Making Choices Impairs Subsequent Self-Control: A Limited-Resource Account of Decision Making, Self-Regulation, and Active Initiative

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The current research tested the hypothesis that making many choices impairs subsequent self-control. Drawing from a limited-resource model of self-regulation and executive function, the authors hypothesized that decision making depletes the same resource used for self-control and active responding. In 4 laboratory studies, some participants made choices among consumer goods or college course options, whereas others thought about the same options without making choices. Making choices led to reduced self-control (i.e., less physical stamina, reduced persistence in the face of failure, more procrastination, and less quality and quantity of arithmetic calculations). A field study then found that reduced self-control was predicted by shoppers' self-reported degree of previous active decision making. Further studies suggested that choosing is more depleting than merely deliberating and forming preferences about options and more depleting than implementing choices made by someone else and that anticipating the choice task as enjoyable can reduce the depleting effect for the first choices but not for many choices.

Keywords: choice, self-regulation, self-control, decision making, executive function

The rich complexity of human social life is partly attributable to choice. Each day millions of people make multiple decisions. These range from momentous and far-reaching decisions, such as what career to pursue and whether to order the troops into battle, to relatively fleeting and inconsequential choices, such as whether to take another cup of tea or to floss that night.

Moreover, choices have proliferated, increasing the number of decisions people can (and must) make. The diversity of consumer product selection has expanded exponentially, such that the average American supermarket in 1976 carried 9,000 different unique products, whereas 15 years later that figure had ballooned to 30,000 (Waldman, 1992). It is estimated that there are currently 1 million SKUs (stock keeping units, thus unique specific products) in the US and that the average supermarket carries 40,000 of them (Trout, 2005). The coffee shop chain Starbucks boasted in 2003 that it offered each customer 19,000 beverage possibilities at every store. Similar proliferations of alternatives have occurred with television channels, dating partners, investment options, and in countless other spheres.

Has the proliferation of choice uniformly made life easier and better? Possibly not. Consumer behavior scientists long have observed that consumers feel frustrated and overwhelmed with the intense information demands that accompany large assortments (Huffman & Kahn, 1998; Malhotra, 1982). Iyengar and Lepper (2000) found that consumers who faced 24 options, as opposed to 6 options, were less willing to decide to buy anything at all, and

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those who did buy were less satisfied with their purchase. Such findings suggest that choice, to the extent that it requires greater decision making among options, can become burdensome and ultimately counterproductive. Although we do not argue that having no choice is good, recent commentaries have denounced the notion of ever-increasing choice, using words like "relentless" and "inescapable" (Mick, 2005) to describe this "tyranny of freedom" (Schwartz, 2000, p. 79).

The present investigation was designed to offer a possible explanation for the detrimental effects of choosing. Our approach was based on recent evidence that the self's executive function relies on a limited resource that resembles a form of strength or energy. Past work has mainly established that this resource is depleted in acts of self-regulation (Baumeister, 2002; Muraven, Tice, & Baumeister, 1998; Vohs & Heatherton, 2000), but it may also be used in other executive activities of the self, most notably in making choices. We hypothesized that this resource is the same as that used for self-regulation. As a result, one repercussion of making choices could be a subsequent reduction in effective self-regulation due to a lack of resources to put toward subsequent tasks and challenges.

Choice and Control

By some analyses, human life is full of constant choices, insofar as almost every time one acts, one could probably have done something different (Sartre, 1956; but cf. Hofmann, Strack, & Deutsch, in press). By that definition, the above Starbucks example would entail that every customer makes 19,000 choices with every order. We use the term *choice* in a more limited sense, however, to refer to choices made by a conscious consideration among alternatives. Much of the time people proceed by routine, habit, and automatic processes (Bargh, 2002). We consider the contemplation of alternatives and selection among them to be a meaningful and effortful internal act that involves more than habitual behavior. The most advanced form of choosing involves weighing information about currently available options so as to select the option that seems most promising. This process would be the most flexible and potentially the most adaptive in terms of promoting survival and reproduction (especially in the multidimensional social environment known as human culture), but it requires the most elaborate information-processing apparatus and the most pliant behavior control system—which would suggest that it is a costly skill. The cost of such choosing is our current focus.

Self-Regulatory Resource Depletion

The self's executive function is the agent that makes decisions, initiates and maintains action, and regulates the self by operating on its inner states (Baumeister, 1998). We define *self-regulation* as the self exerting control to override a prepotent response, with the assumption that replacing one response with another is done to attain goals and conform to standards. Recent findings have indicated that many of the self's activities depend on a common resource, akin to energy or strength. This step encompasses responses designed to move the person from the current point toward the standard (cf. operate mode in cybernetic models; Carver & Scheier, 1990). All of these activities draw on the same resource, which is limited and seems easily depleted.

A series of studies has provided evidence that some self-resource is depleted by acts of self-regulation. Baumeister, Bratslavsky, Muraven, and Tice (1998) and Muraven et al. (1998) showed that performing one act of regulating the self impaired performance on a subsequent, seemingly unrelated act of self-control. Presumably, the first act of self-control depleted some common resource that would have been needed to perform better at the second act of self-control. Depletion of the self's resources (also termed *ego depletion*) has been linked to multiple behavioral problems, including overeating by dieters (Vohs & Heatherton, 2000), prejudicial responding (Richeson & Shelton, 2003), ineffective self-presentation (Vohs, Baumeister, & Ciarocco, 2005), intellectual underachievement (Schmeichel, Vohs, & Baumeister, 2003), inappropriate sexual responses (Gailliot & Baumeister, 2007), and impulsive overspending (Vohs & Faber, 2007).

Self-regulation and decision making may share more than simply being housed under the executive function of the self. The core question of the present research was whether the resources that drive self-regulation might also govern other activities of the executive function, such as decision making (Vohs, 2006). If so, then making choices should lead to impaired self-control afterward, even on tasks unrelated to making those choices.

Choice Can Impair Self-Control

There are several reasons to think that choosing would deplete the self's strength. These reasons also differentiate the act of deliberation from that of choosing. Self-regulation presumably consumes resources because the self must override one response and then substitute a different response, and energy is needed to perform these interrupt and initiate functions. In support of the uniqueness of choosing, the reflective–implemental model (Strack, Werth, & Deutsch, 2006) conceptualizes choosing as a quasi-behavioral act that ties the selected option to the self via the creation of a mental representation. The initiation of a mental link between the active, intentional, reflective part of the self and the desired option also suggests an energy-consuming act that would deplete regulatory resources (Vohs, 2006).

Prior work has contained mixed findings about whether choosing depletes resources. One study found evidence of depletion using a dissonance paradigm, in which making a choice to perform a counterattitudinal behavior resulted in subsequent impairment in self-control (Baumeister et al., 1998). This finding could mean that choosing depletes the self's resources but may also mean that dissonance-reduction processes were depleting. Moller, Deci, and Ryan (2006) produced evidence that participants who freely chose their favorite option showed no signs of depletion. They concluded that autonomous choice is not depleting.

We readily accept that some choices are more depleting than others. Pleasantness might well mitigate the impact of choosing, especially if only a few choices are made. Still, we reasoned that making a choice involves a special intrapersonal act. This step, which commits the person to a course of action (Strack et al., 2006), may take effort above and beyond merely thinking about possible options. Hence choosing may consume some of the self's limited supply of energy, thereby rendering the resource less available for further demands.

Pilot Study

The pilot study was designed to justify the assumptions behind the choice procedure that was to be used in Experiments 1–4, and it also validated a self-report measure for use in Study 5. The purpose was to show that we could measure the exertion involved in choosing.

Method

Participants. Participants were 34 undergraduate students (20 men) who participated in exchange for partial course credit.

Procedure. Participants were randomly assigned to either make choices or rate products. They were given a list of specific varieties of products, such as colored pens, scented candles, popular magazines, and colored t-shirts. Participants in the no-choice condition were asked to indicate the extent to which they had used each product in the past (on a scale from 1 = *never* to 5 = *very often*). Participants in the choice condition were given the same list of products but were instructed to choose between two different versions of each product (e.g., a white t-shirt vs. a black t-shirt, a red pen vs. a purple pen). Participants were told that they would receive a small gift on the basis of their choices or ratings (depending on condition). Thus, participants' responses had potentially real (though relatively minor) outcomes. Both conditions faced a questionnaire with 60 items on it, but only in the choices condition were the items asking for decisions.

Subsequently, participants completed the state version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) and an eight-item questionnaire that served as the manipulation check of the methods. Two of the items asked about the extent to which the previous task had involved making choices, two items asked about engaging in deliberation and careful consideration, one item asked if the task reflected the participant's own choosing, another item asked about whether the task involved thinking about options, and yet another asked about how active the participant had felt during the previous task. The last item asked for ratings of fatigue. The first seven items were designed to tap into the different aspects of choice making that are important in the depletion of self-resources; the last item on fatigue was included to see whether participants reported feeling more tired after making multiple choices. After completing the product-task questionnaire, participants were debriefed and thanked.

Results and Discussion

A factor analysis of the eight items showed that one factor accounted for 43% of the variance in the unrotated solution (eigenvalue = 3.46), whereas the second factor (eigenvalue = 1.27) accounted for an additional 16% of variance. This principal-components analysis extracted a two-component structure (eigenvalues over 1 selected) for the eight items on the choices questionnaire. Factor scores on each of the choice factors were derived for each participant. Of the two factors, the larger one seemed to correspond most closely to the act of making choices, which is to say that the two highest loading items on this factor were perceptions of the extent to which participants' task involved (a) thinking about different options, followed by (b) making many choices. The other factor seemed to relate most closely to feelings of fatigue, in that the tiredness item made the biggest contribution to this factor.

Two independent *t*-tests, one for each factor, were used to predict factor scores as a function of choices condition versus frequency-rating (i.e., no choice) condition. Scores on the Choices factor were significantly predicted by condition, $t(32) = 2.65$, $p < .02$, whereas factor scores on the other factor (i.e., Fatigue) showed no differences as a function of condition, $t(32) = 0.49$, *ns*. Thus, the main finding of the pilot study was that participants who made choices among products reported being more active, conscious, and deliberative during the task relative to participants who merely rated the frequency with which they had used the products.

The choices task took about a minute longer ($M = 210.32$ s, $SD = 65.98$) than did the frequency-rating task ($M = 146.32$ s, $SD = 44.02$), and the difference was significant, $t(32) = 3.36$, $p < .01$. Time spent on the task did not correlate with either of the two factor scores, Factor 1: $r(34) = .07$, *ns*, Factor 2: $r(34) = .12$, *ns*.

As mentioned, participants' first charge after the product task was to complete the PANAS to test for potential mood differences as a function of condition. As expected, condition did not determine positive affect (choices condition: $M = 24.31$, $SD = 7.09$; frequency-rating condition: $M = 25.05$, $SD = 6.61$) or negative affect (choices condition: $M = 13.19$, $SD = 4.45$; frequency-rating condition: $M = 11.89$, $SD = 2.25$), $t(32) = 0.32$, *ns*.

Experiments 1A and 1B: Consumer Choices and an Unsavory Drink

Our theory holds that effortful, involving choices could deplete the self's resources and that this depletion would impair performance on a self-regulation task. Hence in Experiments 1A and 1B, a choice (vs. no choice) manipulation was followed by a self-regulation task.

Self-regulatory resource depletion was measured by how much of a bad-tasting (but not harmful) beverage people drank. Making oneself drink an aversive beverage requires self-control insofar as people are disinclined to imbibe it and must therefore force themselves to do something they do not want to do. We used a drink made of a combination of vinegar and water to approximate a "taking one's medicine" scenario, and in this way we measured behavior and not simply responses on a questionnaire (Baumeister, Vohs, & Funder, 2007). We predicted that people who had made choices among products would not consume as much of the drink as the no-choice participants would.

The two studies were nearly identical. The one main exception was that we altered the no-choice task in Experiment 1B so as to equalize the duration of the initial tasks. While conducting Experiment 1A (and as seen empirically in the pilot study), it occurred to us that the choices task might last longer than the frequency-rating task, a difference that could potentially confound the results. Hence, Experiment 1B used a different no-choice task so as to ensure equal duration in the two conditions.

Method

Participants. Thirty undergraduate students (20 women) participated in Experiment 1A and 30 undergraduate students (18 women) participated in Experiment 1B in exchange for partial course credit.

Procedure. Participants were randomly assigned to a choice task or a no-choice task. Before completing questionnaires, par-

ticipants in the choices condition were told that at the end they would receive a gift based on their choices during the questionnaire; participants in the no-choice condition were told they would also receive a gift but that it would be chosen for them.

In the choices condition, participants made a long series of choices between products, both within and across categories. Participants made choices between items in the following categories: t-shirts, scented candles, shampoo brands, candy, and socks. After choosing preferred items within each product category, participants then made choices between different categories of products. For instance, a red t-shirt may be labeled Product A and a black t-shirt may be labeled Product B and the questionnaire would ask them to choose between A or B, then A or C, then B or C, and so on. Participants' options for making the choices were guided by a questionnaire (e.g., "Would you prefer Product A or Product D?"), and participants were told they would be given a gift at the end of the trial based on their responses during this first part of the experiment. Some of the choices involved products that were displayed in the laboratory, such as t-shirts, scented candles, shampoo brands, and color posters. Other categories of products (specifically, candy bars and types of socks) were listed and described on the choices sheet, but the physical products were not present in the laboratory. After choosing between items within each product category, the questionnaire then asked participants to choose between different categories of products (e.g., a t-shirt or a candle). In a final task, participants made choices among occupations described on a sheet of paper. By the end, participants had made 292 choices.

Participants in the no-choice condition in Experiment 1A completed a questionnaire that required them to rate products and occupations but were not asked to choose between or among items. Participants in the no-choice condition completed a questionnaire asking them to indicate which products they had used in the past year; these products were by and large the same as those involved in the choice task. Thus all participants were exposed to similar stimuli, and all were prompted to consider their preferences, with the main difference being rating versus choosing.

For Experiment 1B, we had participants in the no-choice condition record their thoughts, feelings, and opinions about eight advertisements, a task that also conjured up participants' preferences but again did not require them to make choices. The duration of this task was recorded for Experiment 1B (but not in Experiment 1A).

After completing the product-rating task, participants entered another room and were seated at a table on which were placed 20 small paper cups. Each cup held 1 oz of a mixture made with orange drink mix, water, vinegar, and a small amount of sugar. (The drink was made with two cups of vinegar and six cups of water instead of the eight cups of water that are called for in the standard directions.) The experimenter then told the participant that this part of the experiment concerned motivation. "This is a drink that does not taste good to most people. It is not harmful. I will give you a nickel for every ounce you drink; each little cup is one ounce, and each one is identical. How much you drink is up to you." The number of ounces each participant drank was recorded as a measure of self-regulatory resource depletion; drinking more ounces presumably requires more self-control (to override one's distaste). After the vinegar-drinking task, participants were paid for their drink consumption and given a free gift.

Results and Discussion

Experiment 1A provided evidence that making choices hampers the self's regulatory capacity. Participants who made a series of choices among products and occupations later drank fewer ounces ($M = 2.06$; $SD = 2.46$) of an ill-tasting drink as compared to participants who merely rated their frequency of exposure to those same products and occupations ($M = 7.67$, $SD = 5.35$), $F(1, 29) = 13.57$, $p < .001$.

Experiment 1B likewise found that choice reduced subsequent self-control. Participants in the choices condition drank significantly less of the vinegar drink than participants in the no-choice condition (choices condition: $M = 1.89$, $SD = 2.57$; no-choice condition: $M = 6.87$, $SD = 6.46$), $F(1, 28) = 7.68$, $p < .01$. Time did not confound the results, as the duration of the tasks did not differ by condition, $F(1, 28) < 1$, *ns*. These initial data confirmed our prediction that decision making causes a subsequent reduction in self-control, a finding that does not appear to depend on the duration of the initial task.

Experiment 2: Consumer Choices and Pain Tolerance

Experiment 2 was designed as a replication and extension of Experiment 1, with several refinements. First, the choice manipulation and the dependent measure were administered by separate experimenters and presented as distinct experiments. We used two different experimenters to avoid the possibility that participants would try to perform well on the self-control task in order to ingratiate themselves with the experimenter in the hopes of getting a better gift (which was promised by the first experimenter as the reward for the first task). Second, the experimenter for the dependent measure was kept blind to condition, which eliminated the possibility of unknowingly biasing the results. Third, we sought convergent validity by using a different dependent measure of self-regulation, the cold pressor task. This task requires participants to submerge their arm in frigid water for as long as possible. Overriding the natural tendency to pull one's arm out of the near-freezing water thus constitutes an act of self-control. We predicted that making choices would deplete the resource needed for self-control, leaving people less able to keep their hand in the painfully cold water for a long period of time.

Method

Participants. Twenty-five (16 women) undergraduates participated in exchange for partial course credit.

Procedure. Participants were randomly assigned to either the choice condition or no-choice condition. In the introduction to the experimental session, participants were told that the session would consist of several experiments by different experimenters because each experiment on its own was too short to justify using the whole experimental period; therefore, experimenters across two laboratories arranged their experiments sequentially so as to take up one full time slot.

In the choice condition, participants made many choices between products, both within and across categories, as described in Experiments 1A and 1B. They were once again informed that they would be given a gift at the end of the trial based on their responses during this first part of the experiment.

In the no-choice condition, participants recorded their thoughts, feelings, and opinions about eight advertisements taken from popular magazines. The instructions asked participants to elaborate on their thoughts and opinions and to write detailed comments about their reactions to the ads. Full sheets of lined paper were given to participants to record their reactions to each advertisement. These steps were done to equate the amount of time participants would work at this no-choice task with the amount of time it would take for participants in the choice condition to complete their task. Participants in the no-choice condition were also informed that they would be given the opportunity to select a gift for themselves at the experiment's end.

Following the manipulation (choosing vs. rating), participants were escorted to another room where a second experimenter who was blind to participants' condition administered the cold pressor task. For the cold pressor task, water temperature was maintained at 1 °C (approximately 34 °F) using a mixture of ice and water. An aquarium pump circulated the water so as to prevent a warm pocket from forming around the participant's hand. The room air temperature was also maintained at a constant 72 °F (22 °C). Participants first held their nondominant arm (to the elbow) in room temperature water for 1 min to ensure an equal starting point; then they submerged this arm up to the elbow in the ice water. The experimenter asked the participant to hold there for as long as possible. A stopwatch measured the length of time the participant held his or her arm in the water, with the number of seconds serving as the measure of self-control. After completing the cold pressor task, participants were fully debriefed, chose a gift, and were thanked.

Results

The length of time that participants withstood the pain of holding their arms in unpleasantly cold water was significantly reduced among participants who had made a series of choices ($M = 27.70$ s, $SD = 15.81$) relative to participants in the no-choice condition ($M = 67.42$ s, $SD = 56.35$), $F(1, 23) = 5.97$, $p < .025$. Persistence on the cold pressor task was not confounded with time spent on the first task because the product-rating task took no longer than the choice task, $F(1, 23) = 1.76$, *ns*.

Discussion

Experiment 2 provided converging evidence that making many decisions impairs subsequent self-regulation, consistent with the hypothesis that both choosing and self-control depend on a common but limited resource. The design of Experiment 2 bolstered the findings of Experiments 1A and 1B by ruling out several alternative explanations. We used two experimenters in the current study, one to administer the dependent measure and one to administer the product task. Moreover, the experimenter overseeing the dependent measure was blind to condition, thereby eliminating concern that experimenter demand could have contributed to the results. Also, participants in the no-choice condition were told they would be able to choose their own gift from a standard set of options, thereby eliminating concern that their performance on the self-control measure was aimed at persuading the experimenter to offer them a better gift or a more appealing set of options.

Experiment 3: Choosing College Courses and Procrastination

To provide further evidence of the detrimental impact of making choices on subsequent self-regulation, we designed Experiment 3 as a conceptual replication of Experiment 2 but with new procedures for both the choice-task manipulation and the dependent measure of self-regulation. Instead of making choices among small household products, participants in this study either made choices, or not, regarding the courses they would take to satisfy their degree requirements. They were encouraged to take these choices seriously as if they were actually selecting the classes they were to take in future years, so it seems reasonable to assume that they regarded these choices as important and relevant.

Self-regulation was measured in terms of resisting procrastination. Participants were given 15 min to study for an upcoming nonverbal (math) intelligence test that was framed as a predictor of many desirable life outcomes. To practice, we gave participants a packet of sample problems. However, as a competing temptation, they were also allowed to read magazines and play a video game. We knew that self-regulation would be required for most participants to override the seductive pull of games and magazines and make themselves practice arithmetic problems. Most likely, this is a self-regulation dilemma that would be familiar to many college students, namely, whether to push oneself to study for a test or indulge in more pleasant pastimes. We hypothesized that choosing one's courses would deplete the self's resources as compared to merely reading about courses without choosing. Hence, we predicted that participants who made choices would spend more of their time on the time-wasting temptations of magazines and video games and, correspondingly, would devote less time studying for the upcoming test.

Method

Participants. Twenty-six introductory psychology students (17 men) participated in exchange for partial course credit. Data from 2 participants were not included in analyses (leaving 24 participants in the analyses). One participant correctly surmised that the intelligence test was not to be administered, whereas the other was an acquaintance of the experimenter.

Procedure. Participants arrived at the laboratory individually, where they were informed that the experiment examined whether a person's choice of college major was related to nonverbal intelligence. All participants were shown a list of general education course requirements and a list of all the classes that would satisfy each of these requirements. This information was taken directly from the official undergraduate bulletin, which stated that a total of 36 credit hours (12 courses) in predetermined content areas were required of all undergraduates regardless of major area of study. These 12 courses must be selected from a total of over 60 distinct courses offered at the university.

In the choices condition, participants were directed to spend 8 min indicating which courses they would choose to take to satisfy each of the general education requirements and to write down their selections on the response sheet they were given. If they finished this task, participants were to consult the undergraduate course bulletin to select and then write down the courses they would take to satisfy their major-degree requirements. In the no-choices con-

dition, participants were instructed to peruse course requirements and then read over the descriptions of different courses that satisfy these requirements. These participants were also encouraged to review course descriptions of classes in their major and to consider courses in which they might enroll to satisfy their major-degree requirements. These participants, unlike choice-condition participants, were not asked to make formal choices by writing them down on a response sheet. Rather, they were simply instructed to think about courses in which they would prefer to enroll.

After 8 min had elapsed, the experimenter asked participants to complete the mood measure (PANAS). Participants then began the nonverbal intelligence (math) test portion of the experiment. The experimenter explained the format of the test and told participants that the test was highly predictive of skills important for real-world success. Additionally, participants were told of past research showing that performing practice math problems for 15 min significantly improved performance on the test but practicing for more than 15 min did not lead to additional increases on performance. The experimenter announced he was going to leave the room for 15 min and gave participants a packet of practice math problems. Participants were told they could practice for the upcoming test for as long as they wanted during the next 15 min. The experimenter also noted that participants could look at magazines or play a hand-held video game (both of which were located on a stand next to the participants' work area) if they did not want to work on the practice problems for the entire practice period.

As the experimenter left the room, a research assistant who was blind to participants' experimental condition entered an adjacent room and observed participants through a two-way mirror. The mirror was covered by closed vertical blinds, except for two slats that were slightly bent at an angle that allowed the observer to clearly view participants' behavior without their knowledge. The observer recorded participants' behavior every 30 s according to whether the participant was practicing math problems, looking at a magazine, playing the video game, or engaging in some other (unscripted) activity, such as sitting quietly.

When the experimenter returned, she asked participants to complete a questionnaire, which contained several manipulation check questions. Finally, participants were informed that they would not be taking the nonverbal test and were debriefed and thanked.

Results

Our main prediction was that making a series of choices would result in a state of ego depletion, thereby truncating persistence (or practice) at the math problems and leading to more procrastination. We calculated number of minutes practicing by multiplying number of times the participant was observed practicing by .5 (to represent 30 s in terms of minutes). As expected, the choices versus no-choices manipulation affected how long participants practiced for the upcoming test, $t(22) = 2.43$, $p < .05$.

After making a series of choices, participants spent less time practicing for the upcoming nonverbal intelligence (math) test ($M = 8.39$ min, $SD = 3.64$) than did participants who did not make choices ($M = 11.40$ min, $SD = 1.66$). This finding also indicates that depleted participants spent more time playing video games, reading magazines, and doing nothing than did nondepleted participants. Thus, after making choices, people spent more time on self-indulgent activities and less time on effortful studying.

Although our main focus in the current study was on the amount of time spent on the math problems, we also checked to see whether performance on the math problems differed as a function of choice condition. It did not. We counted every problem participants attempted (because sometimes participants did a bit of work on a problem but failed to finish it) and subjected this measure to a *t*-test with choice condition as a predictor. This measure showed no difference as a function of condition, $t(22) < 1$, *ns*. The number of problems completed also showed no difference as a function of choice condition, $t(22) < 1$, $p > .60$. Number of problems correctly answered also showed no differentiation by condition, $t(22) < 1$, $p > .80$. Last, we conducted an analysis of covariance, comparing the choice and no-choice conditions on number of problems correct, with time spent practicing as the covariate. The effect of the covariate, time spent, approached significance, $F(1, 21) = 4.14$, $p = .06$, but condition was not significant, $F(1, 21) < 1$.

We assessed whether the choices manipulation influenced mood states. Consistent with expectations, the choice manipulation did not differentially affect mood. Reports of positive affect, $t(22) = 1.01$, $p = .33$, and negative affect, $t(22) < 1$, *ns*, were similar in the two groups. Further analyses confirmed that choice and no-choice conditions did not differ with regard to self-rated difficulty of their respective degree programs, $t(22) = 1.10$, *ns*, frustration with the tasks ($t < 1$, *ns*), or stated importance of performing well on the upcoming test, $t(22) = 1.44$, *ns*. Thus, the effects of choice were not due to mood, difficulty, frustration, or perceived importance.

Discussion

Experiment 3 conceptually replicated the finding that making a series of decisions leads to subsequent impairment of self-regulation. Participants in this study were given instructions either to select courses to fill the remainder of their undergraduate careers or to read and think about course options without choosing. Subsequently, participants were given the opportunity to practice for an upcoming math test said to be predictive of successful life outcomes, but their studying was compromised by the availability of tempting, fun alternative activities, such as video games and magazines. Participants who had made choices about their future coursework, as compared to those who simply read and considered their options, spent less time studying and practicing for the math test (and spent correspondingly more time indulging in the tempting distracter tasks). Poor or failed self-regulation is an important contributor to procrastination (Tice & Baumeister, 1997), and thus Experiment 3 demonstrates another way in which making many choices can lead to a breakdown of self-control.

The fact that choosing what courses to take led to less studying is somewhat counterintuitive. Had the opposite effect been obtained, one might readily have interpreted it as indicating that priming the idea of course work prompted people to study. The fact that choosing courses led to less studying is thus most consistent with a limited-resource model.

Experiments 4A and 4B: Course Content Choices and Solvable and Unsolvable Problems

One ambiguity about the findings of Experiment 3 was that participants solved the same number of problems in both condi-

tions, despite the difference in duration of persistence. Although null findings are generally not entitled to substantive interpretation, one could read those results as indicating that people who made choices were better at self-regulation (not worse, as we found in Experiment 2), insofar as they solved approximately the same number of problems in less time. Hence, we felt the importance of conducting a conceptual replication. Experiment 4 tested persistence on unsolvable problems (4A) and solvable problems (4B) after a manipulation of making choices or not.

To increase the robustness of our conclusions, we again changed the choice manipulation, in this case to decisions about the psychology course in which participants were currently enrolled. Participants in the choices condition made a series of decisions about the course, choices they were told (veridically) would determine the way the instructor taught the course both during the current term and in subsequent terms. It is possible that participants in Experiment 3 did not see their choices as binding because students can and do change their minds about what courses to take. In contrast, the choices made in Experiment 4 were irrevocable in the sense that once students' choices were communicated to the instructor via this experiment, there was no opportunity to change the selections, and the instructor did in fact modify the course on the basis of students' selections.

Another change in Experiment 4 was to separate the procedures with different experimenters. When the same experimenter administers both the choice manipulation and the self-regulation measure, it is conceivable that extraneous attitudes toward the experimenter could confound responses to the dependent measure, as noted earlier. Therefore, we used the more elaborate procedure of presenting the tasks as unrelated, including having different experimenters administer the independent and dependent variable tasks in different rooms.

The main measure of self-regulation in this study was persistence at challenging problems. Persistence requires self-regulation insofar as the repeated failures are discouraging and frustrating, and the participant would soon wish to be doing something else—so one has to override the impulse to quit. Because of the possibility that quitting fast on unsolvable problems could be regarded as showing exceptionally good self-regulation, however, we ran two versions of this study, one with unsolvable problems (4A) and the other with solvable problems (4B). With the solvable problems, we were also able to calculate performance quality by counting correct solutions.

Method

Participants in Experiment 4A. Forty-one undergraduates (26 women) participated in exchange for partial course credit. One participant was unable to complete the study.

Procedure for Experiment 4A. After arriving and completing consent forms, participants were told that the first part of the study involved reviewing instructors' materials from their psychology class, and the second, unrelated part of the study involved completing a spatial design task. As in Experiment 2, participants were told that because each experiment in this session was rather short, experimenters in the department combined two studies so as to maximize efficiency in use of subject credit hours. The first experimenter handed out the materials that contained the choices manipulation. All participants were given the same materials, but the instructions that accompanied them were different.

Instructions for participants in the choices condition asked them to read the material and, for each section, to choose the option they preferred. Options were always presented as a two-option forced choice. In one example, participants read descriptions of two possible video clips and chose which film clip they would prefer to see. Another item involved choosing between two different styles of a test question, and another item asked them to choose between two paragraphs of text. Participants in the choices conditions were also told (truthfully) that the choices they made would be reviewed by their instructor and would affect her decisions for future lectures and tests both during this semester while the participants were taking her course as well as for future classes. In all, participants made 35 choices, which were presented as important and consequential for the student participants' lives. Participants were asked to complete all the choices and return the packet to the experimenter before moving on to the next part of the experiment.

Participants in the no-choices condition were simply instructed to read the same material that was presented to the participants in the choices condition. They were not asked to make any choices between the options or to rate the material in any way. They were asked to read the material very carefully and return the packet to the experimenter before moving on to the next part of the experiment.

Next, participants moved across the hall to complete the persistence part of the experiment with the second experimenter. The persistence measure involved unsolvable tracing puzzles. This procedure was made popular by Glass, Singer, and Friedman (1969), and it has been used in previous studies as a measure of self-regulation. Participants were given a packet containing two complex figures. Participants were told that performance on these geometric figures was predictive of future life success due to its links with higher order cognitive abilities. Participants were given two stacks of paper with each page displaying one of the complex figures. The stacks of papers were given to participants so that they could use as many sheets as necessary as they attempted the (unsolvable) task of tracing each figure in its entirety without once lifting the pencil from the paper or retracing any lines. They were asked to bring their sheets back to the experimenter either when they had finished or when they had worked as long as they could on them and wanted to stop. The experimenter recorded how long each participant persisted (to the nearest quarter minute).

After finishing, participants were given a manipulation check that asked participants to rate their mood states in terms of how happy, sad, depressed, or confident they felt (four items rated on a scale from 1 = *not at all* to 7 = *very much so*). In addition, they were asked to indicate to what extent they felt that their activities during the initial task regarding elements of the course would alter the content and design of the course (on a scale from 1 = *not at all* to 7 = *very much*). Last, participants were debriefed and thanked.

Participants in Experiment 4B. Forty-two undergraduates (28 women) took part in exchange for partial course credit. Two participants failed to complete the study.

Procedure for Experiment 4B. The procedure for Experiment 4B was the same as for 4A, with two changes. First, the length of time it took participants to finish the choices or ratings was held constant at 12 min. This was accomplished by having participants in both conditions work through a lengthy packet of stimuli that

could not be completed in less than a certain amount of time, which in this case was 12 min. After 12 min had elapsed, participants were stopped and informed that they would now move to the second experiment.

Second, we altered the operationalization of self-regulation to be persistence at and correct solutions of solvable problems. After being moved to a new laboratory room and greeted by the second experimenter, participants were told that the next study involved a test of simple mathematical calculations, which long have been known to predict success in life. The experimenter explained that this math test was sensitive to brief amounts of practice, and therefore everyone was allowed practice time before taking this test. Participants were given practice sheets of three-digit multiplication problems, which they were told to practice for as long as they could up to 30 min. When participants felt they could not practice any longer, they alerted the experimenter. The experimenter covertly recorded the length of time participants had worked at the math problems (to the nearest quarter minute) and gave participants a question asking them to rate the degree to which their activities during the first task regarding elements of the course would alter the content and design of the course (on a scale from 1 = *not at all* to 7 = *very much*). Then, participants were debriefed, thanked, and excused.

Results

Unsolvable puzzles (Experiment 4A). Participants who did not have to make choices about the material but merely read through it carefully persisted longer on the tracing task ($M = 12.25$ min, $SD = 4.31$) than did participants who were asked to make many choices about the same material ($M = 9.11$, $SD = 3.00$), $F(1, 38) = 7.12$, $p < .05$. Thus, making choices seems to have depleted some resource, thereby reducing persistence on the second task. Ancillary analyses confirmed that the manipulation was effective: Participants in the choices condition reported that they believed that the responses they made would affect their own course more so than participants in the no-choices condition did, $F(1, 38) = 585.95$, $p < .001$. There were no differences on self-reports of being happy, sad, depressed, or confident (Fs < 1).

Solvable puzzles (Experiment 4B). Participants who made choices about the course material failed to persist on the practice items for as long as did participants who read about the same material but who did not make choices (choices condition: $M = 14.70$ min, $SD = 4.05$; no-choices condition: $M = 17.80$ min, $SD = 4.66$), $F(1, 38) = 5.00$, $p < .05$. Participants who had made many choices also completed fewer practice problems than did participants who had not made choices, $F(1, 38) = 6.23$, $p < .05$.

Making choices also appears to have led to poorer performance on the math problems. Participants who had not made choices got significantly more practice problems correct and marginally fewer wrong than participants who were asked to make many choices got, $F(1, 38) = 16.56$, $p < .001$ and $F(1, 38) = 3.81$, $p = .06$, respectively. The difference in number of errors was probably weakened by the fact that participants in the choice condition spent less time and attempted fewer problems, which should cause them to make fewer errors than they would have made on a longer problem set. To correct for this, we computed the error rate by dividing number of errors by number attempted for each participant. Analysis of variance on error rates confirmed that participants in the choices condition made more errors per attempt than did participants in the no-choices condition, and this was a significant difference, $F(1, 38) = 5.10$, $p < .05$.

On the manipulation check, participants in the choices condition were much more likely to believe that they were making choices that would affect the rest of their semester in the classroom than were participants in the no-choices condition, $F(1, 38) = 224.48$, $p < .001$. Thus, again, the manipulation was successful.

Discussion

Experiment 4 showed that making choices about one's psychology course had a significant and detrimental effect on subsequent task performance. Those who made choices subsequently gave up faster on unsolvable (Experiment 4A) and solvable (Experiment 4B) items, as compared to participants who did not make choices. These findings provide further evidence that making decisions can deplete an important self-regulatory resource, thereby making it more difficult for the person to resist the temptation to quit while performing a wearisome task. Furthermore, Experiment 4B confirmed that making choices had a negative effect not only on persistence but also on quality of performance. Participants who made choices got fewer math problems right and had a significantly higher error rate than did participants who had merely thought about the course options without making choices.

Several design features facilitate interpretation of findings. The choices in Experiment 4 were real and consequential, in the sense that they actually influenced the schedule for the remainder of the course (as opposed, possibly, to what participants thought in Experiment 3). Using two experimenters (one unaware of experimental condition) diminished the likelihood that demand characteristics or desire to impress the (first) experimenter influenced the results. The amount of time spent on the first task was the same for all participants in Experiment 4B, ensuring that persistence on the second task was not affected by how much time had been spent on the first task. It was also apparent that less persistence meant poorer performance: Participants who made choices got fewer problems correct (unlike in Experiment 3) and made more errors than did those who did not make choices.

In sum, it appears that making choices depleted some resource that was then unavailable to facilitate performance on both unsolvable and solvable tasks. Self-regulation is useful for making oneself persist on a difficult task, for overseeing the calculation process, and for checking and correcting errors, all of which are weakened by previous efforts involved in making choices.

Study 5: Decision Fatigue at a Shopping Mall

To provide a field test of our central hypothesis, we approached customers at a shopping mall and assessed the number of decisions they had made during their shopping trip thus far. To measure self-regulation, we then asked them to perform easy but tedious arithmetic problems (adding three-digit numbers). This task requires self-regulation because most shoppers would probably rather do something else than perform arithmetic, and so the impulse to quit must be overridden if they are to continue. We predicted that shoppers whose resources were depleted by having made a greater number of prior choices would quit faster on the arithmetic problems.

A conceptual replication of the laboratory findings from Experiments 2–4 was desirable for several reasons. First, this study drew its participants from a nonuniversity sample, which increases confidence in the generalizability of the results. Second, this study avoided a potential confound of differential time spent on different experimental tasks (and shoppers would also furnish estimates of how long they had been shopping, which later could be controlled for when analyzing the impact of prior choices). Third, participation in this study was not affected by a material incentive because no reward or gift was offered.

Having shoppers perform math problems gave us two forms of self-regulation to assess. For one, we could check for persistence at the math problems, which is a classic measure of self-control. In addition, as in Experiment 4, we could also check for the carefulness of participants' work, for which self-regulation would be involved in overseeing the rule-following mathematical process and to check for possible errors. Hence, we predicted that the state of ego depletion among shoppers who had made many choices would therefore lead to poorer persistence and performance relative to shoppers who had not made choices.

Method

Participants. Ninety-six shoppers at an open-air shopping mall in Salt Lake City, Utah were approached, and 19 women and 39 men agreed to participate (60% response rate). The age of participants ranged from 18 years to 59 years, with 91% of participants reporting White (non-Latino) ethnicity, 4% reporting Asian ethnicity, and 5% Latino ethnicity.

Procedure. Shoppers were approached by members of the research team and asked for their time in a volunteer (i.e., no remuneration) experiment. Research assistants were instructed not to reveal much about the experiment before participants agreed or declined to participate, so that the details of the task (described next) did not influence who chose to participate. Participants were told the experiment involved answering some questions about their shopping trip and then engaging in a cognitive task.

After a brief demographic questionnaire, participants completed the self-report scale, which was the same as that from the pilot study except for combining two redundant items asking about the degree of which choices had been made. Participants were asked to respond to questions by thinking about their behaviors during their shopping trip and to give a numeric rating of 1 (*not at all*) to 10 (*very much so*) for the following items: "How many choices did you feel you have made on your shopping trip today?," "How personally important were the choices you made shopping today?," "How much careful consideration did you put into choices you have made today?," "How much did you deliberate before making each choice today?," "How much did you think about your options prior to making each choice today?," "How active did you feel in making your choices today?," and "How tired do you feel right now?" Participants also reported time spent shopping in hours and minutes. Shopping times ranged from 1 min (for participants who had just begun shopping) to 4.5 hr.

Participants were presented with 64 three-digit plus three-digit addition problems printed across two sheets of paper. They were asked to do as many as they could, with the understanding that they could stop anytime they "quit, finished, or decided to give up." These instructions come from past depletion research (Vohs & Heatherton, 2000) in which self-control was measured as persistence on a cognitive task. Unbeknownst to participants, there was a second research assistant standing approximately 5 ft (1.5 m) away who surreptitiously recorded the amount of time that participants spent on the addition problems. Then participants were debriefed and thanked.

Results

Choices scale. First, we conducted a factor analysis on the items from the choice scale to test whether they revealed patterns similar to that seen in the pilot study, which they did. The data were subjected to a varimax rotation (eigenvalues greater than 1 extracted), and a two-component structure emerged. Factor 1 accounted for 49% of the variance observed and Factor 2 accounted for an additional 17%. The items loaded onto factors similarly as in the pilot study. That is, scale items asking about number of choices, importance of the choices, degree of consideration, deliberation, and thought put into the choices, and degree of activity involved in making those choices mainly loaded onto the first factor, whereas the item asking about tiredness loaded strongly and positively on Factor 2. We computed factor scores for each participant and used them as predictors of math performance.

Performance on the math problems. Participants' performance on the math problems was the primary indication of self-control.[1] As mentioned, past research has shown that one consequence of self-regulatory resource depletion is a reduction in cognitive abilities and consequently poorer intellectual performance (Schmeichel et al., 2003). Alongside the two factor scores from the choices scale as extracted by principal-components analysis, the regression models included as predictors time spent shopping, age, ethnicity, and gender (the latter four variables were centered around their means before being entered into the model).

The overall model predicting number of problems completed correctly was significant, $F(6, 50) = 2.48$, $p < .04$. More pertinent was the significant effect of Factor 1 (i.e., the Choices factor), $\beta = -.32$, $t(50) = 2.40$, $p = .02$. The factor scores for Factor 2, which represented mainly the tiredness item, did not significantly predict number of correct solutions ($\beta = -.04$, $t < 1$). The regression model contained no other significant predictors of correctly solved problems (ts < 1.55), except for ethnicity, $t(50) = 2.44$, $p < .02$.

Discussion

Study 5 provided converging support for the hypothesis that decision making interferes with subsequent self-regulation. Shoppers at an outdoor mall reported how much decision making they had done while shopping that day and then were asked to solve arithmetic problems. Self-regulation was measured by performance on math problems. We found that the more choices the shoppers had made, the worse their computations on simple arith-

[1] This study had two dependent variables, persistence at the math problems in terms of duration of time spent working on them and also number of math problems completed correctly. The two variables were highly correlated, $r(58) = .71$, and the regression models yielded highly similar results. Hence a second conclusion from this study is that the more decision making the shoppers had done, the less they persisted on the math problems.

metic problems. Moreover, the negative impact of prior decisions on math persistence remained significant even after controlling for how long they had been shopping, for how tired they were, and for several demographic categories including gender, age, race, and ethnicity.

These findings are consistent with the general hypothesis that making choices depletes an energy resource and thereby impairs subsequent performance. We acknowledge, however, that the correlational design of this study reduces its capacity for drawing causal conclusions. Third variable explanations are still plausible, such as that people who enjoy making effortful decisions while shopping might simultaneously dislike expending effort on math problems. That said, on an a priori basis, one would likely predict the opposite, such that people with high need for cognition would put more thought into both shopping decisions and math problems. In that respect, these findings are less conclusive than those of the prior studies, but they also add valuable convergence. The decisions in this study were not mandated by the experimenter but instead occurred naturally among people during the course of their daily lives. Additionally, interpretation of these findings is strengthened by the fact that the sample was more diverse (in age, education, and income) than the university populations sampled in the preceding studies.

Experiment 6: Choosing Versus Deliberating Versus Implementing

With Experiment 6, we began to delve into the processes and possible boundaries of the effects of choosing. In line with the Rubicon model of action (Gollwitzer, 1990, 1996; Heckhausen & Gollwitzer, 1987), we conceptualized the process of choice as involving three key phases: deliberation among options, deciding on a plan of action (i.e., making a choice), and implementing the chosen option. Deliberating among the options involves weighing their pros and cons and comparing them and, perhaps crucially, forming an ad hoc preference where none existed. Making the choice requires actually selecting one option and committing oneself to behave in that way. Implementing the choice involves behaviors that execute the previously chosen option. In principle, any or all phases of the choice process may tax the self's resources.

Of particular interest was the possibility that choosing would itself deplete the self's energy, above and beyond the processes of deliberating and implementing. Choosing is akin to forming an implementation intention, in the sense that it sets a conditional program for future behavior. The essence of the Rubicon model is the transition between an initial phase of deliberating about the various options to a phase of readiness to take action, which may be in the immediate present or delayed. Thus, the mind undergoes some qualitative change in order to make that transition. To use the popular metaphor of the computer, the difference between deliberating and deciding resembles the difference between performing calculations and writing the output of those onto the disk for storage, where it can be accessed on future occasions as needed. Performing calculations takes energy, but writing onto the disk also consumes energy. By analogy, therefore, choosing would require more energy than merely deliberating.

As Webb and Sheeran (2003) have shown, having such a conditional program (especially in the form of an implementation intention) helps counteract the effects of ego depletion, so a preestablished program can conserve energy. Thus, we suggest that the choice process expends energy now but may perhaps do so such that the system can save energy later, not unlike the way storing information to a disk enables the computer to retrieve and use the result later without having to repeat the calculations.

To provide an initial test of the idea that the act of choosing is depleting apart from the phases of deliberation and implementation, Experiment 6 compared three different conditions. In one, participants only deliberated among options but refrained from making a decision. In another, they made a choice (presumably after also deliberating about the options). In a third condition, they merely implemented choices that had been made for them by someone else, namely a yoked participant in another condition. If the act of choosing is itself depleting, then one should see greater depletion in the choice condition than in the other two conditions. This was our main prediction.

Method

Participants. Sixty-four undergraduates (36 women; 2 participants did not complete this item) participated in exchange for extra course credit or payment. The first 52 were randomly assigned among the three conditions. In response to reviewer-suggested analyses that yielded a marginal ($p = .10$) and hence inconclusive result, we resumed and ran the final 12 participants, who were randomly assigned between the choice and deliberate-only conditions.

Procedure. Choice condition was manipulated with differing instructions as for how to interact with a popular computer website, dell.com. The four pages on the dell.com website contained options for making selections about the computer itself as well as components, services and support options, and accessories. Participants were seated in front of a computer that showed a page for customizing a Dell Dimension desktop computer and then were given one of three sets of instructions.

In the implement condition, participants were given sheets of paper that were printouts of the four computer screens that they were to see during this task. Preestablished choices had been made and radio buttons indicated the chosen options. Participants in this condition were simply asked to find the radio button on each page that matched the selected radio button on the printout and click on it with the computer mouse. Thus, they were simply implementing a choice that had already been made by someone else. In the deliberate condition, participants were asked to deliberate about the options on each page and "form an opinion of the information, thinking about what [they] would prefer." Participants in this group were instructed not to press any buttons to indicate their selections. Participants in the choice condition were asked to deliberate, form preferences, choose the most preferred option in each set, and select it on the website using the computer mouse. The experimenter timed the duration of the dell.com task for each participant.

Participants moved away from the computer at this time and were seated in a small room to perform the anagram task, which was comprised of 80 five-letter solvable anagrams. Prior to starting, participants were told that the anagrams constituted a test of verbal ability, a capacity that university students believe is quite important (Vohs & Heatherton, 2001). In line with past work in self-regulation, participants were told to work on the anagrams

until they solved them all, wanted to stop, or decided to give up. The experimenter timed their efforts directed at this task as a measure of persistence. Last, participants were given a set of postexperimental questions and were debriefed and thanked.

Results

As a manipulation check, we asked participants the extent to which they had deliberated while performing the dell.com task and found significant differences as a function of condition, $F(2, 61) = 10.52$, $p < .01$. As expected, the implement group ($M = 2.82$, $SD = 1.86$) reported deliberating less than the other two groups (choice condition: $M = 5.64$, $SD = 2.53$; deliberate condition: $M = 5.82$, $SD = 2.26$). Participants reported enjoying the dell.com task equivalently across conditions, $F(2, 59) = 1.04$, $p > .30$. We had anticipated that there may be differences in the duration of the dell.com task across conditions and the effect approached significance, $F(2, 61) = 2.81$, $p = .07$. Descriptively, the implement group performed this task in the shortest amount of time ($M = 223.18$ s, $SD = 90.80$), compared to the deliberate ($M = 320.95$ s, $SD = 84.22$) and choice conditions ($M = 273.24$ s, $SD = 172.95$).

The main test of our hypothesis was whether there was a significant difference between choosing and not choosing on later self-regulation. There were debilitating effects of engaging in the full choice process on executive functioning. On anagram persistence, not only was the overall test significant, $F(2, 61) = 3.99$, $p < .03$, but so was the planned contrast of choosing versus not choosing, a test that compared the choice condition versus the two nonchoice conditions, $t(61) = 2.77$, $p < .01$. Comparing the conditions individually revealed that the choice condition ($M = 379.24$ s, $SD = 180.17$) led to significantly less persistence than did the implement condition ($M = 571.29$ s, $SD = 286.65$), $t(61) = 2.66$, $p < .01$, and less persistence than did the deliberate-only condition ($M = 514.0$ s, $SD = 231.37$), $t(61) = 2.01$, $p < .05$. The difference between the deliberate-only and implement conditions was not reliable ($t < 1$, *ns*).

Discussion

Experiment 6 attempted to distinguish among deliberating, choosing, or implementing a choice. Although it is possible that all phases of the decision process can deplete some resources, we did find significant variation among the conditions. Making choices (presumably after some deliberating) was significantly more depleting than either deliberating or implementing alone. Deliberating and implementing were not reliably different from each other. These results point toward the conclusion that actually making the choice itself requires effort and consumes energy, above and beyond the process of thinking about the options and more than expressing or implementing previously made choices.

Experiment 7: Pleasant Versus Unpleasant, Many Versus Few Choices

Experiment 7 addressed two final questions. First, is the depleting effect of choosing cumulative such that making more choices produces more depletion than does making only a few choices? Second, does the subjective enjoyment of the choosing task moderate how depleting the task is?

Regarding the quantity of choice, we reasoned that insofar as choice requires effort, then more choosing should be more fatiguing. If choosing does deplete some psychological resource, then doing more of it should result in more severe depletion. The difference could also address the criticism raised by Moller et al. (2006), who found that making one or two pleasant choices was not depleting. The amount of effort required to make a single choice might be so small as not to produce depletion, but that small amount of effort multiplied by many choices (even pleasant ones) could still be depleting.

Regarding subjective enjoyment, we thought that pleasantness of the choosing process might reduce its deleterious effects. If depletion is caused by forcing oneself to do something, then a pleasant task would presumably be less depleting than an aversive one would be.

There was also reason to predict that choice quantity would interact with subjective enjoyment. The beneficial impact of enjoying the task will likely wane as time and exertion increases. By analogy, people may find physical exercise to be less tiring when they enjoy it than when it is aversive, but extended physical exercise (e.g., running for dozens of miles) is still tiring. Given the robust effect of making choices on the executive system in the previous experiments, it seemed likely that the effects of making choices would wear down the executive system over time, such that any positive effects of choice enjoyment would be nullified if the task required making a great deal of choices. Hence, we designed the experiment to have participants make choices for a short or long period of time (4 vs. 12 min, respectively) or no choices at all. We also obtained participants' anticipated enjoyment of the choice task, which was the creation of a gift registry online. Both variables—duration of choice task (no choices vs. 4 min vs. 12 min) and enjoyment of the choice task—were expected to have significant effects on participants' active responding to a situation in which there was a problem.

Experiment 7 also introduced a change in the dependent variable. Having shown in the preceding studies that decision making affects subsequent self-control, we sought in this study to measure effects on a different manifestation of the self's executive function, namely initiative or active responding. One previous study provided some initial evidence that responding actively instead of passively requires the same sort of energy used for self-regulation and is therefore vulnerable to depletion (Muraven et al., 1998). In Experiment 7, participants were told that their next task would entail watching a video. For each participant, however, the video playback malfunctioned, thereby rendering the task impossible. The measure was how long the participant (passively) sat there before notifying the experimenter of the malfunction. In this case, passivity was counterproductive for the participant's presumptive goals of finishing the experiment and going home because it would not be possible to perform the task until the video was fixed.

Method

Participants. One hundred and ten students (ages 18–43 years; $M = 21.38$, $SD = 3.33$) at a large midwestern university participated in the experiment for either course credit or monetary payment. Ten participants' data were removed because of various disruptions in the experimental procedure, such as connectivity problems with the registry website ($n = 8$) and participants re-

ceiving calls on their cellular phones. The final participant tally was 48 men and 52 women, for a total of 100 participants.

Procedure. Prior to arrival at the laboratory, participants had completed a short questionnaire before participating in the experiment. The questionnaire consisted of items pertaining to participants' enjoyment of and past experiences with wedding gift registries. These reports showed that only two participants had prior experience creating a gift registry and that the distribution of scores was normal in terms of how enjoyable participants envisioned the creation of a gift registry to be ($M = 4.21$, $SD = 1.65$ on a 7-point scale where 1 = *not at all enjoyable* and 7 = *extremely enjoyable*). There was, as might be expected, a gender difference in whether participants viewed the process of creating a gift registry enjoyable, with women reporting more anticipated enjoyment than did men, $t(97) = 5.54$, $p < .01$.

Via a postexperimental question, we confirmed that participants who anticipated that they would enjoy the gift registry creation task indeed got more enjoyment out of the task. Participants were fairly accurate in their predictions: There was a significant though far from perfect correlation between how much participants thought they would enjoy the gift registry creation task and how much they reported enjoying the task after completing it, $r(63) = .31$, $p < .02$. (Degrees of freedom are lower than that for the full sample because one-third of the conditions did not involve creating a gift registry.)

Upon entering the lab, participants were randomly assigned to a no-choices control condition, a short choices condition, or a long choices condition. Participants assigned to the choices conditions spent either 4 min (short choices condition) or 12 min (long choices condition) selecting options from a wedding gift registry using the online interface at target.com's Club Wed. For their first task, participants assigned to the no-choices control group were instructed to think about the route they would take to get home from the building. This is a neutral task that has been used in past research (Vohs & Heatherton, 2001). After the choices or thought task, participants completed the PANAS to assess mood.

Then, participants were moved to a new room and sat in front of a VCR and television. They were told that they would be watching a short video about which they would be answering questions later. The experimenter left, saying she would be back when the video was finished. The video was rigged, however, to show mostly static with faint images of two people talking in the background, behind the static. Given that the video was not showing a scene that was discernible whatsoever, the most responsible action for participants to take would be to alert the experimenter. Hence, the dependent measure was how actively participants responded to the problematic video, specifically in terms of duration of time that passed before participants notified the experimenter of the problem. A 15-min ceiling was in place, such that the experimenter entered the room if the participant had not come to alert her by this time. Ostensibly in lieu of watching the broken video, participants then completed postexperimental questionnaires, a demographics form, and were debriefed.

Validation study. A separate sample of 20 participants watched the video and rated their reactions in order to clarify the impact of the procedure. They indicated that they thought the video was broken and that the experimenter ought to know that the video was having problems; furthermore, participants said that they quickly gave up trying to watch the fuzzy video. These responses confirmed that the optimal response during the main experiment was in fact to notify the experimenter and that sitting in the room was a passive and ineffectual response.

Results

In order to analyze the data, they were first coded into two dummy variables that tested the two choice conditions (low and high) against the no-choice (control) condition. The analytical model regressed time spent waiting before alerting the experimenter (i.e., passivity) on five predictors: ratings of anticipated enjoyment (centered), the two dummy variables, and two interaction terms for which each dummy variable was multiplied by the anticipated enjoyment factor.

Our predictions about the combined effect of choice and anticipated liking of the choice task can be understood statistically as predicting that only one of the interaction terms would be a significant predictor—the Anticipated Enjoyment × Low Choice Condition interaction. A significant interaction term would indicate that anticipated enjoyment ceases to predict passivity after participants had made a high number of choices.

That is what we found: The effect of anticipated enjoyment on passivity was only pertinent after participants had made few choices, whereas after participants had made many choices, passivity scores (seconds waited before alerting the experimenter) were unaffected by anticipated enjoyment. Statistically, there was a significant interaction between enjoyment and the low choice dummy variable, $t(92) = 3.399$, $p = .001$, $\beta = -.39$. The interaction of the other dummy variable (representing the high choice condition) with enjoyment was not a significant predictor, $t(92) < 1$, *ns*, $\beta = .01$. The high choice dummy variable on its own, though, was a significant predictor, $t(92) = 3.54$, $p = .001$, $\beta = .36$, whereas the low choice dummy variable on its own was a nonsignificant predictor, $t(92) = 1.84$, $p < .07$, $\beta = .19$, and enjoyment was a nonsignificant main effect, $t(92) < 1$, *ns*, $\beta = -.04$. Using the Aiken and West (1991) procedure, we created Figure 1, which displays predicted passivity scores as a function of the three experimental conditions (no choice, low choice, and high choice) and at different levels of anticipated enjoyment.

Recall that we measured participants' moods after the choice task to ensure that active responses were not due to transient changes in emotions. In line with previous work, there was no effect of choice task on positive, $F(2, 97) < 1$, or negative emotion, $F(2, 97) = 1.10$, $p > .30$, as measured by the PANAS. Moreover, we wanted to ensure that enjoyment of the choice task did not alter mood states. We correlated anticipated enjoyment with positive and negative mood as well as posttask reported enjoyment with mood and found no correlations to be significant, anticipated enjoyment and positive mood: $r(99) = -.02$; anticipated enjoyment and negative mood: $r(99) = .02$; reported enjoyment and positive mood: $r(64) = .23$, $p > .06$; reported enjoyment and negative mood: $r(64) = -.16$, $p > .19$. Hence, mood did not play a significant role in this experiment.

Discussion

The findings of Experiment 7 add several new aspects to our understanding of the impact of choice. First, quantity of choice contributed to depletion: Participants who made more choices

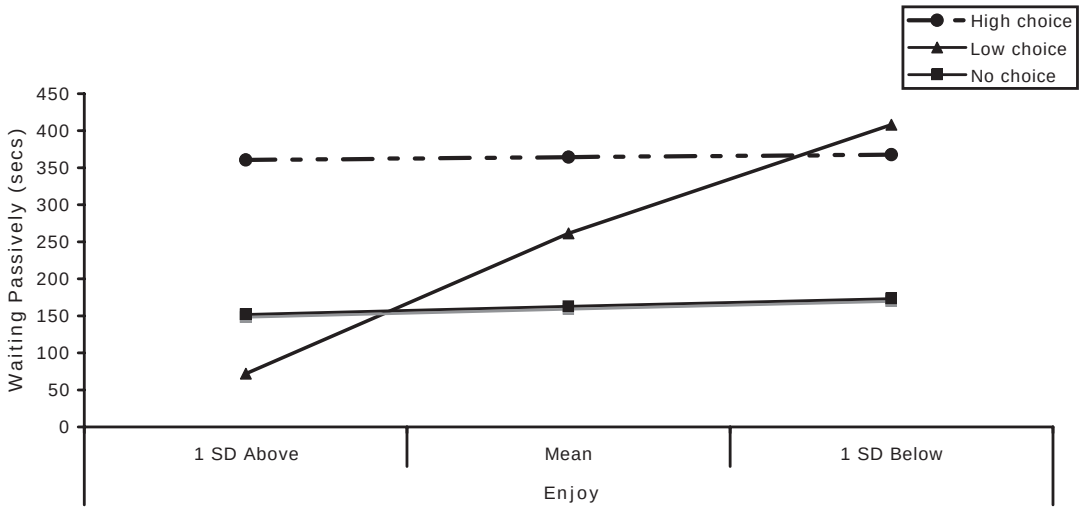

Figure 1. Effect of choice condition (high choice vs. low choice vs. no choice) and anticipated enjoyment of choice task (1 *SD* above the mean vs. mean level vs. 1 *SD* below the mean) on passive waiting (Experiment 7). Higher numbers indicate more passivity and thus worse self-control.

were more passive in the sense of waiting longer to notify the experimenter of the equipment problem. This result suggests that the more choices one makes, the more depleted one is. Such a pattern is most consistent with the theory that choosing progressively consumes a limited resource.

The quantity effect may seem at odds with one null result of Experiment 1, which found no link between the amount of time spent choosing and the degree of depletion. We think the most likely explanation is that the extent of resource depletion is determined by the quantity rather than the duration of choosing. In Experiment 1, all participants in the choice condition made the same number of choices so variations in time pertained merely to how fast they made those choices. In Experiment 7, the manipulated differences in time corresponded to making more versus fewer choices. Also, the variations in time in Experiment 1 may have been too small to produce significant differences in ego depletion, at least with that measure. The design of Experiment 7 ensured that some participants spent 3 times as long as others on the choosing task.

The second finding from Experiment 7 was that subjective enjoyment moderated the depleting effect of choice but only in the 4 min condition. Making a few enjoyable decisions was apparently less depleting than making a few aversive decisions. But when many decisions had to be made, the process was depleting regardless of whether it was pleasant or unpleasant. This finding integrates the results of Moller et al. (2006) with the more general patterns of ego depletion. Moller et al. (2006) found that making a couple of easy, enjoyable choices that expressed the self did not produce ego depletion, and our results are consistent with that. But making many choices becomes depleting even when the activity is viewed as an opportunity for positive self-expression.

General Discussion

Ambivalence about choice presents one of the great seeming paradoxes of modern life. On the one hand, the desire for choice seems ubiquitous. People clamor for freedom in their private and political lives. They exhibit patterns such as reactance (Brehm, 1966; Fitzsimons & Lehmann, 2004) and illusions of control (Ariely, 2000; Langer, 1975) that indicate deeply rooted motives to maintain a feeling of having choices. The marketplace, normally a reliable guide to what people want, offers ever more fine-grained choices, from dozens of car makes and models to (most recently) personalized boxes of disposable tissue paper. On the other hand, people tire of the endless demands for choice and the stress of decision making. In related research, there are signs that too much choice can be detrimental to satisfaction and that people resist facing up to the tradeoffs that many choices involve (Iyengar & Lepper, 2000; Luce, Payne, & Bettman, 1999). One recent analysis demonstrated that behavioral commitment (i.e., buying) initially rose with the number of options but fell when even more options were presented (Avni & Wolford, 2007). The present investigation sought to shed light on the psychic costs of choice. Making choices can be difficult and effortful, and there is a personal price to choosing, which is seen in worse self-regulation.

The main hypothesis was that deliberate, effortful choice consumes a limited resource needed for a broad range of executive functions, including self-regulation. Participants made a series of choices about consumer products, college courses, or class materials—or in the no-choice conditions, participants read, studied, and rated those materials without choosing among them. Making choices apparently depleted a precious self-resource because subsequent self-regulation was poorer among those who had made choices than it was among those who had not. This pattern was found in the laboratory, classroom, and shopping mall. It was found with assigned choices and spontaneously made choices. It was found with inconsequential and more consequential choices.

Having multiple experiments permitted us to employ a diversity of manipulations and measures, so that possible ambiguities regarding one procedure could be remedied in another. We had some participants make binding and irrevocable choices, whereas other

choices could be reversed later. In some studies we assigned them to make choices or not, and in others we measured how many choices they had spontaneously made. We allowed some participants unlimited time to choose, whereas others were required to stop midtask after a fixed interval. We measured self-regulation in terms of how long they could hold a hand in ice water, how much of a bad-tasting beverage they forced themselves to drink, how much they procrastinated while studying, how long they persisted on unsolvable puzzles, and how long they tried and how well they performed on solvable problems. We also employed a range of supplementary measures, including measures of emotion and mood, self-ratings of fatigue, and perceived difficulty of the tasks. The most parsimonious explanation for all these findings is that making choices depletes some important intrapersonal resource—indeed, the same resource that is needed for self-regulation.

Experiment 7 also showed the depleting effect on reduced active responding and a corresponding increase in passivity. This provides valuable further evidence that one common resource is used by the self's executive function for its diverse activities. That is, making decisions, active initiative, and self-control all appear to depend on the same inner resource.

We attempted also to separate the act of choice itself from the related processes of deliberating and expressing (implementing) the choice. Experiments 1–4 showed that choosing was more depleting than just thinking about the options. Experiment 6 found that choosing was more depleting than was the process of putting choices into action and was more depleting than forming a preference while considering options was. Taken together, these findings tentatively argue for something special about choice. Based on the Rubicon model, we have proposed that making a choice produces a lasting change in the person's mental apparatus by etching into the mind and brain the prescription for what to do. The change in mental programming is made at the time of choosing, regardless of whether the chosen action is to be implemented immediately or at some unspecified future time. Making this change requires energy and is depleting.

Alternative Explanations

The present investigation needed multiple experiments, partly because there is no single, unambiguous measure of the constructs. There is no single gold standard measure of self-regulatory resource depletion, and so we measured self-regulation in many different behavioral spheres. The diversity of measures was especially important and helpful because of the theoretical assumption that the same resource is used for many diverse self-regulation activities as well as for effortful decision making.

Given that choosing can be aversive, one important alternative explanation would be that the choosing manipulation was more aversive than the control condition was and that bad moods contributed to the various behavioral decrements afterward. Multiple findings speak resoundingly against this view. We measured mood in several studies and found no differences as a function of choice condition. We also observed the depleting effect of choice even when participants had not reported their moods. Experiment 7 did find that aversive choices are more depleting than pleasant choices, but pleasant choices also became depleting, and moreover the effect of enjoyable versus aversive choosing disappeared when participants had made choices for a relatively long time. In short, neither subjective mood nor enjoyment can explain our findings.

In Experiments 1A and 4A, the experimenter had the informal impression that the choice procedure seemed to take longer than the no-choice procedure, raising the possibility that the effects on self-regulation were caused by the longer duration of the initial task. Experiment 7 showed that spending more time on a depleting choice task had a stronger effect. In other studies, however, the time for the two tasks was kept rigidly equal, which permitted the conclusion that the depleting effects of choice were not due specifically to the time devoted to the task. The best way to integrate these findings is to suggest that it is the amount of psychological work rather than the simple duration of participation that accounts for the extent of depletion.

Experiments 2 and 4 used two different experimenters and blind testing procedures. The results remained strong, and so the effects cannot be explained away in terms of seeking to gain favor for the sake of getting a better gift or a sense of having discharged one's obligation as a research participant. The two-experimenter system also permitted blind testing, which can largely rule out explanations based on experimenter bias or demand characteristics.

Last, it was important for us to confirm empirically that the experimental manipulations about choice were effective. The pilot experiment showed that high-choice procedures made people feel that they were indeed engaging in decision making, as well as putting more deliberate thought into the task, more than the low-choice procedures. The self was more involved in the high-choice procedure than it was in the no-choice procedure, which is why we think that it expended more of its self-resources.

In short, although some findings may seem open to alternative explanations, we attempted to provide evidence against these alternatives with other studies in the current investigation. The most parsimonious explanation for these findings is that making choices depletes a valuable internal resource that is needed for self-regulation, and thus self-regulation is impaired in the aftermath of decision making.

Distinctiveness of Depletion

Some readers may wonder how these self-regulatory resource-depletion effects can be distinguished from other phenomena familiar to cognitive psychology, ranging from cognitive load to mental effort and mental fatigue. Although we are sympathetic to efforts at integrative theorizing that may produce the most general theories, we do note some distinctions and contrasts between the current model and those other processes.

Studies using cognitive load, like ego-depletion studies, are based on the assumption of a limited resource. In particular, cognitive load is presumed to preoccupy attention, which is limited in its capacity. In contrast to ego depletion, however, attention is presumed to be limited only during the time of preoccupation, and so attention reverts to its baseline (full capacity) as soon as the load is lifted—unlike self-regulatory resource-depletion effects, which involve lasting consequences afterward. Attention and willpower are, therefore, two different resources and operate somewhat differently.

There are also empirical distinctions. A cognitive load impairs the maintenance of information in short-term memory (e.g., Szmalec, Vandierendonck, & Kemps, 2005), whereas ego depletion

does not impair the maintenance of information in short-term memory (Schmeichel, 2007, Experiment 2). Thus, ego depletion and cognitive load have distinct effects on short-term memory, suggesting that they are dissociable phenomena. Moreover, recent studies by Schmeichel and Baumeister (2007) found that cognitive load procedures produced results opposite to those of ego depletion on a cold pressor task performance: Cognitive load led to longer durations, whereas ego depletion yielded shorter durations.

Some attention-related phenomena do appear to reveal a "hangover" effect, but these are extremely short-lived—that is, on the order of milliseconds. The phenomenon of attentional blindness, for example, occurs when participants fail to perceive the second of two target stimuli appearing in rapid succession (500 ms or less) at the same location on a viewing screen (Raymond, Shapiro, & Arnell, 1992). Similarly, repetition blindness is the failure to perceive repetitions of stimuli presented in rapid succession (e.g., Kanswisher & Potter, 1989). Note that both phenomena peak and dissipate quite rapidly. By contrast, the current research found that the hangover effect from making choices persisted over the course of at least a few minutes, and other research on ego depletion has found effects up to 45 min postmanipulation. The differing time courses suggest two resources, one that fluctuates rapidly and is primarily attentional in nature and another that fluctuates over longer periods of time and is primarily related to choice making, willpower, and executive control. Our focus was on the latter.

The concept of mental fatigue is quite general and may encompass some patterns of ego depletion. Nonetheless, mental fatigue refers to something quite different. Mental fatigue is presumed to affect a broad range of processes, extending even to exceptionally simple and uncontrolled processes, such as perceptual discrimination (e.g., Parasuraman, 1979). It is typically induced by having participants perform tedious tasks for very long periods of time, such as several hours (e.g., Lorist, Boksem, & Ridderinkhof, 2005). In contrast, self-regulatory resource depletion is often induced by manipulations that require less than 10 min. In the present research, Experiment 7 found depletion occurring after just 4 min, which is probably much too brief to permit discussion of mental fatigue in the cognitive science sense.

Concluding Remarks

The present findings suggest that self-regulation, active initiative, and effortful choosing draw on the same psychological resource. Making decisions depletes that resource, thereby weakening the subsequent capacity for self-control and active initiative. The impairment of self-control was shown on a variety of tasks, including physical stamina and pain tolerance, persistence in the face of failure, and quality and quantity of numerical calculations. It also led to greater passivity.

Decision making and self-control are both prominent aspects of the self's executive function. It is therefore useful to recognize that they draw on a common psychological resource and that one may affect the other. In particular, making many decisions leaves the person in a depleted state and hence less likely to exert self-control effectively. The common resource needed for self-control, active initiative, and effortful decision making may deserve recognition as an important aspect of self and personality.

The human self is quite remarkably different from what is found in most other species. One likely explanation for these differences is that an escalating complexity of social life, including culture, was a defining theme of human evolution (Baumeister, 2005). These uniquely human social systems have conferred remarkable advantages, ultimately including the long and happy lives enjoyed by many modern citizens. But they require advanced psychological capabilities, which are what set the human self apart from the rudimentary selfhood of other animals. Self-control and decision making are central, vital skills for functioning in human culture. Our findings suggest that the formation of the human self has involved finding a way to create an energy resource that can be used to control action in these advanced and expensive ways. Given the difficulty of these modes of action control, the resource is shared and limited. That is presumably why decision making produces at least a temporary impairment in the capacity for self-control.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage.

Ariely, D. (2000). Controlling the information flow: Effects on consumers' decision making and preferences. *Journal of Consumer Research, 27,* 233–248.

Avni, M. S., & Wolford, G. (2007). Buying behavior as a function of parametric variation of number of choices. *Psychological Science, 18,* 369–370.

Bargh, J. A. (2002). Losing consciousness: Automatic influences on consumer judgment, behaviour, and motivation. *Journal of Consumer Research, 29,* 280–285.

Baumeister, R. F. (1998). The self. In D. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed., pp. 680–740). Boston: McGraw-Hill.

Baumeister, R. F. (2002). Yielding to temptation: Self-control failure, impulsive purchasing, and consumer behavior. *Journal of Consumer Research, 28,* 670–676.

Baumeister, R. F. (2005). *The cultural animal: Human nature, meaning, and social life.* New York: Oxford University Press.

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology, 74,* 1252–1265.

Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science, 2,* 396–403.

Brehm, J. W. (1966). *A theory of psychological reactance.* New York: Academic Press.

Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review, 97,* 19–35.

Fitzsimons, G. J., & Lehmann, D. R. (2004). Reactance to recommendations: When unsolicited advice yields contrary responses. *Marketing Science, 23,* 82–94.

Gailliot, M. T., & Baumeister, R. F. (2007). Self-regulation and sexual restraint: Dispositionally and temporarily poor self-regulatory abilities contribute to failures at restraining sexual behavior. *Personality and Social Psychology Bulletin, 33,* 173–186.

Glass, D. C., Singer, J. E., & Friedman, L. N. (1969). Psychic cost of adaptation to an environmental stressor. *Journal of Personality and Social Psychology, 12,* 200–210.

Gollwitzer, P. M. (1990). Action phases and mindsets. In E. T. Higgins & J. R. M. Sorrentino (Eds.), *The handbook of motivation and cognition* (Vol. 2, pp. 53–92). New York: Guilford.

Gollwitzer, P. M. (1996). The volitional benefits of planning. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking*

cognition and motivation to behavior (pp. 287–312). New York: Guilford.

Heckhausen, H., & Gollwitzer, P. M. (1987). Thought contents and cognitive functioning in motivational versus volitional states of mind. *Motivation and Emotion, 11,* 101–120.

Hofmann, W., Strack, F., & Deutsch, R. (in press). Free to buy? Explaining self-control and impulse in consumer behavior. *Journal of Consumer Psychology.*

Huffman, C., & Kahn, B. E. (1998). Variety for sale: Mass customization or mass confusion. *Journal of Retailing, 74,* 491–513.

Iyengar, S., & Lepper, M. (2000). When choice is demotivating: Can one desire too much of a good thing? *Journal of Personality and Social Psychology, 79,* 995–1006.

Kanswisher, N., & Potter, M. C. (1989). Repetition blindness: The effects of stimulus modality and spatial displacement. *Memory and Cognition, 17,* 117–124.

Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology, 32,* 311–328.

Lorist, M. M., Boksem, M. A. S., & Ridderinkhof, K. R. (2005). Impaired cognitive control and reduced cingulate activity during mental fatigue. *Cognitive Brain Research, 24,* 199–205.

Luce, M. F., Payne, J. W., & Bettman, J. R. (1999). Emotional trade-off difficulty and choice. *Journal of Marketing Research, 36,* 143–159.

Malhotra, N. (1982). Information load and consumer decision making. *Journal of Consumer Research, 8,* 419–430.

Mick, D. G. (2005, Fall). Choice writ larger. *Newsletter of the Association for Consumer Research*. Retrieved March 6, 2007, from http://www.acrwebsite.org/

Moller, A. C., Deci, E. L., & Ryan, R. M. (2006). Choice and ego depletion: The moderating role of autonomy. *Personality and Social Psychology Bulletin, 32,* 1024–1036.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology, 74,* 774–789.

Parasuraman, R. (1979, August 31). Memory load and event rate control sensitivity decrements in sustained attention. *Science, 205,* 924–927.

Raymond, J. E., Shapiro, K. L., & Arnell, K. M. (1992). Temporary suppression of visual processing in an RSVP task: An attentional blink? *Journal of Experimental Psychology: Human Perception and Performance, 18,* 849–860.

Richeson, J. A., & Shelton, J. N. (2003). When prejudice does not pay: Effects of interracial contact on executive function. *Psychological Science, 14,* 287–290.

Sartre, J.-P. (1956). *Being and nothingness.* (H. E. Barnes, Trans.). Secaucus, NJ: Citadel Press. (Original work published 1943)

Schmeichel, B. J. (2007). Attention control, memory updating, and emotion regulation temporarily reduce the capacity for executive control. *Journal of Experimental Psychology: General, 136,* 241–255.

Schmeichel, B. J., & Baumeister, R. F. (2007). *Cognitive load and ego depletion have divergent effects on pain tolerance.* Unpublished manuscript, Texas A&M University, College Station.

Schmeichel, B. J., Vohs, K. D., & Baumeister, R. F. (2003). Intellectual performance and ego depletion: Role of the self in logical reasoning and other information processing. *Journal of Personality and Social Psychology, 85,* 33–46.

Schwartz, B. (2000). Self-determination: The tyranny of freedom. *American Psychologist, 55,* 79–88.

Strack, F., Werth, L., & Deutsch, R. (2006). Reflective and impulsive determinants of consumer behavior. *Journal of Consumer Psychology, 16,* 205–216.

Szmalec, A., Vandierendonck, A., & Kemps, E. (2005). Response selection involves executive control: Evidence from the selective interference paradigm. *Memory and Cognition, 33,* 531–541.

Tice, D. M., & Baumeister, R. F. (1997). Longitudinal study of procrastination, performance, stress, and health: The costs and benefits of dawdling. *Psychological Science, 8,* 454–458.

Trout, J. (2005, December 5). Differentiate or die. *Forbes*. Retrieved December 17, 2006, from http://www.forbes.com/opinions/2005/12/02/ibm-nordstrom-cocacola-cx_jt_1205trout.html

Vohs, K. D. (2006). Self-regulatory resources power the reflective system: Evidence from five domains. *Journal of Consumer Psychology, 16,* 215–221.

Vohs, K. D., Baumeister, R. F., & Ciarocco, N. (2005). Self-regulation and self-presentation: Regulatory resource depletion impairs impression management and effortful self-presentation depletes regulatory resources. *Journal of Personality and Social Psychology, 88,* 632–657.

Vohs, K. D., & Faber, R. J. (2007). Spent resources: Self-regulatory resource availability affects impulse buying. *Journal of Consumer Research, 33,* 537–547.

Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science, 11,* 249–254.

Vohs, K. D., & Heatherton, T. F. (2001). Self-esteem and threats to self: Implications for self-construals and interpersonal perceptions. *Journal of Personality and Social Psychology, 81,* 1103–1118.

Waldman, S. (1992, January 27). The tyranny of choice: Why the consumer revolution is ruining your life. *New Republic,* 22–25.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063–1070.

Webb, T. L., & Sheeran, P. (2003). Can implementation intentions help to overcome ego depletion? *Journal of Experimental Social Psychology, 39,* 279–286.

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