University of Bath

Alternative formats
If you require this document in an alternative format, please contact:
openaccess@bath.ac.uk

The Excess Choice Effect: The Role of Outcome Valence and

Counterfactual Thinking

Rebecca J. Hafner*, Mathew P. White and Simon J. Handley

University of Plymouth

* Correspondence Address: School of Psychology, Plymouth University, Drake

Circus, PL4 8AA, Devon, UK. Email: rebecca.hafner@plymouth.ac.uk.

Abstract

Contrary to economic theory, psychological research has demonstrated increased choice can undermine satisfaction. When and why this 'excess choice effect' (ECE) occurs remains unclear. Building on theories of counterfactual thinking we argue the ECE is more likely to occur when people experience counterfactual thought or emotion and that a key trigger is a negative versus positive task outcome. Participants selected a drink (Experiment 1) or chocolate (Experiment 2) from either a limited (6) versus extensive (24) selection (Experiment 1), or were given no choice versus extensive (24) choice (Experiment 2). In both experiments, however, the choice was illusory: Half the participants tasted a 'good' flavour, half a 'bad' flavour. As predicted, extensive choice was only detrimental to satisfaction when participants tasted the 'bad' drink or chocolate, and this was mediated by the experience of counterfactual thought (Experiment 1) or emotion (Experiment 2). When outcomes were positive participants were similarly satisfied with limited versus extensive and no choice versus extensive choice. Implications for our theoretical understanding of the ECE and construction of choice architectures are discussed.

Introduction

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; Botti & Iyengar, 2006). Choice provision can be direct, e.g. letting patients choose hospitals (Fasolo, Reutskaja, Dixon & Boyce, 2010), or indirect by increasing income and thus access to options (Dolan & White, 2007). Crucially, psychological research has challenged 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 be detrimental to satisfaction, and may a) lower the utility experienced from consumption of the chosen good (Chernev 2003a; 2003b; Greifeneder, Scheibehenne & Kleber, 2010), and b) dampen overall product demand (Shar & Wolford, 2007; Iyengar, Jiang & Huberman, 2004).

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), or the excess-choice effect (Arunachalam, Henneberry, Lusk, & Norwood, 2009). Throughout this article we refer to this effect as the 'Excess Choice Effect', or 'ECE'. This phrase is selected as it is relatively neutral, simply describing the effect being considered, whereas many of the other listed terms are comparatively more value laden.

Crucially, 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, Greifeneder &Todd, 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. The current paper attempts to address this by drawing on theories of counterfactual thinking (Epstude & Roese, 2008; Roese & Summerville, 2005). Previous research has established a causal link between the ECE and counterfactual thought. For example, in Hafner, White and Handley's (2012) experiment, participants were found to be significantly more satisfied with a choice of creative drawing material if selected from a limited (6) rather than an extensive (22) selection, and this difference was found to be attributable to the increased level of post-decisional counterfactual thought associated with extensive choice. Similarly, Mogilner, Shiv and Iyengar (in press) found that participants who were presented with a sequential choice of options reported less satisfaction with their chosen outcome, and attributed this to counterfactual thinking and the imagination of potentially 'better' future alternatives.

The current research aims to build upon this and further explore the boundaries of the relationship between extensive choice and counterfactual thought, using key findings established within the counterfactual literature. Specifically we argue that people may be more likely to experience decreased satisfaction following extensive choice when the outcome of that choice is negative, due to the predicted impact of outcome valence (negative versus positive) on the experience of

counterfactual thought and emotion. The specific rationale for this is presented

below, following an introduction to the topic of counterfactual thinking.

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 un-doing 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 emotions including shame, guilt, disappointment

and regret (Kahneman & Miller, 1986; Roese, 1997; Roese & Olson, 1995) which tend to reduce well-being (Niedenthal Tangney, & Gavanski, 1994; Roese, 1997). The generation of counterfactual alternatives relates directly to the ECE according to the counterfactual 'opportunity principle' (Roese & Summerville, 2005; Epstude & Roese, 2008), which asserts that in any given situation, the more choices there are the more opportunities are available and consequently the greater the number of counterfactual possibilities one may consider post-choice.

Counterfactual thinking and valence

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, Gleicher & Strathman, 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 (see also Tsiros & Mittal, 2000).

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, Gleicher, Kost, Baker, Strathman, Richman and Sherman (1990), used Kahneman and Tversky's (1982) investment scenario, and only found evidence for an action effect when outcomes were negative. When outcomes were positive the experimental manipulations were found to have a reduced impact upon affective reactions, suggesting that counterfactual thoughts were more readily cued, and subsequently more influential in judgements pertaining to negative outcomes (see also, Landman, 1987; although cf. Roese & Olson, 1993).

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.

Subsequently, following what we know about the impact of valence upon counterfactual generation, and the link established between extensive choice and counterfactual thought (Hafner et al., 2012; Mogilner et al., in press), 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.

Our ideas build on work by Botti and Iyengar (2004) who found that when faced with negative options, no choice is preferable to any choice. However, participants in that research were aware of the valence of their potential choice outcomes pre-choice (i.e. between appealing or unappealing ice-cream flavours), and the role of counterfactual thinking was not explored. In the current experiment participants experience either 'good' or 'bad' outcomes and were unaware of the outcome prior to sampling, making the task more similar to most consumer decisions. Further, participants were either asked about the reasons why they were (un)satisfied with their choice enabling us to monitor counterfactual thought (Experiment 1), or to provide a measure of perceived regret with choice in order to provide an emotional indicator of counterfactual experience (Experiment 2).

Experiment 1

In Experiment 1 participants chose a drink to sample for a taste test from a limited (6) or an extensive (24) selection of options. In fact the choice was illusory as half the participants tasted exactly the same 'good' flavour and the other half a 'bad'

flavour. It was predicted that in the 'bad' outcome conditions there would be an ECE and this would be mediated by increased counterfactual thinking. Where outcomes were 'good' it was predicted that there would be no differences in counterfactual thinking as a function of choice set size and subsequently no ECE.

Method

Participants

96 participants (59 women and 37 men, mean age = 31, with a range of 19 to 67 years) from the Plymouth public took part in the experiment in exchange for £4 payment.

Design

The experiment had a 2 (choice level: limited vs. extensive) X 2 (outcome valence: 'good' vs. 'bad') between subjects design with participants randomly allocated to one of the four conditions.

Materials

Based on pre-testing of pre-existing flavoured waters (e.g. strawberry, peach), and other colourless flavoured waters created by adding food flavourings to tap water (e.g. rum flavouring, star anise) we selected a relatively 'good' drink flavour (blackcurrant) and a relatively 'bad' one (peppermint). By then adding food colourants to these flavours we created two identically looking choice sets of 24 different coloured drinks: a 'good' set which all tasted of blackcurrant and a 'bad' 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.

Procedure

Participants were informed they were taking part in an experiment on taste perception and were presented with a selection of either 6 (limited choice) or 24

(extensive choice) drinks which they were informed were a variety of different flavours. Participants were instructed to choose the drink they "most liked the look of" and "would most like to sample". After making their choice participants poured some of their chosen drink into a cup and sampled it before completing a three item satisfaction questionnaire (adapted from Iyengar & Lepper, 2000). The items were: "The drink I sampled was tasty", "I was not satisfied with the drink I sampled (reversed)", "I am happy I made the right choice from the selection available". Each item called for ratings on a seven point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Internal consistency among the satisfaction items was high (α =.90) so they were collapsed to form a single satisfaction measure. After each item participants were asked to give "*at least two* reasons why you responded in that particular way".

Measuring counterfactual thinking

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 by Hafner et al., (2012) for a similar task, 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 we were primarily interested in the degree to which people

considered other options, our key measure of counterfactual thinking was the overall

proportion of thoughts that were 'choice counterfactuals' (i.e. 106 of 537 total

statements, 19.74%).

<div align="center">Results</div>

Preliminary analysis

Our manipulation of valence was successful. Participants were more satisfied

if they tasted the 'good' than 'bad' drink (*M*s= 4.90 vs. 2.99, *t*(94) = 5.79, *p*<.001). As

predicted participants also generated a higher proportion of counterfactuals after

tasting a 'bad' than 'good' drink (*M*s= .26 vs. .15, *t*(94) = 2.48, *p*=.02).

Choice level and counterfactuals for 'bad' outcomes

To investigate the existence of the ECE effect for negative outcomes and the

role of counterfactuals we conducted a three step mediation model. Following Baron

and Kenny (1986) we regressed: 1) choice level (limited vs. extensive) on

satisfaction, 2) choice level on counterfactuals, and 3) both choice level and

counterfactuals onto satisfaction. The results are summarised in the upper half of

Figure 1 with the results from Step 1 shown in brackets and those from Step 3 in

italics. Step 1 replicated the ECE with greater satisfaction in the limited vs. extensive

choice condition (*M*s = 3.49 vs. 2.46; β = -.31, *p* = .04). Step 2 found that

counterfactuals were marginally less likely to be generated following limited vs.

extensive choice (*M*s = 1.13 vs. 1.74; β = .26, *p* = .08). Step 3 suggests that the

number of counterfactuals generated negatively affected satisfaction irrespective of

condition (β = -.47, *p* = .001). More importantly the main effect of choice level was no longer significant (β = -.18) once counterfactuals were added to the model. A Sobel test confirmed that counterfactuals were mediating the effect of choice on satisfaction (z = 1.60, *p* = .05, one tailed).

(INSERT FIGURE 1 HERE)

Choice level and counterfactuals for 'good' outcomes

The same approach to analysing the effect of choice and counterfactuals on satisfaction was used to investigate positive outcomes. Supporting predictions there was no main effect of choice level on either satisfaction or counterfactual thinking and no evidence of mediation (lower half of Figure 1). Participants were just as satisfied if they had chosen a pleasant drink following limited vs. extensive choice (*M*s = 5.19; 4.63; β = -.18, *p* = .21) and generated just as many counterfactuals in the limited and extensive choice conditions (*M*s= .88 vs. .72, β = -.18, *p* = .21). Again, demonstrating the importance of counterfactual thinking in general for satisfaction there was a strong negative relationship between them (β = -.40, *p* = .004) but crucially in this case they did not mediate the effect of choice (z = .49, *p*= .31, one tailed).

Experiment 2

Experiment 2 was designed to explore whether the results of Experiment 1 would replicate in an alternative choice task within the domain of consumer choice, this time involving chocolate choice. This experiment was also specifically designed to build upon research by Botti and Iyengar (2004) – in order to explore a) the role of valence on choice preferences (choice vs. no choice) using an extensive choice decision scenario (in contrast to the limited choice scenario's used in that research),

and b) to explicitly explore the mediating role of regret in driving the preference for no choice where outcomes are negative.

In order to replicate the procedure used by Botti and Iyengar (2004) as closely as possible, in this experiment participants were either presented with an extensive choice of 24 options, or were given no choice, and simply given one option to sample. In this manner we then hoped to focus upon the impact of extensive choice on satisfaction, as this is the primary purpose of most research into the ECE, and to further explore the role of valence and counterfactual experience in determining people's preferences for extensive choice versus no choice.

As this experiment was designed to compare the impact of extensive versus no choice on outcome satisfaction, it was not possible to assess counterfactual thought using the same process as Experiment 1. This is because half of the participants in this experiment were not given a choice, and as such could not be asked to explain reasons behind their choices. As such, in this experiment, participants were asked to rate their satisfaction and to then rate their experience of regret after having sampled the chocolate. In this manner we aimed to provide a measure of counterfactual emotion, which is used as an indication of counterfactual experience following choice versus no choice.

In sum, it was predicted that extensive choice would only be detrimental to chooser satisfaction levels where choice outcomes were negative, and that this effect would be driven by an increased tendency to experience the counterfactual emotion of regret. Accordingly, when the capacity to make an active choice is removed, and participants are simply given one chocolate to sample, then satisfaction with the same negative outcome should be increased, as this will remove

the capacity to experience counterfactual thought and emotion which typically follow choice.

Method

Participants

92 Psychology undergraduates (67 women and 25 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.

Design

The experiment had a 2 (choice: no choice vs. extensive) X 2 (outcome valence: 'good' vs. 'bad') between subjects design with participants randomly allocated to one of the four conditions.

Materials

Based on pre-testing we selected a relatively 'good' chocolate flavour (milk chocolate praline) and a relatively 'bad' (Cointreau liqueur) chocolate flavour, which were used to create the extensive choice sets. Following the procedure used in Experiment 1 once again the choice was illusory: participants were informed that the chocolates contained a variety of different flavours including "some liqueur chocolates, some fruit flavoured chocolates, some truffles, some caramels, and other assorted flavours". However in actual fact all of the chocolates presented were identical in flavour, allowing us to provide a thoroughly controlled examination of the effects of choice type (no choice versus extensive choice) upon chooser satisfaction levels (see also Mogilner et al., 2008). Chocolates were presented in individual paper cake cases, each without labels so as to remove any impact of prior expectations on perception of choice outcome.

Procedure

Participants were informed they were taking part in an experiment on taste perception and were either presented with an extensive (24) selection of chocolates, or were simply given one 'good' or 'bad' chocolate to sample. Participants in the choice condition were instructed to choose the chocolate they "most liked the look of" and "would most like to sample". Whilst participants in the no-choice condition were informed that the chocolate in front of them had "been selected for them to sample", and were asked to eat that chocolate.

After sampling their chocolate, participants were asked to rate their satisfaction with the (choice) outcome. Following the procedure used in Experiment 1 this was done using three satisfaction items adapted from Iyengar and Lepper (2000). These were: "The chocolate I sampled was tasty", "I was not satisfied with the chocolate I sampled (reversed)", "I enjoyed the chocolate I sampled". Each item called for ratings on a seven point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). In addition, participants were also asked to rate their experience of regret after having sampled their (chosen) chocolate. Following the procedure used by Iyengar and Lepper (2000) this was done by asking participants: "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*).

<div align="center">Results</div>

Preliminary analysis

Preliminary analysis demonstrated that our manipulation of valence was successful. Participants were more satisfied if they tasted the 'good' than 'bad' chocolate (Ms = 5.92 vs. 4.15, $t(90) = 5.53$, $p < .001$). As predicted participants also reported experiencing greater levels of regret after tasting a 'bad' than 'good' chocolate (Ms = 2.88 vs. 1.54, $t(90) = -3.66$, $p < .001$).

Choice level and regret for 'bad' outcomes

To investigate the impact of extensive vs. no choice for negative outcomes and the role of regret we conducted a three step mediation model. Again following Baron and Kenny (1986) we regressed: 1) choice (no choice vs. extensive) on satisfaction, 2) choice on regret, and 3) both choice and regret onto satisfaction. The results are summarised in the upper half of Figure 2 with the results from Step 1 shown in brackets and those from Step 3 in italics.

Step 1 replicated the detrimental impact of extensive choice, with greater reported satisfaction in the no choice vs. extensive choice condition (Ms = 4.73 vs. 3.57; β = -.31, p = .05). Step 2 found that participants reported experiencing significantly less regret following no choice vs. extensive choice (Ms = 1.70 vs. 4.75; β = .52, p = .001). Step 3 suggests that expressed regret negatively affected satisfaction irrespective of condition (β = -.79, p < .001). More importantly the main effect of choice level was no longer significant (β = -.11) once regret was added to the model. A Sobel test confirmed that regret was mediating the effect of choice on satisfaction (z = 3.21, p < .001, one tailed).

INSERT FIGURE 2 HERE

Choice level and regret for 'good' outcomes

The same approach to analysing the effect of choice and regret on satisfaction was used to investigate positive outcomes. Supporting predictions there was no main effect of choice on either satisfaction or regret and no evidence of mediation (lower half of Figure 2). Participants were just as satisfied if they had chosen a pleasant chocolate following no choice vs. extensive choice (Ms = 5.81; 6.03; β = .10, p = .50) and experienced similar levels of regret following no choice vs. extensive choice (Ms= 1.48 vs. 1.60, β = .05, p = .72). Again, demonstrating the

importance of regret in general for satisfaction there was a strong negative relationship between them (β = -.48, *p* < .001) but crucially in this case they did not mediate the effect of choice (*z* = .37, *p* = .36, one tailed).

Discussion

In line with predictions across two experiments the current research found evidence that extensive choice was only detrimental to satisfaction following relatively 'bad' but not 'good' outcomes, and that this effect could be explained by the generation of more counterfactual thoughts or greater experience of counterfactual emotion following negative experiences and an extensive choice set. These findings demonstrate that thoughts about non-chosen options and the experience of counterfactual emotion contribute to the increased dissatisfaction observed under excess choice conditions. By demonstrating the importance of outcome valence we provide an important moderating condition for the ECE which may help explain the inconsistency of previous findings (cf. Scheibehenne et al., 2010). Each claim is now considered in turn.

Our evidence supporting the role of counterfactual thinking in the ECE follows directly from previous research. Hafner et al., (2012) demonstrated that under normal conditions people generate more counterfactual thoughts when having to choose from an extensive vs. limited choice set but that when the ability to generate such thoughts is attenuated via a cognitive load task, the ECE disappears. Similarly, Iyengar and Lepper (2000) demonstrated that people tend to report greater regret following extensive choice, and regret is one of several negative emotions associated with counterfactual thinking (Niedenthal, et al., 1994). The claim is also consistent with the theoretical arguments of Schwartz (2004) who argued that "as the

number of {options} goes up...opportunity costs, and associated counterfactual thoughts and smidgens of regret, mount higher and higher" (pp.156).

Notably, Petrocelli, Percy, Sherman and Tormala (2011) recently introduced the concept of 'counterfactual potency' (CP), a construct involving the interaction between two components of counterfactual influence – 1) the perceived likelihood of the antecedent in the counterfactual, and 2) the perceived conditional likelihood of the alternative outcome. The authors argue that CP is 'a key predictor of the degree and strength of the influence that a counterfactual thought will exert' (pp. 31). Indeed, in a series of scenario-based experiments, the authors found evidence CP was predictive of participants' experience of negative affect post-choice, as well as judgements of causation and responsibility.

The results from the current research contribute to this literature – suggesting that an additional factor which influencing CP may be the number of options initially presented in the decision scenario. Specifically, the more options one is presented with, the more likely it is that one can imagine having picked a 'better' alternative. However, Petrocelli et al. (2011) suggest that it is CP, rather than counterfactual frequency, which is predictive of post-choice satisfaction and the experience of negative affect. The current research provides evidence contrary to this suggestion, finding that the frequency of counterfactual response was found to significantly mediate the impact of choice set size upon outcome satisfaction (Experiment 1).

One potential explanation for this difference in findings may involve the manipulation of initial choice set size, which was not considered in Petrocelli et al.,'s (2011) research. Indeed, it may be the case that when an individual is faced with a choice involving a limited number of options, then CP, rather than counterfactual frequency, is the stronger predictor of outcome satisfaction, as one would not

necessarily expect the individual to generate a large quantity of counterfactual alternatives in a scenario in which only a small number of other potential outcomes are possible. Conversely, as choice level increases, the number of potential states of the world that did not actually occur (i.e. counterfactuals) also increases – potentially explaining why increased choice leads to demonstrable differences in the frequency of counterfactual generation: consistent with the counterfactual opportunity principle (see Roese & Summerville, 2005; Epstude & Roese, 2008).

It would be interesting to continue to further explore the link between choice level, counterfactual frequency and counterfactual potency: one might predict that increasing choice level also leads to increased counterfactual potency, as well as counterfactual frequency – due to the fact that the greater the number of counterfactual alternatives one has to consider, the greater the likelihood that some of those would be easily imagined 'better' alternatives – contributing to the experience of negative affect and decreased satisfaction post-choice.

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) or demonstrate creativity or artistic talent (Hafner et al., 2012) we might infer that the experience was a relatively negative one for many participants, but we can't know this for sure. Similarly, several studies that seemed to have involved choices with a high chance of positive outcomes (e.g. chocolates, restaurants and music; Berger, Draganska & Simonson, 2007; Scheibehenne, Greifeneder & Todd, 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 our account are studies that demonstrate the ECE using apparently positive (e.g. jams, chocolates, Iyengar & Lepper, 2000, Studies 1 & 3) or neutral (e.g. pens; Shar & Wolford, 2007) stimuli. However, just as with studies that seem to support our 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 we are unable to 'retro-fit' our approach to the previous literature because although we may have intuitive beliefs about whether a choice set is likely to contain options which people will find relatively positive or negative we are unable to determine this. A test of our explanation of the ECE will therefore depend on future studies which, like our own, deliberately manipulate the valence of experiences of choice.

Our results highlight the importance of considering probable outcome valence when constructing choice architectures (Thaler & Sunstein, 2008). If outcomes are likely to be positive 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 (Thaler & Benartzi, 2004) and thus presenting them with many options is 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 default pension scheme that reduces the need to compare many options (Thaler & Benartzi, 2004). We can imagine a similar process

occurring 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 (Degner & Sloan, 1992). In such cases it may actually be better to provide a more limited number of options in order to reduce counterfactual thinking. However, it is of course important to note that the results of the current experiments involving choices of chocolates and drinks may not necessarily accurately generalise to more important real-life decision scenarios such as these, which may to some extent reflect a desire to rely on the expertise of a physician under circumstances with such potentially important consequences. More research will therefore be needed using real-life decision scenarios with consequential outcomes, in order to establish whether this is the case.

To conclude, the current research demonstrated that high levels of choice were only 'too much' when the person experienced a negative outcome because this increased the chance that they would think of options foregone. Given the potential implications for the choice agenda in consumer markets and public policy settings further research is needed to a) identify decision contexts likely to be associated with relatively 'negative' experiences, and b) determine the potential benefits to well-being of reducing choice in these instances.

Notes.

References

Arunachalam, B., Henneberry, S. R., Lusk, J. L., & Norwood, F. B. (2009). An Empirical Investigation into the Excessive-Choice Effect. *American Journal of Agricultural Economics, 91*(3), 810 – 825.

Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology, 51*(6), 1173 – 1182.

Berger, J., Draganska, M., & Simonson, I. (2007). The Influence of Product Variety on Brand Perception and Choice. *Marketing Science, 26*(4), 460 – 472.

Boninger, D. S., Gleicher, F., & Strathman, A. (1994).Counterfactual Thinking: From What Might Have Been to What May Be. *Journal of Personality and Social Psychology, 67,* 297 – 307.

Botti, S., & Iyengar, S. S. (2004). The Psychological Pleasure and Pain of Choosing: When People Prefer Choosing at the Cost of Subsequent Outcome Satisfaction. *Journal of Personality and Social Psychology, 87*(3), 312 – 326.

Botti, S., & Iyengar, S. S. (2006). The Dark Side of Choice: When Choice Impairs Social Welfare. *Journal of the American Marketing Association, 25*(1), 24 – 38.

Byrne, R. M. J. (2005). *The Rational Imagination: How People Create Alternatives to Reality*. Cambridge, MA: MIT Press.

Chernev, A. (2003a). When More is Less and Less is More: The Role of Ideal Point Availability and Assortment in Consumer Choice. *The Journal of Consumer Research, 30,* 170 – 183.

Chernev, A. (2003b). Product Assortment and Individual Decision Process.

Journal of Personality and Social Psychology, 85(1), 151 – 162.

Degner, L. F., & Sloan, J. A. (1992). Decision Making During Serious Illness: What Role Do Patients Really Want to Play? *Journal of Clinical Epidemiology, 45*(9), 941 – 950.

Dolan, P. & White, M. P. (2007). How Can Measures of Subjective Well-Being be Used to Inform Public Policy? *Perspectives on Psychological Science, 2*(1), 71-85.

Epstude, K., & Roese, N. J. (2008). The Functional Theory of Counterfactual Thinking. *Personality and Social Psychology Review, 12* (2), 168-192.

Fasolo, B., McClelland, G. H., & Todd, P. M. (2007). Escaping the Tyranny of Choice: When Fewer Attributes Make Choice Easier. *Marketing Theory, 7*(1), 13 – 26.

Fasolo, B., Reutskaja, E., Dixon, A., & Boyce, T. (2010). Helping Patients Choose: How to Improve the Design of Comparative Scorecards of Hospital Quality. *Patient Education and Counseling*, *78*(3), 344-349.

Gilovich, T., Wang, R. F., Regan, D., & Nishina, S. (2003). Regrets of Action and Inaction Across Cultures. *Journal of Cross-Cultural Psychology, 34,* 61 – 71.

Gleicher, F., Kost, K. A., Baker, S. M., Strathman, A. J., Richman, S. A., & Sherman, S. J. (1990). The Role of Counterfactual Thinking in Judgments of Affect. *Personality and Social Psychology Bulletin, 16,* 284 – 295.

Gourville, J. T., & Soman, D. (2005). Overchoice and Assortment Type: When and Why Variety Backfires. *Marketing Science, 24*(3), 382 – 395.

Greifeneder, R., Scheibehenne, B., & Kleber, N. (2010). Less May be More when

Choosing is Difficult: Choice Complexity and Too Much Choice. *Acta Psychologica, 133,* 45 – 50

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,* 28 – 36.

Harris, P. L. (2000). *The Work of the Imagination.* Oxford: Blackwell.

Iyengar, S. S., Jiang, W., & Huberman, G. (2004).How Much Choice Is Too Much: Determinants of Individual Contributions in 401K Retirement Plans. In O. S. Mitchell & S. Utkus (Eds.), *Pension Design and Structure: New Lessons from Behavioural Finance* (pp. 83 – 97). Oxford: Oxford University Press.

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.

Kahneman, D., & Miller, D. (1986). Norm Theory: Comparing Reality to its Alternatives. *Psychological Review, 93*, 136 – 153.

Kahneman, D., & Tversky, A. (1982). The Psychology of Preferences. *Scientific American, 246*, 136 – 142.

Koehler, D. J., & Harvey, N. (2004). *Blackwell Handbook of Judgment and Decision Making.* Oxford, UK: Blackwell.

Landman, J. (1987). Regret and Elation Following Action and Inaction: Affective Responses to Positive versus Negative Outcomes. *Personality and Social Psychology Bulletin, 13*(4), 524 – 536.

Lenton, A. P., Fasolo, B., & Todd, P. M. (2008). "Shopping" for a Mate: Expected versus Experienced Preferences in Online Mate Choice. *IEEE Transactions on Professional Communication, 51*(2), 169 – 182.

Mas-Colell, A., Whinston, M., & Green, J. (1995). Microeconomic theory. Oxford University Press.

McEleney, A. & Byrne, R. M. J. (2006). Spontaneous Counterfactual Thoughts and Causal Explanations. *Thinking and Reasoning, 12*(2), 235 – 255.

Mogilner, C., Rudnick, T., & Iyengar, S. S. (2008). The Mere Categorization Effect: How the Presence of Categories Increases Choosers' Perceptions of Assortment Variety and Outcome Satisfaction. *The Journal of Consumer Research, 35*(2), 202 – 215.

Mogilner, C., Shiv, B., & Iyengar, S. S. (In Press). Eternal Quest for the Best: Sequential (vs. Simultaneous) Option Presentation Undermines Choice Commitment. *Journal of Consumer Research,* DOI: 10.1086/668534.

Nasco, S. A., & Marsh, K. L. (1999). Gaining Control through Counterfactual Thinking. *Personality and Social Psychology Bulletin, 25,* 556 – 568.

Niedenthal, P. M., Tangney, J. P., & Gavanski, I. (1994). "If Only I Weren't" Versus "If Only I Hadn't": Distinguishing Shame from Guilt in Counterfactual Thinking. *Journal of Personality and Social Psychology, 67*(4), 585 – 595.

Petrocelli, J. V., Percy, E. J., Sherman, S. J., & Tormala, Z. L. (2011). Counterfactual Potency. *Journal of Personality and Social Psychology, 100*(1), 30 – 46.

Roese, N. J. (1997). Counterfactual Thinking. *Psychological Bulletin, 121*(1), 133 – 148.

Roese, N. J., & Olson, J. M. (1993). Self-Esteem and Counterfactual Thinking. *Journal of Personality and Social Psychology, 65*(1),199 – 206.

Roese, N. J., & Olson, J. M. (1995). Counterfactual Thinking: A Critical Overview. In N. J. Roese & J. M. Olson (Eds.), *What Might Have Been: The Social Psychology of Counterfactual Thinking* (pp. 1 – 55). Mahwah, NJ: Erlbaum.

Roese, N. J., & Summerville, A. (2005). What We Regret Most. . . and Why. *Personality and Social Psychology Bulletin, 31*(9), 1273 – 1285.

Reutskaja, E., & Hogarth, R. M. (2009). Satisfaction in Choice as a Function of the Number of Alternatives: "When Goods Satiate". *Psychology and Marketing, 26*(3), 197 – 203.

Sanna, L. J., & Turley, K. J. (1996). Antecedents to Spontaneous Counterfactual Thinking: Effects of Expectancy Violation and Outcome Valence. *Personality and Social Psychology Bulletin, 22,* 906 – 919.

Scheibehenne, B., Greifeneder, R., & Todd, P. M. (2009). What Moderates the Too-Much-Choice Effect? *Psychology and Marketing, 26*(3), 229 – 253.

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.

Schwartz, B. (2000). Self-Determination: The Tyranny of Freedom. *American Psychologist, 55*(1), 79 – 88.

Schwartz, B. (2004). *The Paradox of Choice: Why More Is Less.* New York: HarperCollins Publishers Inc.

Shar, A. M., & Wolford, G. (2007). Buying Behaviour as a Function of Parametric Variation of Number of Choices. *Psychological Science, 18*(5), 369 – 370.

Thaler, R. H., & Benartzi, S. (2004). Save More Tomorrow: Using Behavioural Economics to Increase Employee Saving. *Journal of Political Economy, 112*(1), S164 – S187.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness*. London: Yale University Press.

Tsiros, M., & Mittal, V. (2000). Regret: A Model of Its Antecedents and

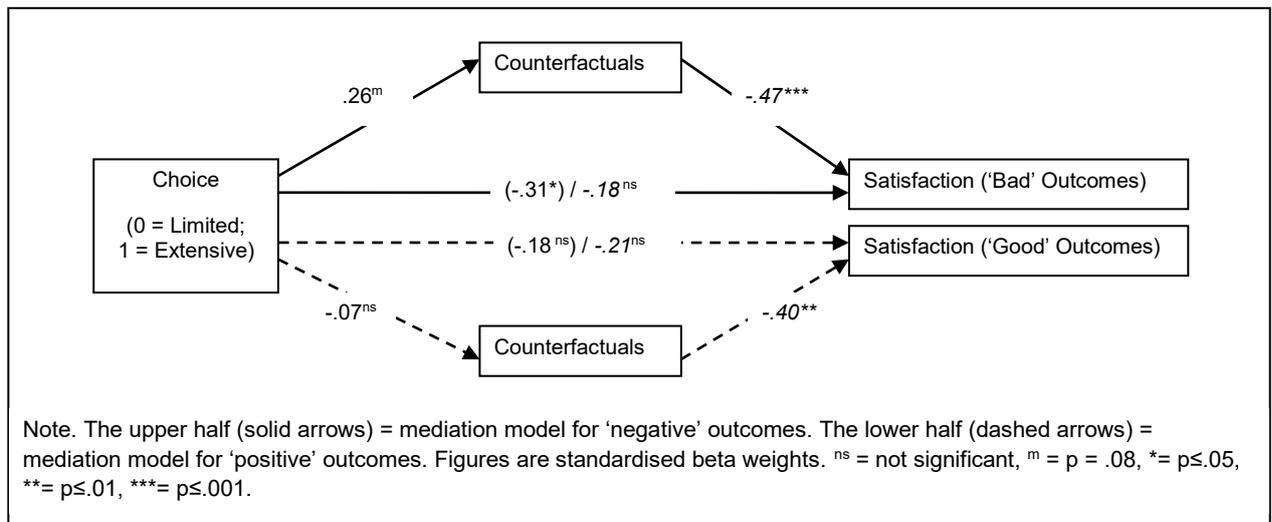Consequences in Consumer Decision Making. *Journal of Consumer Research, 26,* 401 – 417.

White, K., & Lehman, D. R. (2005). Looking on the Bright Side: Downward Counterfactual Thinking in Response to Negative Life Events. *Personality and Social Psychology Bulletin, 31*(10), 1413 – 1424.

Figure Captions

Figure 1. Mediation analysis showing the role of counterfactuals in mediating the effect of choice set size on satisfaction for 'negative' but not 'positive' outcomes.

Figure 2. Mediation analysis showing the role of regret in mediating the effect of extensive choice vs. no choice on satisfaction for 'negative' but not 'positive' outcomes.

Figures

Note. The upper half (solid arrows) = mediation model for 'negative' outcomes. The lower half (dashed arrows) = mediation model for 'positive' outcomes. Figures are standardised beta weights. ^{ns} = not significant, ^{m} = p = .08, *= p≤.05, **= p≤.01, ***= p≤.001.

Figures

Note. The upper half (solid arrows) = mediation model for 'negative' outcomes. The lower half (dashed arrows) = mediation model for 'positive' outcomes. Figures are standardised beta weights. ns = not significant, *= p≤.05, **= p≤.01, ***= p≤.001.