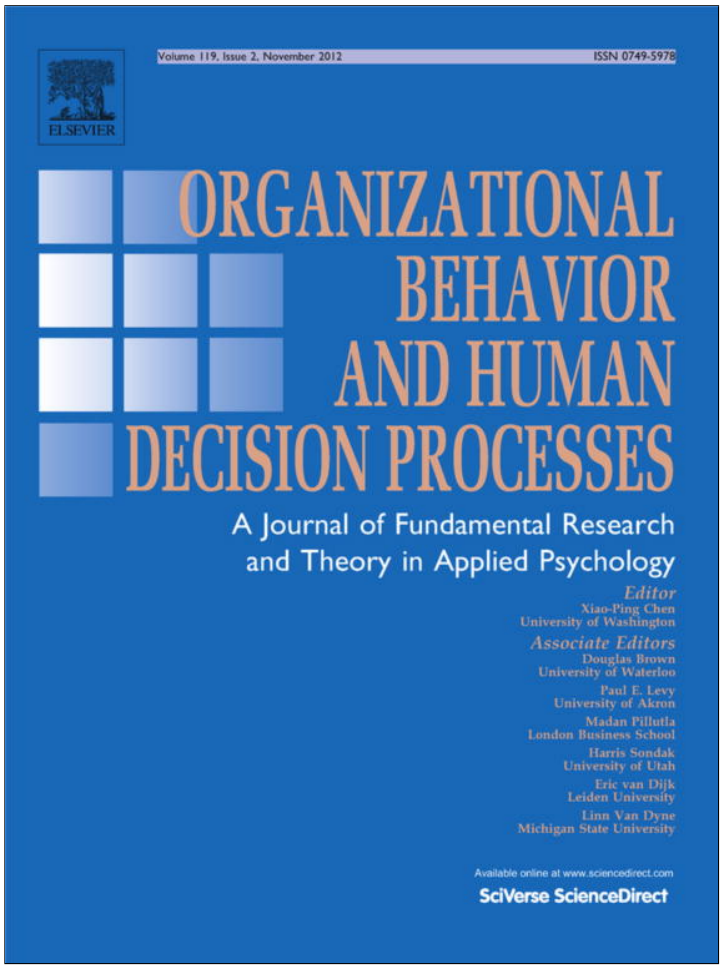

Organizational Behavior and Human Decision Processes 119 (2012) 163–176

Contents lists available at SciVerse ScienceDirect

Organizational Behavior and Human Decision Processes

journal homepage: www.elsevier.com/locate/obhdp

Unsure what the future will bring? You may overindulge: Uncertainty increases the appeal of *wants* over *shoulds*

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ARTICLE INFO

Article history:
Received 5 May 2009
Accepted 19 July 2012
Available online 15 August 2012
Accepted by William Bottom

Keywords:
Want/*should* conflict
Self-control
Uncertainty
Ego depletion

ABSTRACT

This paper examines the effect of uncertainty about the future on whether individuals select *want* options (e.g., junk foods, lowbrow films) or instead exert self-control and select *should* options (e.g., healthy foods, highbrow films). Consistent with the ego-depletion literature, which suggests that self-control resembles an exhaustible muscle, coping with uncertainty about what the future may bring reduces self-control resources and increases individuals' tendency to favor *want* options over *should* options. These results persist when real uncertainty is induced, when the salience of naturally-arising uncertainty is heightened and when individuals are able to make choices contingent upon the outcomes of uncertain events. Overall, this work suggests that reducing uncertainty in a decision maker's environment may have important spillover effects, leading to less impulsive choices.

Introduction

During the 2008–2009 economic crisis, which dramatically increased uncertainty in the lives of many Americans, the *New York Times* reported on skyrocketing sales of candy as other consumer expenditures plummeted (Haughney, 2009). To justify why he had increased his candy consumption during the period in question, one man interviewed by the *Times* explained "there's nothing more stressful than growing financial insecurity everywhere". Often in our lives we face uncertainty about what the future will bring. Will our stock market portfolio move up or down tomorrow? Will our boss assign us to work on project A or project B? When such uncertainty hangs over us, it may systematically reduce our ability to exert self-control and make choices we know we *should* given our long-term interests rather than opting for what we viscerally *want* (i.e., candy).

Often, individuals face internal conflict when making decisions, leading them to waffle when attempting to choose between options they viscerally and impulsively *want* (e.g., eating pizza for lunch, quitting a difficult task) and those they know they *should* exert willpower to select (e.g., eating salad for lunch, persisting on a difficult task) (Bazerman, Tenbrunsel, & Wade-Benzoni, 1998; Milkman, Rogers, & Bazerman, 2008). *Want* options provide more immediate pleasure to an individual than *should* options, but less net future value, and selecting *should* options over *wants* therefore requires an exertion of self-control (Milkman et al., 2008).[1]

This paper examines how uncertainty in a decision maker's environment affects her likelihood of exerting willpower and selecting *shoulds* over *wants*. A series of studies demonstrate that when people choose between *want* options and *should* options, the presence of incidental uncertainty in the decision-making environment depletes their available self-control resources and thus increases their chances of selecting *wants*. These findings have implications for managers, policy makers and marketers interested in finding ways to alter others' likelihood of making *should* choices as well as for individuals interested in increasing their own ability to resist temptation. They suggest that reducing sources of uncertainty can have important positive externalities. These findings also have theoretical implications, providing support for a model of self-control as an exhaustible resource that resembles a muscle, which can be weakened by stressors in the decision-making environment that cause ego depletion (Muraven & Baumeister, 2000).

Past research has demonstrated that contrary to the predictions of neoclassical economic theory (Savage, 1954), incidental uncertainty can lead people to make systematically different choices than they would given any sure outcome (Shafir, 1994; Shafir & Tversky, 1992; Tversky & Shafir, 1992). Past research on ego-depletion has shown that when stressors are introduced into a decision maker's environment that prompt her to engage in the suppression of thoughts or emotions, the likelihood that she will subsequently be able to exert self-control decreases (see Muraven and Baumeister (2000) for a review). This paper extends the ego-depletion, *want*/*should* conflict and uncertainty literatures by examining how incidental sources of uncertainty in a decision maker's environment induce ego-depletion and affect the outcomes of self-control dilemmas.

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[1] Options that are similar to *shoulds* have also been referred to as "cognitive", "utilitarian", "virtue", "affect-poor" and "necessity" options, while *wants* have alternatively been referred to as "affective", "hedonic", "vice", "affect-rich", and "luxury" options (see Khan, Dhar, and Wertenbroch (2005) for a review).

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http://dx.doi.org/10.1016/j.obhdp.2012.07.003

Before presenting a series of laboratory experiments to explore how incidental uncertainty affects ego-depletion and choices between *wants* and *shoulds*, I review the relevant past research on self-control as a muscle and *want/should* conflict.

Past research on self-control as a muscle

Previous research has provided considerable support for a model of self-control as a limited resource that resembles a muscle (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister, Sparks, Stillman, & Vohs, 2007; Muraven & Baumeister, 2000). According to this theory, after an individual makes one attempt to engage in self-control, subsequent attempts are less likely to be successful. More specifically, "self-control strength is used and consumed any time the self actively initiates, alters, or stifles a response" (Muraven & Baumeister, 2000, p. 249), and such use is "ego-depleting", reducing one's capacity for subsequent exertions of self-control.

The empirical support for this model of self-control as a limited resource is extensive. Studies have demonstrated that after exerting self-control in one domain by selecting a *should* over a *want*, experimental subjects are less likely to engage their depleted and exhausted self-control resources again and more likely to select *want* options (Baumeister et al., 1998; Muraven, Tice, & Baumeister, 1998). For example, subjects who were forced to exert self-control by consuming *should* radishes rather than *want* chocolates subsequently exhibited less persistence when working on unsolvable puzzles than others who were allowed to consume chocolates instead of radishes (Baumeister et al., 1998).

One type of stimulus that has been linked previously to ego-depletion is coping with the stress induced by unpredictable stimuli (see Muraven and Baumeister (2000) for a review). In one study demonstrating this relationship, Glass, Singer, and Friedman (1969) found that experimental subjects exposed to regimens of unpredictable noise exhibited greater ego-depletion as measured by subsequent performance on proofreading and frustration-tolerance tasks than subjects exposed to regimens of predictable noise. Consistent with the model of self-control as a muscle, the unpredictability of the stimulus appeared to exhaust self-control resources by requiring active attention and monitoring (Matthews, Scheier, Bunson, & Carducci, 1989; Muraven & Baumeister, 2000). Muraven and Baumeister (2000) argue that coping with such unpredictable stimuli "seems to involve processes that demand inhibition, such as blocking sensations, overriding thoughts, and stopping emotions," (p. 249) which deplete self-control resources.

Past research has not only demonstrated that unpredictable stimuli are ego-depleting, but has also shown that uncontrollable stimuli deplete self-control resources (see Muraven and Baumeister (2000) for a review). For example, exposure to an unpredictable noise has been shown to deplete self-control resources to a lesser degree when the person listening to the noise has access to a button that could be used to turn it off (Glass et al., 1969). Similarly, people who believed they had the option to exit a crowded environment exhibited less ego depletion due to the crowding experience (exhibiting more persistence on a subsequent puzzle task) than those who had no control over the situation (Sherrod, 1974).

Inducing uncertainty about different outcomes a decision maker might face introduces both an unpredictable and an uncontrollable element into a decision maker's environment. Thus, the presence of incidental uncertainty about, for instance, the outcome of a lottery ticket or what will be on the menu for dinner may be ego depleting in the same way as the presence of an unpredictable or uncontrollable noise. Coping with the stress of uncertainty requires overriding thoughts, sensations and emotions triggered by unpredictable and uncontrollable aspects of the future. For instance, uncertainty about the outcome of a lottery ticket may lead an individual to wonder and worry about whether her ticket will be a winner, and if so, how to spend the winnings, and if not, how to manage the disappointment. Faced with other tasks, it will be necessary to suppress those thoughts and emotions that result from uncertainty in order to concentrate. Similarly, highlighting the aspects of a decision maker's life that are highly uncertain is likely to trigger anxieties about different possible outcomes that must be actively suppressed in order for the decision maker to successfully move on with other undertakings.

Suppressing uncertainty is one of the strategies commonly relied upon by decision makers to cope with unknowns, as it can "help decision makers avoid paralysis when they cannot cope with their uncertainty" through other tactics (Lipshitz & Strauss, 1997). When faced with uncertainty, people commonly prefer to suppress thoughts about an uncertain stimulus by actively occupying themselves with distractions (Averill & Rosenn, 1972). Past research has shown that those unsure of whether they will receive an electric shock work hard to suppress thoughts about the uncertain upcoming event by actively deploying their attention away from the possibility (Monat, Averill, & Lazarus, 1972). Such suppression, as described previously, requires an exertion of self-control (Muraven & Baumeister, 2000). Thus, according to the theory of self-control as a muscle, incidental uncertainty in a decision maker's environment will induce ego-depletion, leading to less persistence on difficult tasks requiring the exertion of willpower and a heightened tendency to select *wants* over *shoulds*. In short, the activation of self-control required to suppress natural thought responses to incidental uncertainty will make additional exertions of self-control more difficult and less likely to succeed.

Incidental uncertainty is present in many important decision making environments due to the unpredictability of financial markets, voters, consumers, managers and suppliers, to name just a few sources of volatility. Further, contrary to Savage's (1954) sure-thing principle, uncertainty has been shown in past research to systematically alter choices (Shafir, 1994; Shafir & Tversky, 1992; Tversky & Shafir, 1992), leading people to prefer postponing decisions until all uncertainty – regardless of its relevance to the decision at hand – is resolved. However, the impact of incidental uncertainty on *want/should* conflict has not previously been studied. This paper addresses this important gap in the literature on self-control.

Relevant past research on want/should conflict

A number of factors have been demonstrated in past research to systematically increase the rate at which individuals favor *wants* over *shoulds*. These variables include prompting decision makers to: choose for now rather than later (Milkman, Rogers, & Bazerman, 2009; Read, Loewenstein, & Kalyanaraman, 1999; Read & van Leeuwen, 1998), engage in more concrete and less abstract thinking (Fujita, Trope, Liberman, & Levin-Sagi, 2006), evaluate choices jointly rather than separately (Bazerman, Loewenstein, & White, 1992; Bazerman, Moore, Tenbrunsel, Wade-Benzoni, & Blount, 1999; Bazerman, Schroth, Pradhan, Diekmann, & Tenbrunsel, 1994; Irwin, Slovic, Lichtenstein, & McClelland, 1993; Kahneman & Ritov, 1994), make choices under a high degree of cognitive load (Shiv & Fedorikhin, 1999), and make a choice after recalling a past *should* choice or anticipating a future *should* choice (Khan & Dhar, 2006, 2007). Although debate continues over a common explanation for these findings (for a discussion, see Milkman et al., 2008), a large body of past research has unmistakably demonstrated that the outcomes of self-control dilemmas are highly malleable. The current research contributes to this literature by strengthening the case for a model of self-control resembling a muscle and identifying another important aspect of a decision maker's environment that can

meaningfully influence choices that have important implications for health, productivity, and wellbeing.

It is important to distinguish the current research from one past study of *want/should* conflict in particular. In 2000, O'Curry and Strahilevitz found that the lower the probability of acquiring a prize in a lottery, the more appealing people find "hedonic" (*want*) lottery prizes over "utilitarian" (*should*) prizes. Specifically, these researchers asked subjects to choose between a *want* or a *should* prize but varied the odds that their selected prize would actually be obtained (as opposed to no prize at all). The current paper, on the other hand, examines how *incidental* uncertainty in a decision maker's environment affects choices between *wants* and *shoulds*. O'Curry and Strahilevitz (2000) argue that the decreasing appeal of *wants* as the certainty of their acquisition increases is driven by the combination of: (a) greater utility obtained from anticipating the receipt of a hedonic reward than a utilitarian reward and (b) the increase in anticipatory utility associated with a lower probability event. These mechanisms would not predict a link between incidental uncertainty and self-control, as there is no reason to believe nor evidence to suggest that anticipation utility is altered by incidental uncertainty in a decision maker's environment. However, it is possible that the theory set forth and tested here could provide an alternative explanation for O'Curry and Strahilevitz's (2000) results.

Overview of studies

As described previously, past research on ego depletion suggests that uncertainty in one's environment will reduce available self-control resources and produce an increased preference for *wants* over *shoulds*. Across a series of five studies, this paper thus tests the following hypothesis drawn from the model of self-control as a muscle:

> *Uncertainty in a decision environment depletes self-control resources, leading to increased take-up of want options over should options.*

Study 1 relies on a classic ego depletion paradigm to demonstrate that incidental uncertainty in a decision maker's environment reduces willpower as measured by persistence on a cognitive task. Studies 2a and 2b are scenario studies demonstrating that incidental uncertainty increases the rate at which people report they would choose *want* options over *should* options. Study 3 demonstrates that incidental uncertainty increases take-up of *wants* in non-hypothetical decisions even when choices are made contingent upon the outcome of an uncertain event. Finally, Study 4 demonstrates that the impact of uncertainty on hypothetical choices between *wants* and *shoulds* is mediated by a survey measure designed to quantify ego depletion.

Study 1

Study 1 examines the extent to which people exhibit ego-depletion in the presence and absence of incidental uncertainty. Following a large body of past research, ego-depletion is measured by examining persistence on a difficult task (see for example Baumeister et al., 1998; Vohs & Heatherton, 2000; Vohs et al., 2008).

Method

Participants

Individuals over the age of 18 who were studying in public spaces on the campus of a large, Mid-Atlantic university in the United States were approached and asked if they would be seated in the same place and available to receive a small reward in the form of a lottery ticket in 20 min. Of those who said they would still be in the same location in 20 min, 151 agreed to participate in a short research study in exchange for a Hog Heaven $1 instant game Pennsylvania lottery ticket (Pennsylvania Lottery, 2011) that they were told they would receive after 20 min had passed.

Procedure

All participants were initially asked to fill out a short "lottery questionnaire", which included several demographic questions as well as queries about past experience with lotteries. After completing this questionnaire, all participants were presented with 64 three-digit plus three-digit addition problems printed across two sheets of paper to work on following Vohs et al. (2008). Half of participants (those randomly assigned to the *certainty condition*) were given their Hog Heaven $1 lottery ticket before they were prompted to begin the 64 addition problems and were instructed to immediately scratch-off the ticket to discover their lottery outcome.[2] The other half of participants (those in the *uncertainty condition*) were also shown the Hog Heaven $1 lottery ticket before beginning the addition problems. However, they were not given their ticket nor allowed to scratch it to discover their lottery outcome until the initially stated 20 min time period had passed. This manipulation set up the temptation for participants in the *uncertainty condition* to contemplate whether they held a winning ticket, and if so, how to spend their winnings, and if not, how disappointed they would feel. However, in order to engage in their assigned task, it was necessary to exert willpower to suppress such thoughts.

Upon receiving the 64 addition problems, participants were told both orally and in print on the addition worksheets to "please work on these math problems until you want to quit, are finished, or decide to give up." These instructions were adapted from past depletion research in which ego-depletion was measured by examining persistence on a cognitive task (Vohs & Heatherton, 2000; Vohs et al., 2008). The research assistant administering the study then stepped aside and surreptitiously recorded the time each participant spent on the addition problems before quitting. Persistence was tracked for up to 10 min, which was enough time for most participants who chose to persist to complete the task.

Results and discussion

As predicted, participants facing uncertainty about their lottery outcome exhibited greater ego depletion, persisting on the addition problems for less time (up to a maximum of 10 min) than participants who already knew their lottery outcome (*uncertainty condition*: $M = 361$ s; *certainty condition*: $M = 412$ s; $t(149) = -1.94$; $p = .05$).[3] These results support the hypothesis that the presence of incidental uncertainty in a decision maker's environment depletes self-control resources and follow the paradigm set forth in past ego-depletion research. However, these findings only examine persistence, which is just one of many measures of willpower that may affect productivity and health. Many of the most important policy questions when it comes to self-control involve conflicts between *want* and *should* products and services (e.g., healthy versus unhealthy foods), so the following studies turn to an examination of the impact of uncertainty on these types of consequential choices.

[2] Only six participants in the *certainty condition* discovered that their ticket was a winning ticket (four participants won a free additional $1 lottery ticket, one participant won $1, and one participant won $2).

[3] No participants completed the 64 addition problems in less than 5 min, so one way to ensure that speed completing the entire set of math problems is not confounded with persistence is to examine the percentage of participants who persisted for 5 min or longer. Significantly fewer participants persisted for more than 5 min in the *uncertainty condition* than in the *certainty condition* (*uncertainty condition:* 54%; *certainty condition*: 75%; two sample test of proportions, $p < 0.01$).

Study 2

Study 2 examines the rate at which people select *want* options over *should* options in the presence and absence of uncertainty. This study extends Study 1 by assessing whether uncertainty about the future that is imagined in the form of a scenario (Study 2a) or induced through a directed writing task (2b) alters choices between products.

Study 2a

Method

Participants ($N = 175$) in this study were asked to imagine that their roommate would pick up pizza for dinner from their favorite pizzeria, which only sells one type of pie each night. They were told there was a 50% chance that tonight's pizza would be a carne asada pizza and a 50% chance that it would be a pesto chicken pizza (see Appendix A for detailed pizza descriptions and complete study materials). Participants were then informed that it would be up to them to choose a dessert. The options available were fresh fruit salad (the *should*) or brownies (the *want*).

Participants randomly assigned to the *carne asada condition* were then told that the available pizza would be a carne asada pizza tonight and asked to choose a dessert, while those in the *pesto chicken condition* were told that the available pizza would be pesto chicken pizza and asked to choose a dessert. Participants assigned to the *uncertainty condition* were told the odds remained 50% that the available pizza would be carne asada and 50% that it would be pesto chicken pizza and that they would have to choose a dessert before the resolution of this uncertainty. In short, participants in the *uncertainty condition* were required to make a dessert choice while unknowns remained prominent, creating a temptation to contemplate different possible (though nearly identical and thus inconsequential) futures.

Results

As predicted, participants facing uncertainty about the type of pizza they would eat were more likely to choose brownies (the *want* dessert) over fruit salad (the *should* dessert) (82%) than those who were certain of the type of pizza available (*carne asada condition* – 58%; *pesto chicken condition* – 59%). In a logit to predict *should* dessert selection including only indicator variables for the two certainty conditions, indicator variables for both of these conditions are significant and positive ($\beta_{carne\_asada\_condition} = 1.24$; $p < .01$; $\beta_{pesto\_chicken\_condition} = 1.17$; $p < .01$; $N = 175$; LR $Chi^2(2) = 10.6$).

Study 2b

Method

Online study participants ($N = 159$) were randomly assigned to one of two conditions with equal probability – the *uncertainty condition* or the *certainty condition*. In both conditions, participants completed a directed-writing task designed to manipulate their feelings of uncertainty. The elicitation procedure employed was adapted from a procedure developed by Strack, Schwarz, and Gschneidinger (1985) to manipulate emotions and validated in several subsequent studies (see Keltner, Locke, & Audrain, 1993; Lerner & Keltner, 2001; Tiedens & Linton, 2001; Dunn & Schweitzer, 2005). The induction exercise asked participants to first "briefly describe three to five things that you are most [uncertain/certain] about." The following question asked participants to "describe in detail the one situation that has made you the most [uncertain/certain] you have been in your life, and describe it such that a person reading the description would become [uncertain/certain] just from hearing about the situation." After responding to these two questions, participants were exposed to the uncertainty salience manipulation employed in van den Bos (2001), which asked them to "describe the emotions that the thought of your [being uncertain/sitting in a quiet place (e.g., a park)] generally arouses in you" and to "write down, as specifically as you can, what you think physically will happen to you as you feel [uncertain/sit in a quiet place (e.g., a park)]."

After responding to this series of four questions designed to manipulate the salience of uncertainty, participants were asked "Which of the following magazines would you most like to spend time reading right now?" Their options were *The New York Review of Books* (the *should* choice) or *The National Enquirer* (the *want* choice). These options have previously been established as extremes along the *want-should* spectrum in research by Oster and Scott Morton (2005). See Appendix B for complete study materials.

Results

An examination of the types of unknowns study participants wrote about in the uncertainty condition highlights that efforts to block or override thoughts and emotions likely ensued from the types of unpredictable outcomes considered. In particular, many participants wrote about sources of uncertainty that it would be unhelpful and yet tempting to dwell upon. For example, one typical participant lamented the uncertain economy, stating:

> "*I have never felt so unsure about my future than I am now. The financial market keeps going up and down so that you don't know from one day to another what is happening.*"

Another highlighted uncertainty about property for sale:

> "*I am uncertain about when my home will sell. It is a fairly new construction on over 16 acres of land in a rural area...*"

Concerns about others' health were also raised on a number of occasions in comments like the following:

> "*I am the youngest of 4 children and my siblings are much older than me – 2 of them are in their 80's. I am concerned about their health and how the next years will play out...*"

These examples highlight types of uncertainty that it would be futile but tempting to contemplate at length, which demand active and depleting thought suppression.

Consistent with the prediction that coping with uncertainty induces ego depletion, participants in the *uncertainty condition* (for whom uncertainty salience was heightened) were significantly more likely to select the *want* option than the *should* option (*uncertainty condition* – 54%, $N = 81$; *certainty condition* – 32%, $N = 78$; two sample test of proportions, $p < .01$).

Discussion

The findings presented in Studies 2a and 2b confirm that incidental uncertainty increases the likelihood that when faced with product choices, people will select *wants* rather than exerting the willpower required to choose *shoulds*. Study 2a demonstrates this phenomenon when uncertainty is manipulated through a hypothetical scenario, and Study 2b demonstrates it when life's uncertainties are made more or less salient through a directed writing task. These findings are consistent with the hypothesis that uncertainty induces ego depletion, which reduces those available willpower resources required to resist the temptation to select *wants* over *shoulds*. Study 3 explores this link in a contingent-choice setting involving real rather than hypothetical decisions.

Study 3

Study 3 was designed so that participants facing uncertainty would be prompted to make real choices between *want* and *should* options *contingent* upon the outcome of an uncertain event. Study 3 extends the previous studies by ruling out a number of potential alternative explanations besides ego depletion for the finding that uncertainty increases the appeal of *want* options over *should* options.

One alternative explanation for the previous results presented in this paper is that in the face of uncertainty, people hedge their bets and attempt to lock-in one sure pleasure (or *want*). Study 3 puts this alternative explanation to the test, as there is no need to hedge against a bad uncertain outcome if choices are made contingent upon the outcome of an uncertain event.

In addition, the contingent choice paradigm relied upon in Study 3 helps rule out the possibility that participants facing uncertain futures prefer more generic products or options, which they believe would better fit with all potential eventualities. There is no theoretical reason to believe that *wants* tend to be more "generic" options than *shoulds* and thus better choices in the face of uncertain outcomes. However, if uncertainty continues to affect choices even when they are made contingently, then an explanation whereby *wants* are more generic and thus a less risky selection in the face of uncertainty cannot explain this result.

Method

Participants

Thirty-one students were recruited through advertisements in multiple campus newspapers at several large universities in the Northeastern United States. These students were paid $40 for their participation in this 2 day study, which required one hour of their time on two successive weekdays. There was no attrition from this study – all participants who took part in the study on day one returned to complete the study on day two.

Procedure

On the first day of this study, participants were told that on the following day, they would spend one hour watching a television show assigned by the experimenter while eating a snack of their choice – either an apple (the *should* choice) or a package of M&Ms (the *want* choice). All participants received descriptions of the concepts "*want*" and "*should*" and were asked to classify which was more of a *want* – an apple or a package of M&Ms – and which was more of a *should* – an apple or a package of M&Ms. Participants' responses confirmed that apples are perceived as *shoulds* while M&Ms are perceived as *wants*.[4]

Half of the participants were randomly assigned to the *certainty condition* and were told which television show they would watch tomorrow as well as the title of another show from the available library that they would not be watching. The other half of participants were assigned to the *uncertainty condition* and were told the names of two television shows they might watch tomorrow and informed that a coin toss tomorrow would determine which show they would actually see. In both conditions, the two shows presented to participants were selected from the set of 136 h-long television programs with episodes available for free viewing on www.hulu.com as of October 2008 (e.g., Buffy the Vampire Slayer, Party of Five, ER, NOVA).[5] After learning what show(s) they would either potentially or definitely see tomorrow, participants were prompted to make a binding choice about what snack to eat while watching television (an apple or a package of M&Ms). Participants in the *uncertainty condition* were prompted to make their snack choices contingent upon the outcome of tomorrow's coin toss. In other words, participants selected what snack they would eat if the first of the two television shows they might watch were randomly selected tomorrow and also what snack they would eat if the second of those two shows were randomly selected. Snack choices could be identical or different for the two shows depending on the participant's preferences. Importantly, participants in the *uncertainty condition* were required to make a snack choice while unknowns remained prominent, creating a temptation to contemplate different possible tomorrows. Finally, after making their snack selections, participants completed a PANAS questionnaire to measure positive and negative affect (Watson, Clark, & Tellegen, 1988). See Appendix C for complete study materials.

Results and discussion

The results of this study are consistent with those of Studies 1 and 2. Participants facing uncertainty about the television show they would watch tomorrow were more likely to choose M&Ms (the *want* snack) over an apple (the *should* snack) (63%) than those who were certain of the show they would be watching (27%) (when the rate of M&M selection is averaged across the two contingent choices made by participants in the *uncertainty condition* to provide a single observation per participant).[6] Including both choices made by each participant in the *uncertainty condition* in a logistic regression to predict M&M selection with clustered standard errors to account for repeated observations of the same individual indicates that this difference is statistically significant ($z = -2.04$, $p < .05$; $N = 47$). This finding lends additional support to the hypothesis that the ego-depletion induced by coping with uncertainty increases the probability that individuals will select *want*s over *should*s, as the decisions of participants in this contingent choice setting could not be explained by "hedging" or a desire for generic fit.

There is no evidence that participants' levels of positive or negative affect vary across conditions. Previous research has shown that uncertainty dampens positive and negative emotions felt in response to potential outcomes (van Dijk & Zeelenberg, 2006), suggesting that different intensities of emotions induced by the *certainty* and *uncertainty conditions* in this experiment might explain the results described above. However, no significant differences by condition were detected for any of the 20 emotions measured by the PANAS scale (Watson et al., 1988).

Study 4

Study 4 goes beyond Studies 1–3 by further exploring the validity of the hypothesized mechanism driving uncertainty's impact on self-control exertion. Specifically, Study 4 examines whether a survey measure designed to capture an individual's degree of ego-depletion mediates the effect of incidental uncertainty on the likelihood that individuals will select a *want* over a *should*.

Method

Participants

Two hundred and twenty-one participants from the United States were recruited over the internet through Amazon's

[4] Twenty nine of 31 participants classified apples as *shoulds* and M&Ms as *wants* and the remaining participants classified apples as both *wants* and *shoulds*.

[5] The two shows presented to participants were "semi-randomly" selected in that participants in both conditions were randomly assigned to either see descriptions of two randomly selected shows that were similar on the *want/should* spectrum or two randomly selected shows that were extreme opposites on that spectrum.

[6] Of those making contingent selections in the uncertainty condition, 72% selected M&Ms with *want* shows ($N = 18$), while 50% selected M&Ms with *should* shows ($N = 14$). *Want* shows are defined as those that received average ratings ranging from 1 to 3 on scale from 1 = *want* to 6 = *should*, and *should* shows are defined as those that received average ratings from 4 to 6 on this scale.

Mechanical Turk to participate in a short online survey study. These participants were paid $0.40 for completing a survey that they were told would take about 5 min of their time.

Procedure

Participants were randomly assigned to one of two conditions with equal probability – the *uncertainty condition* or the *certainty condition*. The same uncertainty manipulation was relied upon in this study as described in Study 2b (see Appendix B): participants completed a directed-writing task, and those in the *uncertainty condition* wrote about aspects of their life that were uncertain, while those in the *certainty condition* wrote about aspects of their lives that were assured. After completing this writing task, participants were asked "Which of the following movies would you most like to spend time watching right now?" Their options were "a documentary about a fairly esoteric topic that has been called 'a bit dull but highly educational and enlightening'" (the *should* choice) or "an action film with attractive movie stars that has been called 'empty but highly entertaining'" (the *want* choice).

After making their selections, participants were asked two questions to measure their degree of depletion, which were adapted from past depletion research by Tice, Baumeister, Shmueli, and Muraven (2007). Depletion is only rarely measured using survey data and is instead typically measured by exploring persistence and choice, as in Studies 1–3 (see for example Muraven et al., 1998; Vohs & Heatherton, 2000; Vohs et al., 2008). However, this study goes beyond revealed preferences to more carefully explore mechanism by adapting the scale developed by Tice et al. (2007) to measure self-reported depletion. Participants were asked to what extent on a 7-point scale (1 = not at all; 7 = very much) they felt too tired to select the documentary film and to what extent they felt too worn out to select the documentary film ($\alpha = 0.96$, thus the two measures are summed to form a single scale).[7] See Appendix B for complete study materials.

Results and discussion

Participants in the *uncertainty condition* reported feeling too tired and worn out to select the documentary film at a significantly higher rate than participants in the *certainty condition* ($M_{uncertain} = 6.94$, $M_{certain} = 5.84$, $t(219) = -2.18$, $p < .05$) suggesting that uncertainty indeed induces depletion. Further, consistent with the prediction that uncertainty increases the rate at which participants lack the willpower to select *shoulds*, the *should* option was selected more frequently in the *certainty condition* than the *uncertainty condition* (*uncertainty condition* – 38%, $N = 108$; *certainty condition* – 54%, $N = 113$; two sample test of proportions, $p < .05$).

I next test whether self-reported depletion mediated the relationship between uncertainty and selections of *want* options over *should* options (Baron & Kenny, 1986). When controlling for the uncertainty manipulation in a logistic regression, self-reported depletion was a significant predictor of selecting the *want* option, $\beta_{depletion} = 0.28$, $p < .001$. After controlling for self-reported depletion, the effect of uncertainty on *want* take-up decreased from $\beta_{uncertainty} = 1.10$, $p < .05$ to $\beta_{uncertainty} = 0.49$, $p = .112$. A bootstrap analysis showed that the 95% bias-corrected confidence interval for the size of the indirect effect excluded zero (0.02, 0.15), indicating a significant indirect effect of self-reported depletion on *want* take-up (MacKinnon, Fairchild, & Fritz, 2007; Shrout & Bolger, 2002).

[7] Tice et al. (2007) measured the depletion induced by thought-suppression by asking participants both how tired and how worn-out they felt.

General discussion

The results presented above suggest that incidental uncertainty can have dramatic effects on choice, contradicting the "sure-thing principle" of Expected Utility Theory (Savage, 1954). Specifically, they demonstrate that incidental uncertainty in a decision maker's environment induces ego depletion and that individuals are more likely to select *want* options when they face uncertainty about the future or when uncertainty's salience is heightened. Together these findings suggest that eliminating uncertainty from situations involving decision making may have meaningful spillover effects.

The results presented in this paper are consistent with the predictions of the ego-depletion literature, which proposes that the presence of stressors requiring an individual to actively suppress thoughts about an external stimulus will make it more difficult for that individual to subsequently exert the willpower required to select *should* options over *wants*. A common method of coping with uncertainty is to suppress thoughts about the uncertainties one faces (Monat et al., 1972). The findings presented in this paper, which demonstrate a causal link between incidental uncertainty and self-control failures, thus lend additional support to the theory of self-control as a muscle that can be exhausted by repeated use (Muraven & Baumeister, 2000).

One notable alternative explanation for the findings presented in this paper is that uncertainty induces a negative mood state, and negative moods reduce available self-control resources (Tice et al., 2007). However, the fact that the PANAS emotions scales in Study 3 showed no movement on any of their 20 indices suggests that mood is an unlikely driver of the findings presented in this paper. It is also difficult to imagine that uncertainty about such incidental details as pizza toppings (see Study 2a) meaningfully influence mood. Finally, the mediation results presented in Study 4 are not easy to reconcile with a mood-based account of this paper's results. In short, considerable evidence supports an ego depletion account of the findings presented in this paper, while the results presented in Studies 1–4 lend little support to a mood-based explanation.

In addition to their theoretical implications, the findings presented in this paper have implications for a widely used preference elicitation method in experimental economics and psychology. The Becker–Degroot–Marshak (BDM) method for eliciting willingness to pay through an incentive-compatible procedure assumes that making multiple choices without knowing for certain which will be enacted does not alter the nature of those choices (Becker, Degroot, & Marshak, 1964). However, the studies presented this paper demonstrate the fallibility of this assumption – when it is uncertain which choice will be enacted, the appeal of *wants* over *shoulds* is heightened. This finding has implications for the interpretation of research relying on the BDM method.

The findings presented here also suggest multiple interesting potential avenues for future research. For instance, past research has suggested that unethical decision making may be a *want* choice (see Mead, Baumeister, Gino, Schweitzer, & Ariely, 2009; Tenbrunsel, Diekmann, Wade-Benzoni, & Bazerman, 2010), implying that the presence of uncertainty may reduce ethical decision making. Future studies could test this intriguing hypothesis: for instance, does increasing financial uncertainty lead to a concurrent increase in unethical behavior? In addition, the current research suggests that advance planning

to reduce uncertainty may have a beneficial impact on self-control dilemmas, and this could be examined directly in future studies.

These findings also have important policy implications. Research suggesting ways in which people may be "nudged" (Thaler & Sunstein, 2008) to make more *should* decisions can help policy makers design interventions that will help individuals save more for retirement, exercise more regularly, eat more healthfully, and generally engage in fewer behaviors that are costly to society. This paper documents a previously unknown lever – uncertainty – that leads to systematic changes in whether people select *shoulds* or *wants*. By removing external uncertainty from decision contexts where the exertion of self-control would be desirable, policy makers may be able to increase the rate at which individuals engage in healthy behaviors.

Individuals can also benefit from the knowledge that uncertainty reduces their capacity to engage in *should* behaviors. When dieting, saving, or attempting to meet a deadline at work, individuals may benefit from knowing that decreasing other sources of uncertainty in their lives could increase their overall ability to exert self-control. Similarly, managers should be aware of the positive externalities of reducing uncertainty for their employees. By providing clear information about upcoming projects, meetings and events, rather than leaving such things up in the air, managers may be able to increase the rate at which their employees engage in *should* behaviors like working efficiently rather than procrastinating.

Acknowledgments

I thank Max Bazerman, John Beshears, Howard Kunreuther, Karim Kassam, David Laibson, Kathleen McGinn, David Parkes, Maurice Schweitzer, Jack Hershey, as well as seminar participants at London Business School, the University of Southern California, Harvard University, Ohio State University, the University of Pennsylvania and the Society for Judgment and Decision Making for helpful feedback on this paper. I also thank my research assistants Jessica Matthews, Vanessa Schneider, Liliana Urrutia, Samantha Kim and Samantha Lee for their help collecting data and Bill Simpson for his technical expertise. Finally, I thank Harvard Business School and The Wharton School for funding support.

Appendix A. Stimuli for study 2a

You have a big meeting today so your roommate has volunteered to pick up take-out pizza from your favorite pizza place for dinner tonight. Your favorite pizza place only makes one type of pizza each night, and it's always excellent. You've learned from experience that there is a 50% on Tuesdays (today is a Tuesday) that the available pizza will be a Carne Asada Pizza (see below for a detailed description) and a 50% chance that it will be a Pesto Chicken Pizza (see below for a detailed description).

[A color photograph of a pizza with the characteristics described appeared here]	**Possibility #1: Carne Asada Pizza** Grilled steak, fire-roasted mild chilies, onions, cilantro pesto, Monterey Jack, and Mozzarella cheeses. Topped with fresh tomato salsa and cilantro. Served with a side of tomatillo salsa.
[A color photograph of a pizza with the characteristics described appeared here]	**Possibility #2: Pesto Chicken Pizza** NEAPOLITAN PIZZA: Grilled chicken breast marinated in a basil pesto sauce with mild onions, Mozzarella cheese, sun-dried tomatoes, pesto sauce and toasted pine nuts.

Carne Asada Condition: {This morning your roommate called the restaurant and learned that the pizza available tonight would be Carne Asada Pizza.}

Pesto Chicken Condition: {This morning your roommate called the restaurant and learned that the pizza available tonight would be Pesto Chicken Pizza.}

Uncertainty Condition: {Tonight when you get home, you will find out which pizza you are eating – Carne Asada Pizza or Pesto Chicken Pizza.}

You are in charge of choosing what dessert to have with the pizza for dinner: (a) fresh fruit salad or (b) fresh brownies. You are trying to lose weight, so you know you probably *should* choose the fresh fruit salad, but fresh brownies are what you viscerally *want*.

Carne Asada Condition: {Your roommate has asked you to tell her which to buy for dessert after your Carne Asada Pizza dinner?}

Pesto Chicken Condition: {Your roommate has asked you to tell her which to buy for dessert after your Pesto Chicken Pizza dinner?}

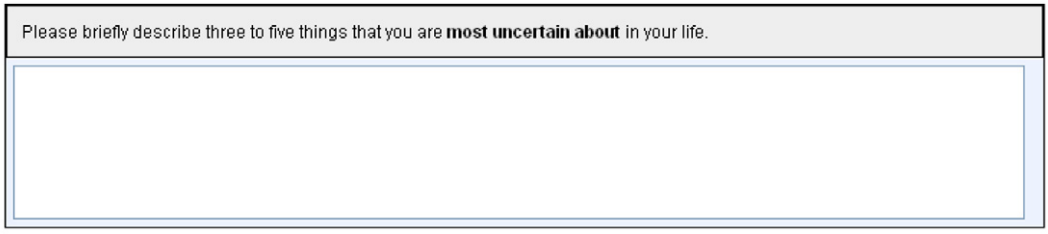
Uncertainty Condition: {Although you are unsure of which pizza you will be eating tonight, realizing there is a 50% chance that you will have Carne Asada Pizza and a 50% chance that you will have Pesto Chicken Pizza, your roommate has asked you to tell her which dessert to buy for tonight?

Which do you tell her, still unsure of the pizza you will be eating, that she should buy for dessert?} [CIRCLE YOUR CHOICE BELOW]

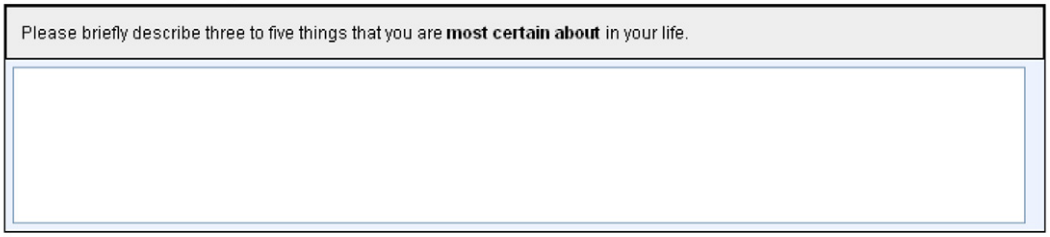
(a) fresh fruit salad or (b) fresh brownies

Appendix B. Stimuli for studies 2b and 4

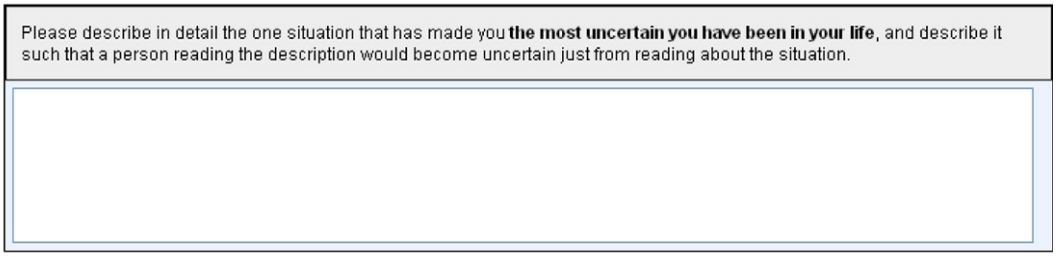
SCREEN 1 – Uncertainty Condition



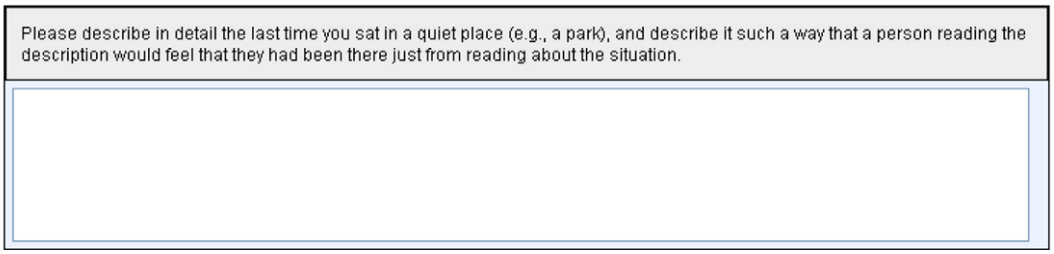
SCREEN 1 – Certainty Condition



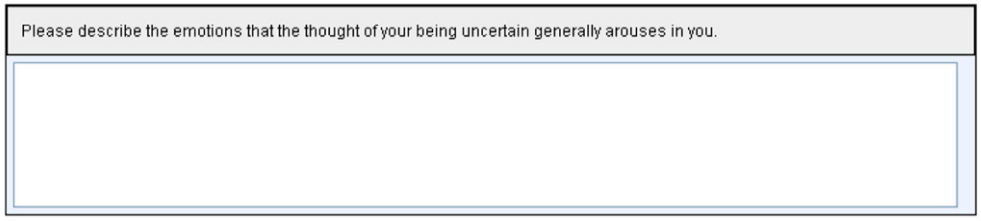
SCREEN 2 – Uncertainty Condition



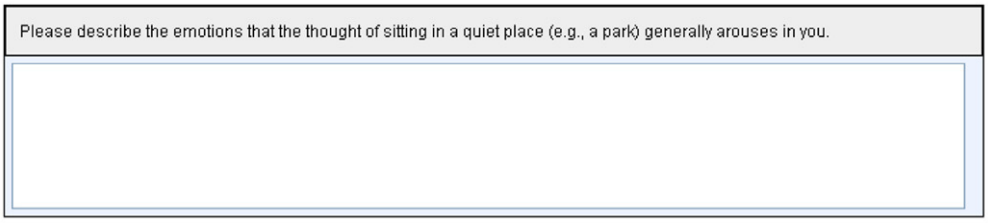
SCREEN 2 – Certainty Condition



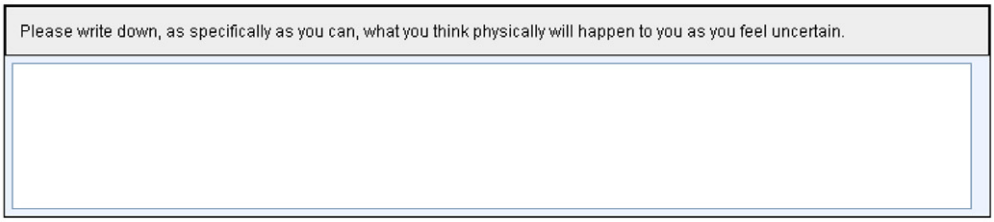
SCREEN 3 – Uncertainty Condition



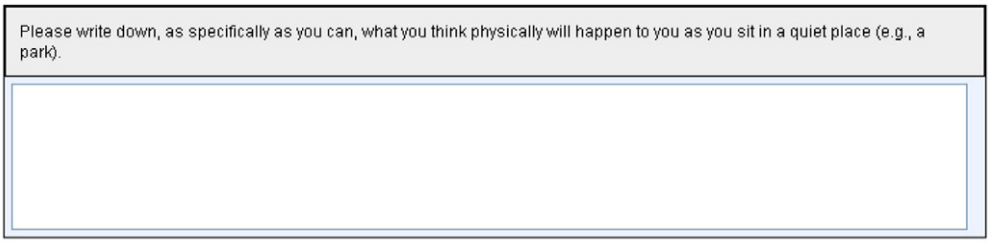
SCREEN 3 – Certainty Condition



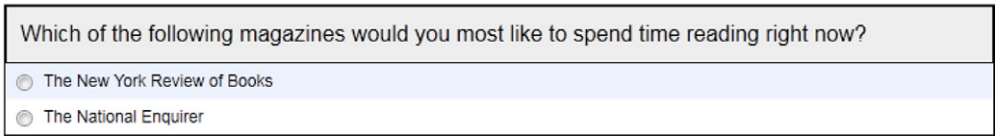
SCREEN 4 – Uncertainty Condition



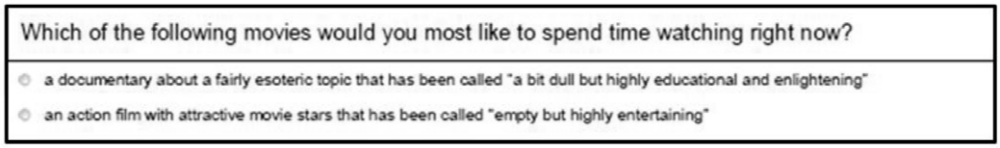
SCREEN 4 – Certainty Condition



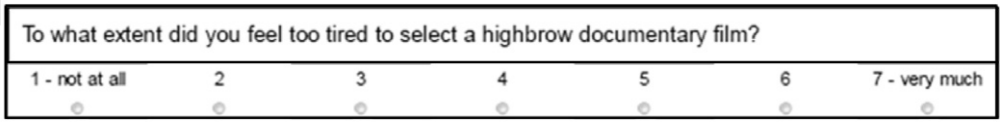
STUDY 2B, SCREEN 5 – Both Conditions

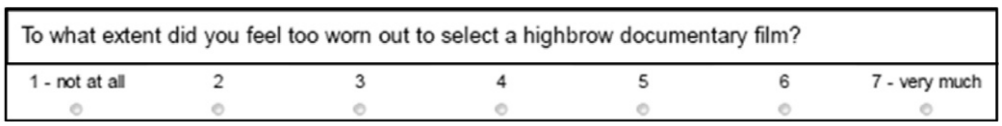


STUDY 4, SCREEN 5 – Both Conditions



STUDY 4, SCREEN 6 – Both Conditions





Appendix C. Stimuli for study 3

Day 1

SCREEN 1 – Both Conditions

Tomorrow when you return to this lab you will all be watching films and eating snacks. Note as you consider any film viewing selections that you will be monitored during the hour film viewing period to ensure that you are paying attention, and anyone caught sleeping, reading e-mail, doing work, or not paying attention for any other reason **will NOT receive their $30 study completion payment** - they will only receive their $10 show-up fee. Also, note that you will be required to throw away any uneaten snacks you are given during tomorrow's session - snacks may not be taken out of the lab.

Click Here

SCREEN 2 – Both Conditions

Research Study

Please enter your USER ID here (this number was given to you by the experimenter):

Submit Screen 1

SCREEN 3 – Both Conditions

Research Study

There is research suggesting that people experience internal conflict when choosing between things they feel they ***should*** do but don't particularly want to do ("should" options) and things they ***want*** to do but don't feel they should do ("want" options). *Should* options are typically less instantly gratifying but provide more long-term value than *want* options. To give a concrete example, a greasy slice of pizza (which tastes great but is quite unhealthy) is more of a *want* option and less of a *should* option than a simple salad (which often tastes just so-so but is quite healthy).

Consider the following choice that a person could face:

Eating **an apple** 

or

Eating **a package of M&Ms** 

1. Which option do you think is more of a *should* choice?
   - ○ Eating **an apple**.
   - ○ Eating **a package of M&Ms**.

2. Which option do you think is more of a *want* choice?
   - ○ Eating **an apple**.
   - ○ Eating **a package of M&Ms**.

Submit Screen 2

SCREEN 4 – Uncertainty Condition

Research Study

Tomorrow a coin flip will determine

Which of the following television shows you watch for 1 hour:

(1) The A Team (see description below).

[An image of the DVD cover art associated with this television show appeared here]	"In 1972 a crack commando unit was sent to prison by a military court for a crime they didn't commit. These men promptly escaped from a maximum security stockade to the Los Angeles underground. Today, still wanted by the government, they survive as soldiers of fortune. If you have a problem, if no one else can help, and if you can find them, maybe you can hire: THE A-TEAM."

or

(2) Alfred Hitchcock Hour (see description below).

[An image of the DVD cover art associated with this television show appeared here]	The Alfred Hitchcock Hour was a mystery and suspense anthology hosted by the master of supsense Alfred Hitchcock. Each 60 minute episode included opening and closing vingettes featuring Hitchcock who would often explain some aspect of the day's show and would often offer subtle (or not so subtle) jabs at the shows sponsors.

NOTE: We will monitor you tomorrow while you are watching the show to ensure that you are paying attention. If we find that you are not paying attention (because you fall asleep, are reading a book, etc.), you will only receive a show-up fee of $10 and no additional $30.

Submit Screen 3

SCREEN 4 – Certainty Condition

Research Study

Tomorrow it has been determined that you will watch

The following television show for 1 hour:

The A Team (see description below).

[An image of the DVD cover art associated with this television show appeared here]	"In 1972 a crack commando unit was sent to prison by a military court for a crime they didn't commit. These men promptly escaped from a maximum security stockade to the Los Angeles underground. Today, still wanted by the government, they survive as soldiers of fortune. If you have a problem, if no one else can help, and if you can find them, maybe you can hire: THE A-TEAM."

The other show in our library, which you will not watch tomorrow is:

Alfred Hitchcock Hour (see description below).

[An image of the DVD cover art associated with this television show appeared here]	The Alfred Hitchcock Hour was a mystery and suspense anthology hosted by the master of supsense Alfred Hitchcock. Each 60 minute episode included opening and closing vingettes featuring Hitchcock who would often explain some aspect of the day's show and would often offer subtle (or not so subtle) jabs at the shows sponsors.

NOTE: We will monitor you tomorrow while you are watching the show to ensure that you are paying attention. If we find that you are not paying attention (because you fall asleep, are reading a book, etc.), you will only receive a show-up fee of $10 and no additional $30.

Submit Screen 3

SCREEN 5 – Uncertainty Condition

Research Study

Now you must make the following choice, which we will hold you to tomorrow:

Note that this choice is NOT hypothetical - it is a real choice!

Tomorrow you will receive a snack to eat - either an apple or a package of M&Ms - during the hour you spend watching the show selected by a coin flip: either the show ***The A Team*** or the show ***Alfred Hitchcock Hour***. Now you must choose which snack you want to receive if: (A) a coin flip determines that you will watch ***The A Team*** and (B) a coin flip determines that you will watch ***Alfred Hitchcock Hour***.

3. Which snack do you choose to be given tomorrow as a bonus if a coin flip determines that you will spend 1 hour watching an episode of the show ***The A Team***?

○ An apple 

○ A package of M&Ms 

4. Which snack do you choose to be given tomorrow as a bonus if a coin flip instead determines that you will spend 1 hour watching an episode of the show ***Alfred Hitchcock Hour***?

○ An apple 

○ A package of M&Ms 

NOTE: You will not be allowed to leave the CLER lab with your snack.You must either eat it during the hour of film viewing or return whatever remains of it when you leave the room.

Submit Screen 5

SCREEN 5 – Certainty Condition

Research Study

Now you must make the following choice, which we will hold you to tomorrow:

Note that this choice is NOT hypothetical - it is a real choice!

Tomorrow you will receive a snack to eat - either an apple or a package of M&Ms - during the hour you spend watching the show ***The A Team***. Now you must choose which snack you want to receive while watching ***The A Team***.

3. Which snack do you choose to be given tomorrow as a bonus while you spend 1 hour watching an episode of the show ***The A Team***?

○ An apple 

○ A package of M&Ms 

NOTE: You will not be allowed to leave the CLER lab with your snack.You must either eat it during the hour of film viewing or return whatever remains of it when you leave the room.

Submit Screen 5

SCREEN 6 – Both Conditions

Research Study

Below are a number of words that describe different feelings and emotions. Please read each item and select the appropriate answer next to that word. Indicate the extent to which you feel this way right now.

Use the following scale to record your answers:

(1) = Very slightly or not at all (2) = A little (3) = Moderately (4) = Quite a bit (5) = Extremely

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
5. Interested	○1	○2	○3	○4	○5
6. Distressed	○1	○2	○3	○4	○5
7. Excited	○1	○2	○3	○4	○5
8. Upset	○1	○2	○3	○4	○5
9. Strong	○1	○2	○3	○4	○5
10. Guilty	○1	○2	○3	○4	○5
11. Scared	○1	○2	○3	○4	○5
12. Hostile	○1	○2	○3	○4	○5
13. Enthusiastic	○1	○2	○3	○4	○5
14. Proud	○1	○2	○3	○4	○5
15. Irritable	○1	○2	○3	○4	○5
16. Alert	○1	○2	○3	○4	○5
17. Ashamed	○1	○2	○3	○4	○5
18. Inspired	○1	○2	○3	○4	○5
19. Nervous	○1	○2	○3	○4	○5
20. Determined	○1	○2	○3	○4	○5
21. Attentive	○1	○2	○3	○4	○5
22. Jittery	○1	○2	○3	○4	○5
23. Active	○1	○2	○3	○4	○5
24. Afraid	○1	○2	○3	○4	○5

Submit Screen 5

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