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The Goldilocks Placebo Effect: Placebo effects are stronger when people select a treatment from an optimal number of choices

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Abstract (197 words)

People are often more satisfied with a choice (e.g. chocolates/pens) when the number of options in the choice set is 'just right' (e.g. 10-12), neither too few (e.g. 2-4), nor too many (e.g. 30-40). We investigated this 'Goldilocks Effect' in the context of a placebo treatment. Participants reporting non-specific complaints (e.g. headaches) chose one of Bach's 38 Flower Essences from a choice set of 2 (low choice), 12 (optimal choice) or 38 (full choice) options to use for a 2-week period. Replicating earlier findings in the novel context of a health-related choice, participants were initially more satisfied with the Essence they selected when presented with 12 vs. either 2 or 38 options. More importantly, self-reported symptoms were significantly lower two-weeks later in the optimal (12) vs. non-optimal choice conditions (2 and 38). Since there is no known active ingredient in Bach's Essences, we refer to this as the 'Goldilocks Placebo Effect'. Supporting a counterfactual thinking account of the Goldilocks Effect, and despite significantly fewer symptoms after two-weeks, those in the optimal choice set condition were no longer significantly more satisfied with their choice at the end of testing. Implications for medical practice, especially patient choice, are discussed.

1.0 Introduction

1.1 Overview

Contrary to economic rational choice theory and popular belief, high levels of choice may be associated with lower chooser satisfaction than more moderate, psychologically 'manageable', levels of choice. Much as Goldilocks in the popular children's story preferred her porridge not too hot, nor too cold but somewhere, 'just right' in the middle, people are often more satisfied with choices drawn from mid-range choice sets (e.g. 6-12) rather than too little choice (e.g. 2-4 options) or too much choice (e.g. 30-40 options). However, most optimal choice set research has focused on relatively mundane consumer choices (e.g. pens/chocolates/jams/sweets/drinks etc.) and immediate effects on satisfaction. We thus know very little about the importance of optimal choice levels, or Goldilocks Effects, for more meaningful decisions, e.g. in health care contexts, or outcomes over the longer term.

The current paper addresses both these issues by offering individuals reporting non-specific medical symptoms such as pains and headaches optimal (just right) vs. non-optimal (too low or too high) choices of a placebo treatment, Bach's Flower Essences. Self-reported symptom level and satisfaction with the essence selected was measured at the start of the trial and two-weeks later. Thus we aimed to examine whether: a) the Goldilocks Effect for choice would extend to immediate satisfaction with a medically-related choice; b) any short term impact of choice level upon immediate satisfaction levels would persevere or dissipate over time; and crucially, c) whether initial choice level might affect participant's reports of treatment effectiveness.

1.2 Economic Theory vs. Psychological Research

According to economic theory, increased choice should, all else equal, increase satisfaction with the chosen option as it increases the likelihood that individuals can satisfy their personal preferences (Mas-Colell, Whinston, & Green, 1995; Perloff, 2010). Consequently, increased choice has become a dominant focus of policy making (Schwartz, 2000; 2004; Botti & Iyengar, 2006). Consumers are now offered greater 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; Propper, Wilson & Burgess, 2005), pensions (Benartzi & Thaler, 2002; Iyengar, Jiang & Huberman, 2004; Iyengar & Kamenica, 2010; Thaler & Benartzi, 2004), education (Schwartz, 2004; Cullen, Jacob, & Levitt, 2006), entertainment (Iyengar, 2010; Schwartz, 2004), and even religion (Wolfe, 2001). According to Schwartz (2004) the notion that the provision of choice is beneficial is widely accepted in modern society. However, psychological research has begun to question this assumption and examine its boundaries and limitations.

For instance, focusing predominantly on the impact of increased choice in the consumer domain, several studies have demonstrated that high levels of choice can both dampen overall product demand (Iyengar et al., 2004; although cf. Scheibehenne, Greifeneder & Todd, 2010) and lower the utility experienced from consumption of the chosen good (Chernev 2003a; 203b; Greifeneder, Scheibehenne & Kleber, 2010; Hafner, White & Handley, 2012; 2016; Lee & Lee, 2004; Diehl & Poynor, 2010; Mogilner, Shiv & Iyengar, 2013); findings which are supported by Chernev, Böckenholt, and Goodman's (2015) recent meta-analyses. Perhaps the most famous example was provided by Iyengar and Lepper (2000). These authors 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.

In an extension of this paradigm, which had usually just used two choice levels (low and high), Shar and Wolford (2007) presented participants with choice sets between 2 and 20 pens. Importantly, they found that the likelihood of choosing to buy a pen increased as the number of choices rose to an optimum of ten options, after which point as choice increased still further, the likelihood of purchase steadily decreased. This suggests that satisfaction is a curvilinear function of the number of options available. Similar findings were reported by Reutskaja and Hogarth (2009), in a study examining a choice set of gift boxes.

The negative impact of increased choice beyond an optimal intermediate level is variously referred to in the literature 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; Hafner et al., 2016). However, the current research hereby presents a novel term which encompasses Shah and Wolford's (2007; see also Reutskaja & Hogarth, 2009) observation that a moderate level of choice is still better than too little choice.

Specifically, building on research in both developmental psychology, where infants spend longer looking at visual arrays with a moderate amount of information

than ones with too little or too much stimulation (Kidd, Piantadosi & Aslin, 2012), and astrobiology, where the ‘Goldilocks Principle’ refers to a planet’s need to be neither too near nor too far from a sun to sustain life (Muir, 2007), we hereby present a new terminology to describe this phenomenon in the domain of choice; the ‘Goldilocks Effect for Choice’ (GEC). The central aim of the present study was to test the prevalence of the GEC by directly contrasting levels of – potentially – ‘too little’ (2), or ‘too much’ (38) choice, with a number of options that, on the basis of previous research (Shar & Wolford, 2007; Reutskaja & Hogarth, 2009) may be perceived to be ‘just right’ (12 options). In addition, we aimed to examine whether the GEC may go beyond simple consumer decisions to the potentially more important domain of health-related choices.

1.3 The Goldilocks Effect, Counterfactual Thinking and Temporal Considerations

Why might the Goldilocks Effect for choice occur? One possibility appears to be the propensity for large choice sets to generate too many counterfactuals. Counterfactuals are evaluative thoughts about imagined alternatives to past events (Epstude & Roese, 2008), epitomised by the phrase “what might have been” (Roese, 1997). Counterfactual generation is often automatic, and widespread, documented in both early childhood (Harris, 2000) and across cultures (Gilovich, Wang, Regan, & Nishina, 2003). Importantly, as the number of choices in a choice set grows, the greater the number of counterfactuals people can and do generate also grows (Hafner et al., 2012; 2016). That is, the more choices there were, the more alternative states of the world where a different, possibly better, option had been chosen, can be imagined. In economic terms, the ‘opportunity cost’ of the options foregone appears to increase as the number of options increase.

However, there is also evidence that the experience of counterfactual thought and emotion following action dissipates over time (Kinnier & Metha, 1989; Gilovich, Medvec & Chen, 1995; Gilovich & Medvec, 1994; 1995; Roese & Summerville, 2005; Byrne, 2005). In part this seems due to processes of cognitive dissonance reduction (see Gilovich & Medvec, 1995; Gilovich et al., 1995; 2003; Festinger, 1957; Cooper & Fazio, 1984). Since previous research into choice effects has typically considered relatively immediate outcome satisfaction it thus remains unclear whether a similar phenomenon occurs for choices where the outcomes, unlike the immediate taste of a chocolate for instance, take some time to become apparent.

Schwartz (2004) appears to assume that it will. Specifically, he argues that many of the more consequential choices we make, in employment, healthcare and pensions, won't be known for some time. This is supported by the only study (as far as we are aware), which has made any attempt to explore the prevalence of choice effects over time, using a consequential scenario with non-immediate outcomes. Specifically, using the example of partner selection in online dating, D'Angelo and Toma (2017) found that those who selected their partner from a limited (6) rather than an extensive (24) number of options were less satisfied with their choice after a week of contemplation. The authors argue this is precisely because outcomes for consequential scenarios are often not immediately apparent at the outset. Indeed, furthering this, Schwartz (2004) argues that too much choice in these domains might explain why life satisfaction does not seem to be growing in many modern societies despite large increases in income and choice (e.g. Easterlin, 1974). For example, a good graduate who had been offered places on twenty different management programmes may be less satisfied with their new post than one who was only offered

places on two programmes, because they begin to ask themselves whether it would have been better if they had gone on this or that alternative programme.

Although apparently plausible, if counterfactual generation is key to understanding the Goldilocks Effect and if counterfactuals dissipate over time, then, in theory, satisfaction with the chosen outcome should be less affected by the number of options the further in time the rating of satisfaction is made from the actual moment of choice. Put differently, any Goldilocks Effect which may be apparent in the short term may reduce over time, as counterfactual alternatives would be made less salient. A secondary aim of the current study was thus to explore this possibility by asking people to report both their satisfaction with their choice, and key health related outcomes, over a two-week period.

1.4 Selecting an ideal health-related context to test the predictions

In order to create an experiment which would be representative of the kind of health care decisions faced by individuals in modern society (see Botti & Iyengar, 2006), we wanted to create a decision scenario in which the outcomes of the choice would take some time to become apparent and which thus allowed participants to continue to reflect on their choice for some time (see also, D'Angelo & Toma, 2017). Moreover, we also wanted a situation where the actual outcomes participants could experience should be the same regardless of the choice they made (Hafner et al., 2016; Mogilner et al., 2008). We did not want a situation where a larger choice set may mean patients actually chose a more effective treatment. Our challenge was thus to find a context with a large number of possible options, all of which would have essentially the same objective outcome regardless of which was selected, but which needed a reasonable length of time 'to work'.

The context we selected was the popular Bach's Flower Essences Remedies (<http://www.bachcentre.com/centre/remedies.htm>). These remedies, which are usually administered orally in liquid form (e.g. two drops from a pipette) are essentially water, alcohol and the essence of a specific plant which is said to be attuned to a specific emotion (e.g. gorse can help treat feelings of hopelessness and despair). Given links between emotion and stress the remedies also claim to treat a range of non-specific stress-related symptoms such as headaches and fatigue. Importantly for our purposes, there are 38 such remedies and research suggests that they are no more effective than a placebo (see Walach, Rilling & Engelke, 2001; Armstrong & Ernst, 1999; Hyland, Geraghty, Joy & Turner, 2006; Hyland, Whalley & Geraghty, 2007). This allowed us to present participants with choice sets ranging from 'too few' (2), 'just enough' (12) or 'too many' (38) options where there was no evidence that one of the choices chosen would be more effective than any other.

Following Shah and Wolford (2007), it was predicted that at the initial time of choice, satisfaction would be an inverted U-shaped function of the number of alternatives available. Participants should be most satisfied if offered 12 rather than 2 or 38 options. Given the lack of research in this area for extended outcomes, we were less sure of what might happen to satisfaction and, crucially, self-reported symptoms, over the longer-term (although see D'Angelo & Toma, 2017). If the Goldilocks Effect for Choice is important for health-related decisions whose outcomes take time to manifest, then we would expect to see the same quadratic function for both satisfaction and symptoms two-weeks later when participants were asked to report on how well the treatment had been going. By contrast, if counterfactuals are the key mechanism by which the effect occurs and if

counterfactual thinking dissipates over time then we should see no difference as a function of choice set size after two weeks.

2.0 Method

2.1 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.

2.2 Design

The experiment had a 3 (choice level: limited (2), intermediate (12), extensive (38)) X 2 (time: Day 1, Day 14) between-subjects design, with participants randomly allocated to one of the three choice conditions.

2.3 Materials

Participants were presented with a choice of Bach's Flower Essence's, each presented with a short two sentence description of its proposed healing properties, as provided by Bach (1931).

2.4 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. At the first experimental session, participants were presented with a choice of 2, 12 or 38 flower essences, and were asked to pick the essence which they felt would be most relevant to their symptoms, and subsequently would most like to trial. The essences included in the 2 and 12 subset conditions were randomly selected from the extensive (38) choice set.

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, until the second and final experiment session on Day 14. Ethical approval was granted by the School of Psychology Ethics Committee and by the Faculty of Science Ethics Committee at Plymouth University.

2.5 The Questionnaires and Dependent Measures

At both times of testing, participants were also asked to complete a questionnaire designed to measure satisfaction with choice (DV1). This was done using the following key item (adapted from Iyengar & Lepper, 2000): *‘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*).

In addition, the questionnaires were designed to provide a physiological measure of satisfaction, with regard to any reported improvement in the severity of participants’ physical symptoms over time (DV2). The inclusion of these two DV measures provides an importance advance from previous choice research, which has typically focused on self-reported satisfaction levels only. By including a measure of symptomology the current study was able to provide insight into the parameters of choice effects in a way that has been previously unexplored, enabling us to determine whether decision scenarios in which outcomes take time to appear may also result in consequential impact to one’s health and well-being.

Both before their initial selection (to provide a baseline) and two weeks after using the essence participants were asked: *'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*). Compliance with instructions was also assessed at Day 14, by asking participants to report how many doses of the essence they had taken, using yesterday as a salient example which could be easily recalled. The majority (71%) of participants reported that they had taken the requested number of doses (3), whilst a further 14% reported they had taken 2 doses; providing evidence for generally high levels of compliance across the sample.

2.6 Analytical approach

In order to test the quadratic relationship between choice level and satisfaction demonstrated in previous research (Shah & Wolford, 2007; Reutskaja & Hogarth, 2009), we conducted one-way univariate analyses of variance (ANOVA) with a key planned contrast. This contrast was of the form (-.5, 1, -.5) which enabled us to compare intermediate choice (12) with both extremes (2 and 38) at the same time. Even if the main effect of choice is in itself not significant this does not necessarily refute the hypothesis because we were expecting satisfaction with 2 and 38 options to be similar (due to the predicted quadratic relationship) and such similarity will drive down the overall main effect because two of the three conditions are similar. In the case of self-reported symptoms, we used an Analysis of Covariance (ANCOVA) approach, with a similar planned contrast, with baseline symptoms before the choice manipulation serving as the covariate. This was important to ensure that any later effects were not simply due to random differences between conditions from the start.

3.0 Results

3.1 Baseline symptoms

Participants were asked to describe their symptoms prior to being presented with the initial choice set on Day 1. The most commonly cited complaints were stress-related, including fatigue, aches and pains and anxiety, with 62% of participants reporting suffering from one of these ailments. A further 37% described suffering from a variable combination these symptoms (for example: (“*stress, anxiety and fatigue*”; “*stress and back ache*”), meaning 99% of participants described either one stress related symptom, or a mix of stress related symptoms. This was consistent with our use of a student sample. Symptom severity scores, before choice, ranged between 1 and 7. Preliminary analysis revealed no significant differences across choice condition at this stage: $F(2,69) = .08$, $p = .92$, $\eta^2 = .002$, with similar baseline symptoms recorded in the 2 ($M = 3.81$, $SD = 2.04$), 12 ($M = 3.62$, $SD = 1.90$), and 38 ($M = 3.60$, $SD = 1.65$) option conditions.

3.2 Satisfaction Analysis

Supporting the first prediction, the one-way Analysis of Variance (ANOVA) comparing choice satisfaction immediately after making the choice found a significant main effect, $F(2,80) = 3.13$, $p = .05$, $\eta^2 = .07$. Importantly, in line with a quadratic relationship, the highest level of satisfaction was associated with 12 options ($M = 5.03$, $SD = 1.36$), whereas both fewer (2, $M = 4.10$, $SD = 1.51$) and more (38, $M = 4.66$, $SD = 1.17$) options were associated with lower satisfaction. As predicted, the planned contrast was significant $F(1,80) = 4.71$, $p = .03$, $\eta^2 = .06$.

11 participants failed to complete the Day 14 measure. As such the next section of analyses, which explores choice effects over time, focuses on the remaining 72 participants. After taking the chosen treatment for two weeks, no main effect of choice level on satisfaction remained, $F(2,69) = .47$, $p = .63$, $\eta^2 = .01$, and this

time the planned contrast was also not significant, $F(1,69) = .12, p = .73, \eta^2 = .002$. Specifically, similar levels of satisfaction were found in the 2 ($M = 3.94, SD = 1.81$), 12 ($M = 3.55, SD = 1.66$), and 38 ($M = 3.44, SD = 1.53$) option conditions. This provides initial evidence to suggest that the effects of choice level upon satisfaction may not be long-lasting, as predicted by the counterfactual account.

Supporting this, a repeated measures ANOVA using the 72 participants who completed both sets of questionnaires (Day 1 and Day 14) revealed a significant main effect of time on satisfaction: $F(1,69) = 25.43, p < .001, \eta^2 = .27$, with higher levels of satisfaction reported at Day 1 versus Day 14 (M 's = 4.86 versus 3.60 respectively). These results affirm our conclusion that there is a significant reduction in the initial effects of choice on satisfaction over time.

3.3 Symptom analysis

Despite the lack of any effect on satisfaction at two-weeks, analysis nevertheless revealed a significant main effect of choice set on self-reported symptoms $F(1,68) = 4.01, p = .05, \eta^2 = .06$. Specifically, participants reported fewer symptoms after taking their selected essence for two-weeks (controlling for baseline symptoms at $M = 3.65$) if they had initially chosen from 12 ($M = 2.69, SD = 1.37$) rather than 2 ($M = 3.44, SD = 1.63$), or 38 options ($M = 3.63, SD = 1.55$). Importantly, and supporting the quadratic hypothesis, the planned contrast was found to be significant, $F(1,68) = 5.38, p = .02, \eta^2 = .07$. This finding appears to suggest that counterfactuals, while possibly important for satisfaction, may be less important for actual symptom levels.

3.4 The relationship between satisfaction and symptoms

No correlation was found between satisfaction and symptoms at the initial time of choice across condition: $r = .20, p = .09$, or between change in satisfaction

and change in symptoms over time: $r = .01$, $p = .92$, demonstrating the two measures appear to provide independent means of assessing alternate levels of chooser well-being.

4.0 Discussion

The current research provides evidence for a Goldilocks Effect for Choice within the novel domain of health psychology. In line with predictions, we found evidence that satisfaction at the initial time of choice is an inverted U-shaped function of the number of options available. This is consistent with previous research (e.g. Shar & Wolford, 2007; Reutskaja & Hogarth, 2009), demonstrating the optimizing effects of intermediate choice, and detrimental effects of extensive and very limited choice upon short term satisfaction. Nevertheless, the current experiment also found evidence that the initial effect of choice level upon psychological satisfaction does not appear to be long lasting, and evened out over a two week period. 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).

As mentioned previously, one explanation for this predicted reduction in counterfactual generation over time relates to processes of cognitive dissonance reduction. Specifically, Gilovich and Medvec (1995) argue that time allows for two processes of 'repair work' which enable individuals to improve negative decision outcomes: behavioural and psychological repair work. Behavioural repair work is possible only in reversible choice scenarios, and enables individuals to change initial outcomes to something more suitable. Conversely, psychological repair work enables individuals to reduce the cognitive dissonance associated with non-

reversible choice outcomes, such as those obtained in the current research. This is thought to involve a process of reinforcing positive aspects of the chosen alternative, and disparaging the rejected alternatives post-choice (Schwartz, 2004). As such we suggest the short-term GEC may dissipate over time due to processes of dissonance reduction 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 measure of counterfactual thinking was used in this experiment, further research will be needed in order to establish whether this is the case.

Perhaps the most interesting finding was the 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 reported significantly fewer physiological symptoms, at the end of the 2 week period, than participants who chose from either 2 or 38 options. Crucially, all participants, irrespective of choice level, essentially experienced identical placebo treatment interventions. This is assured on the basis that nearly all (99%) of our participants reported stress-related ailments at the beginning of the study. As such, given the impact of Bach's flower essences upon stress-related symptoms is secondary (i.e. following links between the targeted emotion and stress reduction), it is unlikely that the effects upon physiological symptomatology can be attributed to actual suitability of the presented options for the specific symptoms described. In effect, all of the possible options were equivalent in providing non-direct treatment to target stress-related symptoms. Thus, the current research provides evidence to

suggest that the power of optimal choice does extend to self-reported symptoms and physiological well-being following an objectively equivalent choice outcome, even in the relative long-term of two-weeks.

These findings, if replicable, 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). It appears that the increased likelihood of participants' experiencing a placebo effect following moderate choice may be the result of optimised *expectations* about the potential outcome of that choice (in contrast to the low or perhaps unrealistically high expectations of those in the limited and extensive choice conditions respectively). This is in line with previous research which has shown expectations are key to eliciting placebo effects (see, Montgomery & Kirsch, 1997; Kirsch, 1985; 2005; Morris, 1999), and with Diehl and Poynor's (2010), proposition of an 'expectation-disconfirmation mechanism'; in which the impact of varying choice levels on satisfaction is explained by associated variations in expectations about the degree of preference match one might achieve.

Thus not only does the current research extend our knowledge of the long term impact of choice level, but also provides support for the idea that the possibility that the underlying mechanism behind this impact may involve the influence of choice upon expectations (see Diehl & Poynor, 2010). In doing so, these results also add to the previous literature into psychosomatic medicine – 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 researchers may subsequently wish to bear the influence of choice set size in mind when designing experiments in this field.

The appearance of the GEC on symptomology over time is also in line with recent work by D'Angelo and Toma (2017), who found that subjects who were given a selection of 24 vs. 6 potential online partners were less satisfied with their chosen date one week after having made their selection. The authors argue this demonstrates that in high-stakes contexts, a passage of time may be necessary for choice overload effects to emerge. Our research, conducted in a similarly high-stakes context, appears to provide support for this theory. However, we suggest that, unlike the case for romantic partner selection, where one may continue to ruminate on ramifications that may have been unclear at the moment of selection (such as how family and friends will respond to one's partner), in the case of health related decisions, such thoughts are likely to *decrease* overtime, consistent with the counterfactual account. Specifically, as the temporal distance to initial time of choice increases, one is less likely to bring salient examples of unchosen options to mind, given the availability bias, and limitations to working memory capacity (Tversky & Kahneman, 1974; Craik & Lockhart, 1972). As such, whilst in the case of romantic partner selection ruminations may increase over time due to fresh concerns that arise when considering integrating a chosen partner into one's social circle, in the case of the health related context we present, the appearance of novel considerations pertaining to the outcome are likely to be less frequent over time. This is supported by the counterfactual account, and by our finding that choice effects on psychological satisfaction decrease over time. However, more research is needed which provides a direct assessment of levels of counterfactual thought across varying contexts such as these, in order to establish whether this is the case.

Nevertheless, we do find that the GEC for symptomology appears over time. We suggest the appearance of this effect is more likely theoretically attributed to the

role of expectations elicited at the initial moment of choice. As discussed, with too little, or too much choice, one is likely to have either low or unrealistically high (respectively) expectations about the potential impact of the chosen outcome (Diehl & Poynor, 2010). Yet when the presented choice level is 'just right', expectations are likely to be optimised. Given the role of expectations in determining experience of placebo effects (Montgomery & Kirsch, 1997; Kirsch, 1985; 2005), this theory would appear to account for the appearance of the GEC for symptomology over time.

We suggest that expectations may also explain the decreased psychological satisfaction experienced following an extremely limited choice at the initial time of choice. The counterfactual account is unlikely to account for this effect, given the reduced number of alternative states of the world available for choosers to ruminate on. As such we suggest that in the case of 'too little' choice, choosers may experience decreased satisfaction immediately following selection due to the impact of this upon expectations (see Diehl & Poynor, 2010). Consequently, we provide evidence that the detrimental impact of either 'too little' or 'too much' choice may be accounted for due to different underlying principles within the choice process. Yet, as our results demonstrate, both appear to be equally deleterious when it comes to enabling the chooser to experience satisfaction with their chosen outcome. It would be interesting for future research to continue to explore the role of these underlying drivers of satisfaction in consequential choice scenarios such as this, in order to determine the extent to which expectations and counterfactual thought levels vary according to manipulations in initial choice set size.

Finally, the current research also highlights the potential importance of bearing choice level in mind during the construction of public policy, particularly with regard to the relevant and highly consequential field of medical decision making

(Schneider, 1998; Botti & Iyengar, 2006; Fasolo, Reutskaja, Dixon & Boyce, 2010). Specifically, following Eccles' (2002) claim that placebo effects form a part of the response to any active medical intervention (see also, Margo, 1999), our findings hint at the suggestion that one might predict similar potential benefits to choosers health and well-being if using optimal choice level for decisions involving active health care treatments. Policy makers and organisations in the health care sector may subsequently be wise to bear this in mind when developing potential choice architectures and treatment plans for patients. 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.

In all, we have found evidence for the short term Goldilocks Effect for Choice in the novel domain of health psychology, demonstrating replicability outside of the typically researched domain of consumer goods. We have also demonstrated that the impact of extensive choice upon psychological satisfaction found in the short term does not appear to persist over time, a finding which appears to be consistent with counterfactual theory and with the predicted reduction in the salience of counterfactual alternatives over time. Notably, we also found evidence that choice level can impact upon the choosers' physiological, as well as psychological well-being; with an optimal choice level leading to greater experience of a placebo effect, and reduced experience of (reported) physiological symptoms over time. However, as the current experiment involved the choice and use of placebo treatments more research will be needed in order to explore 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) finally to identify whether optimal choice levels might lead to similar improvements in physiology for active health care treatments. These remain interesting avenues for future research to explore.

Notes. (19)

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