active Choice’ Condition Instructions

- Please look at the selection of chocolates displayed on the table in front of you.
- This selection consists of a variety of flavours including some liqueur chocolates, some fruit flavoured chocolates, some truffles, some caramels, and other assorted flavours.
- You will shortly be asked to sample one of these chocolates.
- In order to select this chocolate, please look at each chocolate in turn.
- When you are ready, please pick the chocolate you most like the look of, and most want to sample.
  
- Please now eat the chocolate you have selected.
- Once you have eaten the chocolate please complete the questionnaire provided.
  
- Once you have completed ‘Questionnaire Two’ please move on to ‘Questionnaire Three’ and ‘Questionnaire Four’ in turn.

#### Appendix 4.12 – Experiment 5 ‘Default Choice’ Condition Instructions

- Please look at the selection of chocolates displayed on the table in front of you.
- This selection consists of a variety of flavours including some liqueur chocolates, some fruit flavoured chocolates, some truffles, some caramels, and other assorted flavours.
- **The chocolate on the table in front of you has been pre-selected from this selection for you to sample.**
- **Are you happy to sample this chocolate or would you like to switch to another chocolate type? (Please record your answer by ticking one of the two boxes below):**

Yes I am happy to try the pre-selected chocolate

No I would like to switch to another chocolate type

- If you have chosen to try the pre-selected chocolate please now eat the chocolate.
- Please then answer the questionnaire provided.
  
- **Alternatively, if you have chosen to switch to another chocolate type please turn over the instruction sheet marked ‘switch’ on the table in front of you.**

Appendix 4.13 – Supplementary tables for Experiment 6

Table 1. Mean difference and standard errors of pairwise comparisons for choice type for Positive Outcomes – Experiment 6.

Positive Outcomes							
		Satisfaction			Regret		
Pairwise Comparison		Mean Difference	Sig.	(SE)	Mean Difference	Sig.	(SE)
Active	Default	-.064	.874	.404	.464	.318	.462
	Control	.212	.582	.383	.119	.788	.439
Default	Active	.064	.874	.404	-.464	.318	.462
	Control	.276	.488	.397	-.345	.449	.454
Control	Active	-.212	.582	.383	-.119	.788	.439
	Default	-.276	.488	.397	.345	.449	.454

Table 2. Mean difference and standard errors of pairwise comparisons for choice type for Negative Outcomes – Experiment 6.

Negative Outcomes							
		Satisfaction			Regret		
Pairwise Comparison		Mean Difference	Sig.	(SE)	Mean Difference	Sig.	(SE)
Active	Default	.067	.879	.437	.800	.112	.500
	Control	-1.167*	.009	.437	2.350*	.000	.500
Default	Active	-.067	.879	.437	-.800	.112	.500
	Control	-1.233*	.006	.437	1.550*	.002	.500
Control	Active	1.167*	.009	.437	-2.350*	.000	.500
	Default	1.233*	.006	.437	-1.550*	.002	.500

#### Appendix 4.14 – Experiment 7 Forecasting Questionnaire

- Please now look at Photo 1 and Photo 2 on the table in front of you. These photos are of different experimental conditions in a chocolate tasting experiment.
- In **Photo 1 (Condition 1)**, participants are given a choice of 24 different chocolates, and are asked to select which one they would like to sample.
- In **Photo 2 (Condition 2)**, participants are given one chocolate, **a default**, and are given the option of sampling this default, OR switching to one of the other 23 chocolates
- Finally, in **Condition 3** participants are given one chocolate, but this time have no opportunity to change, and are simply asked to sample this chocolate.
- **Please imagine you are taking part in this experiment. Which condition would you rather be in? (Please tick the appropriate box)**

**Photo 1/ Condition 1** (active choice from 24 options)

**Photo 2/ Condition 2** (given a default but with the opportunity to change)

**Condition 3** (given one chocolate with no chance to change)

#### Appendix 4.15 – Experiment 4 Counterfactual Analysis using *Proportions* of Counterfactual Responses Generated

Data from the counterfactual ‘thought-listing’ aspect of the questionnaire were then analysed in order to examine the prediction that inactive (default) choice participants would generate less counterfactual thoughts than active choice participants. A one way ANOVA revealed no effect of choice type upon the proportion of counterfactual responses generated:  $F(1,46) = 2.62, p = .11, \eta^2 = .05$ . Counterfactual generation was found to be similar in the active choice, and default stick conditions ( $M_s = .01, .04$ ).

As per the results using the total number of counterfactual responses generated, these results appear to go against earlier predictions that participants in the default condition would generate fewer counterfactuals than participants who made an active choice. However the very low levels of counterfactuals generated overall (c.f. the counterfactual rates in Experiments 1 and 2 using the same method) parallels the earlier finding that there were no differences in satisfaction according to the active/default choice manipulation.

Subsequently as no substantive differences were found whether I used the total number of counterfactual responses, or the proportion of counterfactual responses, the total number of counterfactuals is reported in the main body text in order to provide the reader with a clearer perspective on overall counterfactual generation.

#### Appendix 4.16 – Experiment 5 Counterfactual Analysis using *Proportions* of Counterfactual Responses Generated

Data from the counterfactual ‘thought-listing’ aspect of the questionnaire were then analysed in order to examine the prediction that inactive (default) choice participants would generate less counterfactual thoughts than active choice participants. Consistent with main analyses using total numbers of counterfactuals generated, a one way ANOVA revealed a marginal effect of choice type upon the proportion of counterfactual responses generated:  $F(1,83) = 3.11, p = .08, \eta^2 = .04$ . Once again the number of counterfactual thoughts generated was found to be marginally higher in the active than in the default stick condition ( $M_s = .05, .02$ ).

Consequently as per Experiments 1, 2, and 4, once again no substantive differences were found whether I used the proportion or total number of counterfactual responses generated: in both cases evidence was found for a marginal counterfactual *action effect*. Given that, and following the procedures used in previous experiments, the total numbers are therefore included in the main body text in order to give the reader a clearer overview of overall counterfactual prevalence.

## Appendix 5.1 – Drinks Pilot Test Instructions

- For the second part of the experiment you will be asked to sample a small amount of 8 different types of flavoured water.
- In between each sample you will be required to drink a small amount of mineral water to take away the taste of the previous sample.
- Please ensure you have enough mineral water left in your glass for this (after the chocolate sampling), and pour more if necessary.
- The drinks samples are displayed on the table in front of you (labelled 'SAMPLE 1 – 8')
- When you have finished reading these instructions please begin the experiment by drinking 'SAMPLE ONE' and then answering the first set of questions on the questionnaire which relate to your enjoyment and taste perception of that sample.
- Once you have finished this first set of questions please drink some mineral water to take away the taste of this sample, and then drink 'SAMPLE TWO', and answer the questions relating to this sample
- Please continue with this procedure until you have tried all 8 samples.

## Appendix 5.2 – Chocolate Pilot Test Instructions

- For the first part of the experiment you will be asked to sample a small amount of 8 different types of chocolate.
- In between each sample you will be required to drink a small amount of mineral water to take away the taste of the previous sample.
- Please pour yourself a glass of mineral water now in preparation for this.
- The chocolate samples are displayed on the table in front of you (labelled 'SAMPLE 1 – 8')
- When you have finished reading these instructions please begin the experiment by eating 'SAMPLE ONE' and then answering the first set of questions on the questionnaire which relate to your enjoyment and taste perception of that sample.
- Once you have finished this first set of questions please drink some mineral water to take away the taste of this sample, and then eat 'SAMPLE TWO', and answer the questions relating to this sample
- Please continue with this procedure until you have eaten all 8 samples.

Appendix 5.3 – Drinks Pilot Test Questionnaire

On a scale of 1 (strongly disagree) to 7 (strongly agree) please indicate your responses to the following questions and statements, by circling the corresponding number.

**SAMPLE ONE**

**1. I enjoyed the drink I just sampled**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

**2. If I had to give the drink I just tasted a score from 1 – 10 with 1 being really unpleasant, and 10 being totally delicious I would give it a score of:**

*Really Unpleasant*

*Totally delicious*

1      2      3      4      5      6      7      8      9      10

**3. The drink I sampled was tasty**

*Strongly Disagree*

*Strongly Agree*

1                      2                      3                      4                      5                      6                      7

**4. Do you regret drinking the drink you just sampled?**

*Not at all*

*Very much*

1                      2                      3                      4                      5                      6                      7

**5. To what extent were you familiar with the flavour of the drink you just tasted?**

*Not at all familiar*

*Very familiar*

1                      2                      3                      4                      5                      6                      7

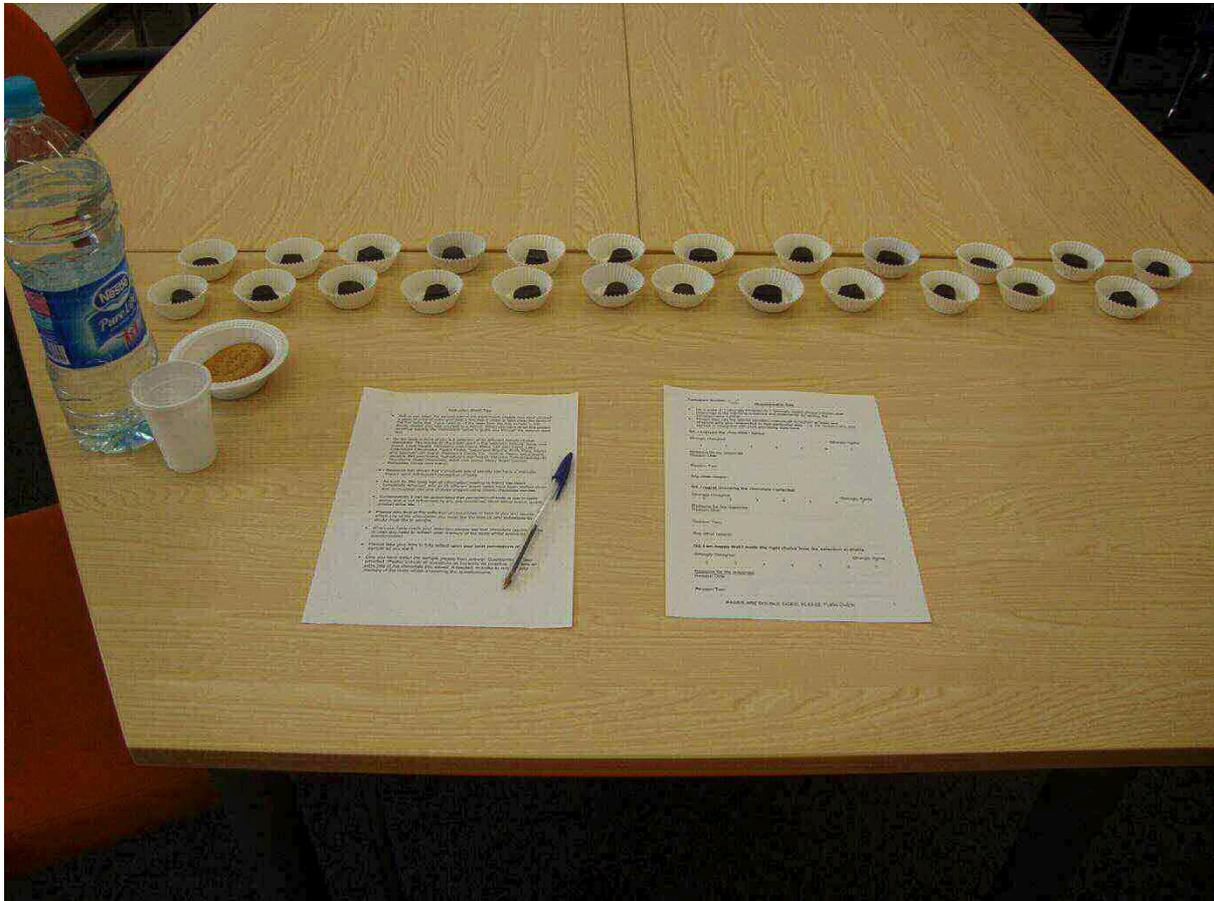
**6. If you were familiar with the flavour of the drink you just tasted, which flavour/brand, if any, did it remind you of?(If none please put 'none').**

**“It reminded me of: \_\_\_\_\_”**

## Appendix 5.4 – Experiment 8 – Selection of Drinks used in Extensive Choice Condition



Appendix 5.5 – Experiment 8 – Selection of Re-Moulded Chocolates used in Extensive Choice Condition



## Appendix 5.6 – Experiment 8 Brief

- This experiment is designed to investigate the degree to which different tastes and flavour preferences are influenced by individual differences, and visual cues.
- You will be required to complete two taste tests, one with flavoured waters and one with chocolates.
- When you have finished reading this brief, please read 'Instruction Sheet One', which will guide you through the first taste test.
- After completing this taste test please answer 'Questionnaire One', which will relate to your taste experiences.

- 
- After this you will be required to complete the second taste test. Please refer to 'Instruction Sheet Two' for this, and then answer 'Questionnaire Two' when the taste test is complete.
  - You have the right to withdraw from the experiment now, or at any time later in the experiment, should you wish to do so.
  - All data given will remain anonymous and confidential at all times.
  - Do you have any questions?
  - Are you happy to continue?
  - If so please begin by reading the 'Instruction Sheet One' on the table in front of you to start the first taste test.

## Appendix 5.7 – Experiment 8 Experimental Set-Up



## Appendix 5.8 – Drinks Taste Test Instructions

- This experiment is designed to investigate individual differences in taste perception.
- On the table in front of you is a selection of 24 (*extensive choice conditions only*) / 6 (*limited choice conditions only*) different flavoured waters.
- The waters displayed in front of you are 24 different flavours including: orange and mango, tropical fruits, blackcurrant, cherry, banana, white grape and pear, aniseed, plum, apple and raspberry, orange, blueberry, elderflower, red grape and lime, pomegranate, lemon and lime, summer fruits, peach, peppermint, raspberry, apple and pear, cranberry, blackberry and apple, strawberry and passion-fruit (*extensive choice conditions only*).
- / The waters displayed in front of you are 6 different flavours including: orange and mango, blackcurrant, banana, lemon and lime, peppermint, and apple and pear (*limited choice conditions only*).
- Please now look at the selection carefully, and decide which one of the waters you most like the look of, and subsequently would most like to sample.
- When you have made your selection please pour a small amount of that sample into one of the plastic cups provided, and then drink it.
- Please take your time to fully reflect upon your taste perceptions of the sample as you drink it.
- Once you have drunk the sample please then answer the questionnaire provided. Please answer all questions as honestly as possible, and take extra sips of your selected sample if needed to refresh your memory of the taste whilst answering the questionnaire.

## Appendix 5.9 – Chocolate Taste Test Instructions

- On the table in front of you is a selection of 24 (*extensive choice conditions only*) different brands of milk (*positive valence condition only*) / dark (*negative valence condition only*) chocolate. The brands of chocolate used in this selection include: Asda own brand, Lindt, Nestlé, Morrisons own brand, Milka, Lidl own brand, Lake Champlain Chocolates, Tesco Finest, Green and Black's, Kraft, Meiji, Marks and Spencer own brand, Pearson's Candy Co., Godiva, Tesco value brand, Jacob's, Aldi own brand, Sainsbury's own brand, Mauxion Schokoladefabrik, Thornton's, Hotel Chocolate, IKEA own brand, Nicky Grant Cornish Patissiere, Co-op own brand.
- On the table in front of you is a selection of 6 (*limited choice conditions only*) different brands of milk (*positive valence condition only*) / dark (*negative valence condition only*) chocolate. The brands of chocolate used in this selection include: Lidl own brand, Thornton's, Sainsbury's own brand, Green and Black's, Marks and Spencer's own brand, and Nicky Grant Cornish Patissieré.
- Research has shown that a products brand identity can have a dramatic impact upon subsequent perception of taste.
- As such for this taste test all information relating to brand has been completely removed, and all 24 / 6 different brand types have been melted down and re-moulded into one of three shapes using plastic chocolate moulds.
- Consequently it can be guaranteed that perception of taste is due to taste alone, and is not influenced by any pre-conceived ideas about brand, quality, product price etc.
- Please now look at the selection of chocolates in front of you and decide which one of the chocolates you most like the look of, and subsequently would most like to sample.
- When you have made your selection please eat that chocolate (saving a little in case you need to refresh your memory of the taste whilst answering the questionnaire).
- Please take your time to fully reflect upon your taste perceptions of the sample as you eat it.
- Once you have eaten the sample please then answer the questionnaire provided. Please answer all questions as honestly as possible, and take an extra bite of the chocolate you saved, if needed, in order to refresh your memory of the taste whilst answering the questionnaire.

Appendix 5.10 – Experiment 8 Questionnaire

- On a scale of 1 (strongly disagree) to 7 (strongly agree) please indicate your responses to the following questions and statements, by circling the corresponding number.
- Please then use the spaces provided underneath to explain **at least two reasons why you responded in that particular way** – i.e. the reasons why you agreed or disagreed with each preceding statement.

**Q1. The drink/chocolate I tasted had an unusual flavour**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**Q2. I regret choosing the drink / chocolate I selected**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**Q3. I am happy that I made the right choice from the selection available**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**Q4. I was NOT satisfied with the drink/chocolate I sampled**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**Q5. The drink/chocolate I sampled was tasty**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

**Q6. I believe my choice of drink / chocolate PREVENTED ME from having an enjoyable taste experience during the experiment**

*Strongly Disagree*

*Strongly Agree*

1

2

3

4

5

6

7

Reasons for my response:

Reason One:

Reason Two:

Any other reason:

## Appendix 5.11 – Experiment 8 Debrief

Participant Number:

The experiment is now over, thank-you for participating.

The experiment was investigating the excess-choice-effect (ECE), wherein conflicting evidence has been found for and against the notion that increased choice can lead to decreased satisfaction with the chosen option (e.g. Iyengar & Lepper, 2000; Shar and Wolford, 2007; Scheibehenne, Greifeneder & Todd, 2010).

The current experiment was designed to further this research by testing the hypothesis that the ECE may be more prevalent when the outcome of that choice is a relatively bad or unpleasant one. In cases where the outcome is pleasant or enjoyable it is predicted that the effects of excess choice in causing decreased satisfaction will be reduced/ will no longer be apparent.

For this study you took part in two taste tests, a chocolate taste test and a drinks taste test. In both cases you were either presented with a limited selection of 6 options, or an extensive selection of 24 options. Further to this, all of the outcomes you were presented with were either deemed as above or below average enjoyment levels (determined through previous pilot testing). So it was pre-determined that you would either get a relatively good or a relatively bad outcome from the selection, regardless of your choice.

It was predicted that those participants in the relatively bad outcome conditions would be less satisfied with their choices if presented with an extensive, rather than a limited, number of options, providing support for the ECE. Whereas for those participants in the relatively good outcome conditions, it was predicted that choice level would have a reduced impact upon satisfaction levels.

I would like to remind you that all data has been kept completely anonymous and confidential throughout the experiment, and will be referred to in any future analysis by means of your participant number. You maintain the right to withdraw your data at any point after this experiment. Should you wish to do so please email me with your participant number which is at the top of this page.

Thank-you for taking the time to participate in my experiment. If you have any further questions or concerns about your participation in the study please do not hesitate to contact me or Mat on one of the following:

[rebecca.hafner@plymouth.ac.uk](mailto:rebecca.hafner@plymouth.ac.uk)  
[mat.white@plymouth.ac.uk](mailto:mat.white@plymouth.ac.uk)

I would appreciate it if you would not discuss the background information relating to this study or its predictions with anyone, as this may affect data collection later on.

### References

Iyengar, S. S., & Lepper, M. R. (2000). When Choice Is De-motivating: Can One Desire Too Much of a Good Thing? *Journal of Personality and Social Psychology*, 79(6), 995 – 1006.

Scheibehenne, B., Greifeneder, R., & Todd, P. M. (2010). Can There Ever Be Too Many Options? A Meta-Analytic Review of Choice Overload. *Journal of Consumer Research*, 37, 409 – 425.

Shar, A. M., & Wolford, G. (2007). Buying Behaviour as a Function of Parametric Variation of Number of Choices. *Psychological Science*, 18(5), 369 – 370.

## Appendix 5.12 – Experiment 8 Counterfactual Analysis using *Proportions* of Counterfactual Responses Generated

The counterfactual analyses were also run using the proportion of counterfactual responses generated, and results were found to parallel earlier analysis using the total numbers counterfactuals. Specifically, t-tests revealed that the valence manipulation was also successful: participants were found to generate a greater proportion of counterfactual thoughts following negative than positive outcomes ( $M_s = .26$  vs.  $.15$ ,  $t(94) = 2.48$ ,  $p = .02$ ). Supporting this, a 2 (valence: positive vs. negative) X 2 (choice level: limited vs. extensive) ANOVA revealed a significant main effect of valence on the proportion of counterfactual responses generated:  $F(1,92) = 6.47$ ,  $p = .01$ ,  $\eta^2 = .07$ . No main effect of choice level was found:  $F(1,92) = 1.07$ ,  $p = .30$ ,  $\eta^2 = .01$ , however, a significant interaction was found between valence and choice level:  $F(1,92) = 4.04$ ,  $p = .05$ ,  $\eta^2 = .04$ .

A simple main effects analysis was then conducted to follow up the interaction in order to examine specific predictions that participants would generate more counterfactuals under extensive than limited choice only where outcomes were negative. Results were found to provide support for this prediction. Specifically, where outcomes were negative participants were found to generate more counterfactuals under extensive than limited choice:  $M_s = .32, .19$ ;  $F(1,92) = 4.54$ ,  $p = .04$ ,  $\eta^2 = .05$ . Where outcomes were positive, this effect of choice level was not significant:  $F(1,92) = .49$ ,  $p = .49$ ,  $\eta^2 = .005$ , with similar proportions of counterfactual responses being generated following extensive and limited choice ( $M_s = .13, .17$  respectively).

In all, for this experiment the results were found to be even more pronounced using the proportions of counterfactuals generated, as opposed to the total numbers of counterfactuals generated. However, the total numbers are reported in the main text in order to maintain consistency with the procedure used in previous chapters, and in order to provide the reader with a clearer indication of overall counterfactual prevalence.

## Appendix 5.13 – Experiment 8 Analysis of Chocolate Task Data

### *Satisfaction Analyses*

A 2 (valence: positive vs. negative) X 2 (choice level: limited vs. extensive) ANOVA revealed no main effect of valence ( $F(1,92) = 2.44, p = .20, \eta^2 = .03$ ), or choice level ( $F(1,92) = .01, p = .92, \eta^2 < .001$ ) upon satisfaction. In addition, there was no interaction between valence and choice level:  $F(1,92) = .01, p = .92, \eta^2 < .001$ . Satisfaction was found to be similar in the positive and negative ( $M_s = 5.44, 5.00$ ), extensive and limited ( $M_s = 5.21, 5.24$ ) choice conditions.

### *Counterfactual Analyses*

A 2 (valence: positive vs. negative) X 2 (choice level: limited vs. extensive) ANOVA revealed no effect of valence ( $F(1,92) = 1.91, p = .17, \eta^2 = .02$ ), or choice level ( $F(1,92) = .21, p = .65, \eta^2 = .002$ ) on the total number of counterfactuals generated. In addition, no interaction was found between valence and choice level:  $F(1,92) = .38, p = .54, \eta^2 = .004$ , with similar proportions of counterfactuals generated in the positive and negative ( $M_s = .24, .14$ ), extensive and limited ( $M_s = .20, .18$ ) choice conditions, providing support for earlier satisfaction analyses.

In all, as reported in the main text (Section 5.8.1) the manipulation of valence was not found to work for the chocolates task. Therefore, as both the 'positive' and 'negative' outcome conditions were both perceived as being relatively positive (in comparison to the pilot test data using the same chocolates, and in comparison to the drinks task 'negative' outcome condition), one would not necessarily expect to have found any further effects of choice level, as based on the findings of the previous chapters, we have seen that a negative task outcome may be a key factor contributing to the prevalence of the ECE. Consequently these results appear to be consistent with the finding that any outcome perceived in a positive manner may be less likely to lead to any experience of an ECE. However as the main aim of this task was to provide a contrast between a negative with a positive outcome condition in order to establish whether this was the case, and as the manipulation of valence was unsuccessful in this instance, the data from this task are subsequently excluded from main analyses in order to focus upon the drinks task, where the manipulation of valence was found to work as intended.