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The Pain Was Greater If It Will Happen Again: The Effect of Anticipated Continuation on Retrospective Discomfort

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The Pain Was Greater If It Will Happen Again: The Effect of
Anticipated Continuation on Retrospective Discomfort

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Abstract

Across six laboratory Studies and one Field Study, we demonstrate that people remember an unpleasant experience as more aversive when they expect this experience to return than when they have no such expectation. Our results support a bracing explanation for this effect: When faced with the anticipated return of the experience, people prepare for the worst by remembering it as more aversive. This bracing can be “turned off” by either limiting people’s self-regulatory resources or by denying them the time to brace. These results indicate that people’s general tendency to remember aversive experiences as less unpleasant than they had actually been (as demonstrated in prior research) does not necessarily imply that people will be willing to re-engage in these experiences—as the anticipation of repeating the experience would counter-act the initial memory bias.

Keywords: memory, bracing, expectations

Although we generally pursue pleasant experiences, we sometimes choose to engage in experiences that are inherently aversive or have an important aversive component to them. For instance, we may suffer through an irritating task because our job requires it, or we may sweat through a grueling run because of the eventual physical and psychological rewards. Many times, we even consider repeating these activities in spite of their inherent aversiveness. Achieving our professional objectives may require many repetitions of the same boring tasks, and becoming an elite distance runner certainly involves many grueling runs. Whether or not we choose to re-engage in these activities depends on the extent to which we remember the aversiveness of our experience: we may be less likely to set out on another run if we would accurately remember the agony of every stride.

Perhaps fortunately, there are many psychological mechanisms that prevent us from reliving these aversive experiences to their truest extremes. For instance, we generally tend to focus on the positive while neglecting the negative memories of an experience (Mitchel, Thompson, Peterson, & Cronk, 1997; Sutton, 1992) and we have difficulty remembering the intense pain of an experience when we are in an incongruent ‘cold’ state (Read & Loewenstein, 1999). This kindness of our memory subsequently creates less aversive expectations and may entice us into partaking in the experience once more. Thus, we may fail to remember the true aversiveness of an irritating task or the stinging agony of a distance run, leading us to sign up for another task or plan another run.

However, this reasoning assumes that our memory of the experience is not affected by our contemplation of repeating the experience. The studies reported in this paper examine whether this indeed holds, or whether the prospect of repeating an experience can in fact change

how we remember it. Even though it has been firmly established that our memories influence our expectations (Jones and McGillis 1976) and that those expectations influence our experiences (e.g., Klaaren, Hodges, & Wilson, 1994; Wilson, Lisle, Kraft, & Wetzel, 1989), currently, little is known about whether and how our expectations influence our memories.

We know that our flawed memory produces less aversive expectations, but are our expectations equally kind to our memory? If we consider engaging in another irritating task, how will that consideration influence how we remember the previous task? One possibility is that the expectation of re-engaging in an unpleasant experience will magnify the aforementioned tendency to remember the experience as less aversive than it actually was. To reduce the dread associated with the prospect of an unpleasant experience, people may choose to convince themselves that the experience was not that bad after all. This is similar to the behavior of strategic optimists who choose to be optimistic about an uncertain event in order to savor the possibility of a positive outcome (Norem & Illingworth, 1993). Furthermore, some prior research suggests that people can strategically increase their liking of an aversive experience when they anticipate having to go through a repeated series of these experiences. In particular, Gibbs (2005) observed that people rated a bitter drink as less aversive when they expected to consume it 20 times than when they expected to consume it only once. The author argued that participants manipulated their taste to render their current situation less unpleasant. In sum, people may choose to remember an experience as less aversive if they expect to continue the experience, thus reducing expected disutility and increasing the likelihood of repeating the experience.

Yet, in contrast to the view that the anticipated repetition of an unpleasant experience may lead people to convince themselves that it was less aversive, the studies to be presented in this paper indicate that the anticipated repetition instead tends to *increase* the remembered

aversiveness of the experience. Thus, although prior demonstrations of our biased memory for unpleasant experiences suggest that we can easily be enticed into repeating these experiences, the current research indicates that people may remember these experiences less fondly when they are actually confronted with the prospect of having to repeat them. In other words, whereas our memories tend to be kind to our expectations, our expectations are decidedly less kind to our memories.

As will be discussed next in more detail, there are two psychological mechanisms that are consistent with these findings. In particular, the anticipation of repeating an unpleasant experience may cause people to remember the experience as more unpleasant as a result of (1) closing the cold-to-hot empathy gap, or (2) encouraging people to brace for the upcoming continuation.

When Expected Repetition Makes the Past Seem Worse

The Cold-To-Hot Empathy Gap

When attempting to predict the behavior of both others and themselves, people have an inability to accurately perspective take (Loewenstein, O'Donoghue, & Rabin, 2003; Read & Loewenstein, 1999). Specifically, people tend to egocentrically use their present state as an anchor when making predictions. This is especially true when making predictions about visceral states (Loewenstein, 1996; Nordgren, van der Pligt, & van Harreveld, 2006). For example, in one study, participants demanded higher compensation to repeat an aversive experience that they had participated in one week earlier (putting their hand in cold water) when they sampled the

experience again as compared to those participants who did not resample the experience (Read & Loewenstein, 1999). By re-sampling the experience, participants were placed back in a “hot” state, leading to more extreme evaluations of the aversiveness of the experience compared to the “cold” state control condition.

Generally, people in a cold state lack the ability to predict what it would be like to be in the more arousing, hot state. This cold-to-hot empathy gap (Read & Loewenstein, 1999) is an important contributor to people’s tendency to remember unpleasant experiences as less aversive than they actually were. At the time of recall, people tend to be in a cold state and have difficulty imagining the visceral discomfort they experienced while in a hot state. However, the dread associated with an anticipated return to the aversive experience may reinstate the hot state, consistent with prior findings that people experience more intense emotions during anticipation rather than retrospection (Van Boven & Ashworth, 2007). This re-activation of the hot state would then make it easier to vividly remember how painful the experience truly was. For instance, although someone who has been subjected to a sustained irritating sound may fail to fully recall the agony of the experience, the dread of having to listen to the sound again may make it easier to re-imagine how painful the experience really was.

Bracing

The previous account suggests that the prospect of continuing an unpleasant experience can lead people to recall this experience as more aversive by undoing a psychological mechanism that usually leads to a failure to appreciate the true aversiveness of the experience (i.e., an inability to imagine hot affect in a cold state). However, the second account assumes that

the anticipation of an impending aversive experience influences memory through a separate, independent effect, rather than through the undoing of another mechanism. In addition to the strategic optimism we described earlier, people also often exhibit defensive pessimism (Norem & Cantor, 1986a). Specifically, when faced with an upcoming aversive experience, some people choose to expect the worst in hopes of creating a less extreme contrast between their expectations and reality (Norem & Cantor, 1986b). Since people are generally more upset by unexpected negative events than expected ones (Feather, 1966), this type of strategy may increase subsequent well-being. Furthermore, although people are generally optimistic about uncertain outcomes, they tend to become pessimistic about the outcome as the event draws near (Carroll, Sweeney, & Sheppard, 2006; Taylor & Sheppard, 1998). For example, students who predicted their exam scores immediately after taking an exam were generally optimistic. However, as the date when their scores were to be announced approached, they lowered their expectations to brace for the worst (Sheppard, Ouellette, & Fernandez, 1996).

In the context of a to-be-repeated aversive experience, bracing for the worst implies increasing the anticipated unpleasantness of the upcoming experience by increasing the recalled unpleasantness of the past experience. Whereas participants in Gibb's (2005) study reacted to anticipated repetition by perceiving the experience as less aversive, thus improving their *current* well-being by reducing dread (similar to strategic optimism), we propose that people may often brace for repeated aversive experiences by perceiving these experiences as more aversive, thus improving their *later* well-being by inducing a favorable contrast between the expected versus actual aversiveness of the experience (similar to defensive pessimism). For instance, people may brace for the return of a sustained irritating sound by remembering that experience as having been more agonizing (thus increasing current dread, but possibly reducing future distress).

Overview of the Present Studies

The primary purpose of the present studies is to examine whether and how the expectation of returning to an aversive experience influences people's memory of it. Across both controlled laboratory studies and a field study, we find that people who expect to return to an aversive experience, remember their previous exposure to that experience as having been more aversive, compared to people who do not expect the aversive experience to return. We will present a series of six laboratory experiments where participants either listen to an irritating noise (Study 1) or complete an aversive task (Studies 2 – 6). Some participants anticipate listening to or completing the task again, while others do not. We demonstrate that those participants who anticipate the return of the aversive activity remember their past exposure as having been more aversive than those who believe to be done with the activity. We also demonstrate that this effect is not caused by the cold-to-hot empathy gap but rather is caused by participants' tendency to brace for the upcoming aversive experience. We further demonstrate that this bracing can be “turned off” by either limiting people's self-regulatory resources or by denying participants the time to brace. A final field study demonstrates the robustness of this effect outside a laboratory setting (Study 7). In particular, we demonstrate that, although women tend to remember their most recent menstrual period as less painful the more time has passed, they remember it as more painful as their next period draws near.

Study 1

The goals of the first laboratory experiment was to test whether people who anticipate an unpleasant experience to return, remember this experience as more aversive (compared to people who do not anticipate the experience to return). All participants first listened to the same irritating sound (the noise of a vacuum cleaner) for the same amount of time, after which some were informed that they would later be listening to more of the noise, while others were told that they were done with the experience. We predicted that the anticipation of a return to the aversive experience would cause participants to remember the previous experience as having been more aversive.

Method

Thirty undergraduate students (21 women) completed the experiment in exchange for partial course credit. Participants were seated at a computer and asked to put on a set of headphones. In order to obtain a baseline measure of participants' dislike of the stimulus, all participants first listened to a five-second fragment of the irritating sound (vacuum cleaner noise), and then rated it on a 101-point unmarked slider scale anchored by "Not Irritating At All" and "Tremendously Irritating." Next, participants listened to the target sound for 40 seconds and then were randomly assigned to one of two between-subjects conditions. Approximately half of the participants were told that they were done listening to the noise (*Done*), whereas the other half were told that, in a few minutes, they would listen to more of the same noise (*More*). All participants then completed an unrelated filler task for approximately five minutes and then indicated, on 9-point scales, how irritating the experience was (1 = "Not Irritating," 9 = "Terribly Irritating") and how hard it was to listen to the noise (1 = "Not Hard At All," 9 = "Extremely

Hard”). Participants also indicated how much they would (hypothetically) be willing to pay to avoid listening to the same noise for a full 10 minutes. Finally, participants were debriefed and thanked. To avoid unnecessary discomfort, no participants in this study (or in any subsequent study) were actually exposed to more of the stimulus.

Results and Discussion

The two primary measures of remembered aversion (irritation and hardness) were highly correlated ($r = .81, p < .001$) and were thus pooled into a single measure of aversion. An ANCOVA on this single measure, using the baseline measure of aversion (i.e., their prior rating of the noise fragment) as a covariate, revealed an effect in the predicted direction. Participants who anticipated listening to more of the noise remembered the original experience as more aversive than did those who thought they were done listening to the noise ($M_{More} = 5.92, M_{Done} = 4.56$), $F(1, 27) = 4.40, p < .05$. This was confirmed with a similar ANCOVA on participants' willingness to pay to avoid listening to the noise for 10 minutes. Participants who anticipated more of the noise were willing to pay considerably more than participants who did not anticipate more ($M_{More} = \$3.62, M_{Done} = \0.94), $F(1, 27) = 5.48, p < .05$.

Study 2

The first study demonstrated that the prospect of returning to a viscerally aversive sound caused participants to remember that sound as more irritating. In the second study, we tested the

robustness of this effect by conceptually replicating it with a stimulus that does not evoke strong visceral reactions but is merely unpleasant: a boring task.

Method

Forty-four undergraduate students (25 women) completed this study in exchange for partial course credit. Participants were seated at a computer and first went through a mildly tedious task to establish a baseline measure of perceived boredom to be used as a covariate in the subsequent analyses. In this initial task, they were shown four objects on the screen and asked to indicate, as quickly as possible, which of the objects was a circle. To ensure that the task was tedious, participants completed 15 trials with a 3-second interval between trials, after which they rated the task on a 9-point scale anchored by “Not At All Boring” (1) and “Extremely Boring” (9). Next, participants completed the focal task in which they had to drag a circle from the left side of the computer screen to a “drop area” located on the right side of the screen. Again, in order to make this task boring, participants completed 50 trials with a 1.5-second interval between trials. Following completion of the last trial, participants were randomly assigned to one of two conditions. Approximately half of the participants were informed that they would be completing another 50 trials of the circle moving task (*More*), whereas the other half were told that they were done with the task (*Done*). Next, participants completed an unrelated filler task for approximately 10 minutes and then responded to our three primary dependent measures: participants rated how irritating, annoying, and boring the task was using 9-point scales anchored by “Not At All Irritating / Annoying / Boring” (1) and “Extremely Irritating / Annoying / Boring” (9). Finally, participants were debriefed and thanked.

Results and Discussion

In this experiment, as in all our subsequent lab experiments, the three primary measures of aversion—irritation, annoyance, and boredom—were highly correlated (all α 's > .9) and were thus pooled into a single measure of remembered aversion. An ANCOVA on this new measure, using the baseline measure of task boredom as a covariate, revealed a reliable effect of the anticipation manipulation, $F(1, 42) = 5.40, p < .05$. As predicted, and consistent with the previous study, participants who anticipated completing more of the task perceived the original task as more aversive than did those who were done with the task ($M_{More} = 7.26, M_{Done} = 6.56$).

Study 3

In the first two studies, people who anticipated returning to an unpleasant experience remembered that experience as more aversive than those who were told they were done with it. These results are consistent with an *increase* in perceived aversiveness as a result of anticipated continuation (as we hypothesized), but also with a *decrease* in perceived aversiveness as a result of knowing the experience has finished. The next study was designed to distinguish between increased aversiveness in the *More* conditions and decreased aversiveness in the *Done* conditions by adding a control condition in which participants had no expectation of either completion or continuation. If the previously observed effect is indeed caused by an increase in perceived aversiveness as a result of anticipated continuation, then participants in the *More* condition

should remember the experience as more aversive than those in the control condition, whose responses should not differ from those in the *Done* condition.

A second objective of this study was to distinguish between the two possible explanations of the anticipation effect. Participants who anticipate a return to the boring task may remember their previous experience as more aversive either because the dread of the upcoming task returns them to a hot state (thus bridging the cold-to-hot empathy gap), or because they brace themselves for the upcoming task by lowering their expectations and imagining the worst. One way in which these two accounts differ is in the required similarity between the past experience and the anticipated experience. If the effect of anticipation is caused by the re-activation of a hot state, then the anticipation of a similarly aversive, but not identical task should also lead to an increase in remembered aversiveness. However, if the effect is the result of participants bracing for the worst, then anticipating an aversive experience should only affect the remembered aversiveness of that identical experience. Bracing for an upcoming task by imagining it to be highly aversive should affect the remembered aversiveness of that same task, but not of a clearly different (albeit also aversive) task. To test between these two accounts and determine the importance of similarity between the experienced and anticipated activity, we included a new condition where participants expected that they would be completing an aversive task that was different from the one they had just experienced.

Method

One hundred and twelve participants (88 women; median age = 32) from an online panel completed the study in exchange for entry into a \$50 lottery. To create a control condition in

which participations assumed neither completion nor continuation, we needed to alter the procedure to make the total number of tasks ambiguous. First, participants completed 15 trials of the same circle moving task that was used as focal task in Study 2. They then completed an unrelated study that lasted for approximately five minutes. Following this study, participants reported how irritating, annoying, and boring the first task was on the same 9-point scales used in Study 2. Next, participants again completed the circle moving task, but this time for 50 trials. By having all participants go through a first iteration of the task, rate the task, and then present them with a second iteration, we created the possibility that a task would be repeated after rating it (which was essential to create uncertainty about completion in the *Control* condition).

Participants were then randomly assigned to one of four conditions. Similar to the previous experiment, participants in the *Done* condition were told that they were done with the task, and participants in the *More* condition were told that, in a moment, they would complete another 50 trials of the task. Participants in the *More of Other* condition were told that, in a moment, they would complete a different task which also involved dragging objects on the screen. Finally, participants in the *Control* condition were not given any information at this point. Next, all participants completed another unrelated five-minute filler task, after which they received a reminder of the completion or continuation information they had received prior to the filler task (corresponding to their condition). All participants then indicated how irritating, annoying, and boring the last iteration of the circle moving task was using the same 9-point scales as used in Study 2. Finally, they were debriefed and thanked.

Results and Discussion

As can be seen in Figure 1, an ANOVA on the pooled measure of perceived aversiveness revealed a reliable main effect of the anticipation manipulation, $F(3, 108) = 6.81, p < .001$. Unpacking this effect, we first observe a replication of our previous result: participants who anticipated completing more of the same task (*More* condition) perceived the original task as having been more aversive than participants who did not expect to complete more of the task (*Done* condition), $F(1, 108) = 6.21, p < .05$. Next, participants in the *Control* condition remembered the experience as less unpleasant than did those in the *More* condition, $F(1, 108) = 9.62, p < .01$, but not differently from those in the *Done* condition, $F < 1$, indicating that anticipation increases perceived aversiveness (rather than completion decreasing perceived aversiveness). Finally, inconsistent with an account relying on the cold-to-hot empathy gap, but consistent with a bracing explanation, we find that only anticipation of the same experience increased remembered aversiveness of the past experience. Specifically, responses from participants in the *More of Other* condition were significantly lower than those in the *More* condition, $F(1, 108) = 19.49, p < .001$, and surprisingly, even lower than those in the *Done* condition, $F(1, 108) = 4.60, p < .05$.

Since the results of this study are consistent with a bracing account of the anticipation effect, but not with a cold-to-hot empathy gap account, the next three experiments test predictions that can be directly derived from the bracing explanation. Prior research indicates that bracing and other forms of defensive pessimism require both time and resources to manifest (Norem & Cantor, 1986b; Norem & Illingworth, 1993). Therefore, in the next two studies, we manipulate time to brace and the availability of self-regulatory resources. In Study 4, we asked some participants to rate the aversiveness of the experience immediately after telling them that they will be completing more of the task, thus denying them the time to brace for the upcoming

experience (compared to participants in the previous studies who could brace for the anticipated experience during the filler task). In Study 5, we presented some participants with a depleting task, thus lowering their available self-regulatory resources during the time that they would normally brace for the upcoming aversive experience. Finally, in Study 6, we demonstrate that people who tend to engage in bracing behavior in other domains show a stronger anticipation effect in our paradigm.

Study 4

If the anticipated continuation of an aversive experience indeed increases the remembered aversiveness of that experience because people are strategically bracing for its return by preparing for the worst, then the effect should be reduced or removed if we limit participants' time to brace themselves. To test this prediction, we replicated the procedure used in Study 2, but included a new condition. Previously, participants in all of our studies learned of their condition before a short filler task and reported their remembered aversion only after completing that filler task, thus giving participants in the *More* conditions ample time to brace for the upcoming task. In this new study, we added a condition in which participants only learned after the filler task that they would soon have to return to the boring task. This procedure limited their time to brace for the upcoming aversive experience as they learned of it immediately before they were asked to remember how aversive the original experience was.

Method

One hundred and fifty-four undergraduate students (106 women) completed the study in exchange for partial course credit. The procedure was identical to that of Study 2 with two major differences. First, participants were assigned to one of *three* conditions: *Done*, *More Expected* (identical to the *More* conditions of Studies 2 and 3), and *More Unexpected*. Participants in the *More Unexpected* condition were informed that they were done with the circle moving task before the filler study, but afterwards were told that they would actually be completing 50 more trials. This information immediately preceded the dependent measures. Second, after the primary dependent measures, we asked participants to indicate on the same 9-point scales how irritating and annoying the *first* task was (i.e., the task used to establish a baseline measure of aversiveness). This allowed us to test whether anticipation of an upcoming experience affects memory for just the focal task, or all aversive tasks. If, as we contend, the underlying psychological mechanism is bracing, then we should only expect to find an effect of anticipation on memory for the same task.

Results and Discussion

We first turn to the remembered aversiveness of the focal task. As can be seen in Figure 2, an ANCOVA on the pooled measure of remembered aversion, using the baseline measure of task boredom as a covariate, revealed a reliable effect of the anticipation manipulation, $F(2, 150) = 4.76, p < .05$. First, we again find that participants in the *More Expected* condition report greater aversion than those in the *Done* condition, $F(1, 150) = 3.71, p = .056$. More importantly, and consistent with the bracing account, when participants did not have the time to brace (*More Unexpected*), they remembered their past experience as less aversive than those who did have

time to brace (*More Expected*), $F(1, 150) = 9.17, p < .005$, and no different from those who did not anticipate returning to the task, $F(1, 150) = 1.25, ns$. We next turn to the remembered aversiveness of the non-focal (baseline) task. The two measures of aversiveness were highly correlated ($r = .90, p < .001$) and were thus pooled into a single measure of aversiveness. Consistent with the argument that bracing for an upcoming experience should only affect the remembered unpleasantness of that same experience, an ANOVA on the pooled measure did not reveal an effect of the anticipation manipulation, $F(2, 151) = 1.10, ns$. Thus, whereas Study 3 demonstrated that memory for the target task is not affected by anticipation of a different task, this result indicates that memory for a different task is not affected by the anticipated return to the target task.

Study 5

The previous study demonstrated that the expected return to an aversive experience does not affect participants' perception of this experience when they do not have sufficient time to brace for its return. Likewise, the present study tests whether reducing the self-regulatory resources people need to brace themselves similarly reduces the effect of anticipation. We manipulated participants' self-regulatory resources using a procedure adapted from the ego-depletion literature (Vohs et. al 2008): during the time period that participants could be bracing themselves, we asked participants to complete a series of either easy or difficult choices. We expected that participants who were making the difficult (rather than easy) choices would be more depleted (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Moller, Deci, & Ryan, 2006), and therefore would be less likely to have sufficient self-regulatory resources to brace for the

upcoming aversive experience. Bracing essentially requires that people force themselves to experience more aversion right now (by dreading a terribly aversive outcome) in order to reduce their future discomfort (since the future experience would turn out to be less aversive than expected). However, when people are depleted, they may lack the self-regulatory resources to limit future suffering by inflicting greater distress on themselves right now, and thus fail to inflate the perceived aversiveness of the experience.

Method

One hundred and seventy-four undergraduate students (121 women) completed this study in exchange for partial course credit. The procedure was identical to that of Study 2, with two critical differences. First, similar to Study 4, participants not only rated the remembered aversiveness of the focal task, but also that of the initial, non-focal task. Second, rather than having participants complete a non-demanding filler task between the continuation/completion instructions and the remembered aversiveness ratings, participants instead completed a choice task that was either resource depleting or not. All participants were shown 20 pairs of female faces and asked to indicate, for each pair, which woman was more attractive on a 101-point unmarked slider scale anchored with “The woman on the left is more attractive” and “The woman on the right is more attractive.” Participants in the *Depletion (No-Depletion)* condition saw 16 (4) sets of photos of women who were roughly equally attractive and 4 (16) sets of photos of women who differed greatly in attractiveness. Thus, participants in the *Depletion* condition made primarily difficult (i.e., close) choices, whereas those in the *No-Depletion* condition made primarily easy choices. As a manipulation check, after completing all 20 trials,

participants indicated how difficult it was to judge which women were more attractive on a 9-point scale anchored by “Not At All Difficult” (1) and “Very Difficult” (9).

Results and Discussion

First, the manipulation check results show that the choices made in the *Depletion* condition were in fact considerably more difficult than those in the *No-Depletion* condition ($M_{Depletion} = 4.49$, $M_{No-Depletion} = 2.33$), $t(172) = 7.50$, $p < .001$, suggesting that more resources were used in the former condition.

Next, a 2 (anticipation: done, more) x 2 (depletion: depleted, not depleted) ANCOVA on the pooled aversiveness measure, using the baseline measure of task boredom as a covariate, revealed a main effect of the anticipation manipulation, $F(1, 169) = 4.48$, $p < .05$: participants who expected to return to the aversive task remembered this task as more aversive than those who did not anticipate more of the task ($M_{More} = 7.12$, $M_{Done} = 6.29$). More important, the effect of anticipation depended on the level of depletion, $F(1, 169) = 5.00$, $p < .05$. As can be seen in Figure 3, the anticipation effect was replicated for participants who had not been depleted, $F(1, 169) = 9.41$, $p < .005$, but disappeared when participants lacked the resources to brace for the upcoming experience, $F < 1$.

As in the previous study, we again did not observe an effect of anticipation on the remembered aversiveness of the non-focal task, $F < 1$, consistent with the notion that bracing for an upcoming experience should only affect the remembered aversiveness of that same experience.

Study 6

In the final laboratory experiment, we examined whether participants who showed a stronger reaction to the anticipation manipulation were more likely to engage in bracing behavior in another area as well. Specifically, we replicated Study 2, but included a self-report measure of people's tendency to brace in the context of academic exams. We predict that people who are more likely to brace themselves for exam results should also react more strongly to the anticipated return to the boring task in our experiment, that is, they should show a stronger increase in the remembered aversiveness of the task.

Method

Fifty-one participants (34 women; median age = 22) from an online panel completed this experiment in exchange for entry into a \$50 lottery. The procedure was identical to that of Study 2 with one major difference. After answering all primary dependent measures, participants answered the following question: "Imagine that you have just taken a test and you are uncertain about your performance. Which would you be more likely to do?" on a 9-point scale anchored by "Prepare for the worst and convince yourself that you did poorly" (-4) and "Hope for the best and convince yourself that you did well" (+4).

Results and Discussion

Replicating the basic anticipation effect, an ANCOVA on the pooled aversiveness measure, using the baseline measure of task boredom as a covariate, revealed a main effect of the anticipation manipulation. Those participants who expected to return to the boring task remembered this task as more aversive than those who did not expect to return to the task ($M_{\text{More}} = 7.40$, $M_{\text{Done}} = 6.26$), $F(1, 48) = 5.18$, $p < .05$. We again did not observe an effect of anticipation on the remembered aversiveness of the non-focal task, $F < 1$, confirming that people only inflate the aversiveness of a task that they are about to repeat.

Most important, we computed a correlation between the perceived aversiveness of the focal task and the bracing question. As predicted, responses to these two measures for participants in the *More* condition were strongly negatively correlated ($r = -.46$, $p < .05$), suggesting that participants who were more likely to brace in a testing situations also were more likely to brace for the upcoming aversive task in our paradigm. Importantly, we observed no such correlation for participants in the *Done* condition ($r = -.08$, $p > .6$), indicating that people who tend to brace themselves for bad exams do not simply perceive all experiences as more aversive. Rather, only when an unpleasant experience is expected to return, do people who tend to prepare for the worst remember this experience as more aversive than do those who hope for the best.

Study 7

The preceding experiments demonstrated, in a controlled setting, that people brace for the return of an aversive experience by remembering this experience as more aversive. The present study extends this finding to a naturally occurring aversive experience: menstruation. For many

women, menstruation is an aversive and even painful experience (McFarland, Ross, & DeCourville, 1989), and while all women who regularly menstruate likely anticipate their next menstrual period to some degree, it is likely that those whose next period is temporally close, anticipate it more than those whose next period is temporally distant. In other words, to the extent that women brace for their upcoming period, they should do so most when it is about to occur. As such, we conducted a field study where we measured women's remembered aversiveness of their previous period as a function of the time until their next period. We expected that women would remember their previous period as more painful the closer they were to their next period.

Method

Four hundred and ninety-five women (median age = 29) participated in an online study in exchange for entry into a \$50 lottery. Of those 495 participants, 315 were menstruating at the time of the survey and were omitted from the analyses¹. Participants first indicated how many days were left until their next period. Next, they indicated how painful the worst and the average moment of their last period was on two separate 9-point scales anchored by "Not at all Painful" (1) and "Extremely Painful" (9). They then completed a series of questions designed to be used as covariates in our analysis in order to control for possible confounding variables. These questions included: whether or not they used birth control, were trying to get pregnant, had any psychological conditions related to their period, had any physical conditions related to their period, or were on any medication related to their period. In addition, we measured their self-

reported tolerance for pain (1 = “I do not tolerate pain well,” 9 = “I tolerate pain very well”), the average duration of their period, and their age. Finally, participants were debriefed and thanked.

Results and Discussion

The two measures of remembered pain were highly correlated ($r = .86, p < .001$) and were thus pooled into a single measure. To test the hypothesis that women remembered their previous period as more aversive as their next period approached, we submitted this pooled pain measure to an OLS regression with the number of days until the next period as the critical independent variable. Interestingly, as described in Table 1, we found a curvilinear relationship between time and remembered pain ($\text{regression-}R^2 = .62$). Women who had just experienced their period remembered it as more aversive than those who had experienced it some time ago. However, critical to our hypothesis, women who were approaching their next period remembered their last period as having been more painful than did those who were still many days removed from their next period. As can be seen in Figure 4, the relationship between time and remembered pain follows a U-shape.

We can further decompose this pattern in a number of ways. First, we can confirm that there is a negative relationship between time until next period and remembered aversiveness for women who are on the right side of the time range. We start by splitting the sample into two groups based on a median split of the time until next period ($\text{median} = 10$ days). Running the regression described above on the group of women who are closest to their next period (0 – 10 days away) reveals only a negative linear relationship. $B = -.13, t(89) = -1.91, p = .06$, and no

quadratic relationship, $t < 1$, *ns*, confirming our hypothesis that, as their next period approaches, women remember their previous period as having been more aversive.

Alternatively, we can compare the responses of women who are *very* close to their next menstruation (less than three days away; consistent with McFarland, Ross, & DeCourville, 1989), and other women. The results of a series of ANCOVA analyses with all the aforementioned covariates reveals that these women whose next period is imminent remember their past period as more painful ($M = 6.26$) than do other women, regardless of whether they are compared to women who are three to four days away from their next menstruation ($M = 4.61$), $F(1, 23) = 8.27$, $p < .01$, three to 10 days away from their next menstruation ($M = 4.91$), $F(1, 73) = 3.88$, $p = .053$, or all other women ($M = 4.76$), $F(1, 170) = 5.29$, $p < .05$.

This field study corroborates the findings of our laboratory experiments in a natural context. Of course, given the correlational nature of this study, we acknowledge that other factors may contribute to this effect. One possibility is that women whose period was impending were, in fact, currently experiencing more pain than women at other stages of their cycle, implying that they were in a “hot” state when recalling their previous pain. However, this is inconsistent with previous research on menstruation that found that women felt the same level of pain regardless of where they were in the non-menstruation portion of their menstrual cycle (McFarland, Ross, & DeCourville, 1989).

General Discussion

The results of six laboratory experiments and a field study demonstrate that people’s memory for an aversive experience becomes more negative when they anticipate returning to

that experience. People who have just listened to an irritating noise remember that experience as more irritating when they expect having to listen to more of the noise (Study 1); and people who have completed a boring task remember that experience as more aversive when they anticipate more trials of the same task (Studies 2 through 6). Finally, women remember their last menstrual period as more painful when their next period is imminent (Study 7).

Our findings suggest that the anticipated return to the experience affects people's perception of the experience by activating a strategic bracing mechanism. More specifically, in anticipation of the unpleasant experience, people prepare for the worst by raising the remembered aversiveness of their previous exposure to that same experience. Although this bracing response adds to current distress by augmenting the dread of the upcoming experience, it may improve later well-being by creating a more favorable contrast between actual suffering and expected suffering. Consistent with this bracing account, we observed that the prospect of returning to an unpleasant experience affected participants' perception of that particular unpleasant experience but not of other similarly aversive experiences (Studies 3 through 6), and only if participants had sufficient time (Study 4) and self-regulatory resources (Study 5) to brace themselves for the upcoming experience. Furthermore, those people who reported more bracing in a very different context (e.g., for exam results) tended to remember the experience as more aversive, but only when they expected the experience to return (Study 6).

There are, of course, other psychological mechanisms that can contribute to an increase in perceived aversiveness of an experience when one expects to return to the experience. One such alternative process relies on the cold-to-hot empathy gap mentioned in the introduction (Loewenstein, 1996). Whereas people may generally fail to remember the true aversiveness of an experience because they are in a "cold" state afterwards, the dread caused by an anticipated

return to that experience may re-activate a “hot” state and make it easier for them to vividly imagine the aversiveness of the experience. Although this account certainly is plausible (especially in situations in which sufficient time has passed for participants to return to a cold state), it does not seem to explain the effects observed in the studies reported here. In particular, while the anticipation of any clearly aversive experience should be able to activate a hot state and make it easier for participants to fully recall the aversiveness of a past experience, we find that memory for past experiences is only affected by anticipation of the exact same experience (Studies 3 through 6). Furthermore, even though the activation of a hot state should occur quickly and automatically (Loewenstein, 1996), we observe that anticipation does not increase remembered aversiveness unless people have sufficient time (Study 4) and self-regulatory resources (Study 5).

Implications

The fact that people remember their previous experiences as having been more aversive when they anticipate continuing or repeating that experience has several important implications. First, this finding adds to our understanding of the malleability of people’s memory for their past appraisals. As early as Heider (1958), psychologists have known that people manipulate their memories. For instance, out of a desire to remain consistent over time, people tend to misremember their previous attitudes as more consistent with their present attitudes than they actually were (Bem & McConnell, 1970). More recently, people misremembered their appraisals of the infamous OJ Simpson trial as overly consistent with their current appraisals of the trial (Levine, Pohaska, Burgess, Ride, & Laulhere, 2001). The present research adds to this literature

by demonstrating another instance in which people alter their memory for their past appraisals—not to create the illusion of consistency, but rather to steel themselves against future harm.

The current research also adds a qualification to the substantial number of prior findings that people tend to remember their aversive experiences as less extreme than they actually were (e.g., Mitchel et al., 1997). Whereas the literature suggests that people may be easily tempted to repeat these experiences, the results reported here suggest that people may second-guess these temptations once they actively contemplate repeating the experience—since this contemplation may alter their memories and render them substantially less rosy. Furthermore, our results also allow some recommendations for ways to encourage people to re-engage in aversive experiences that are clearly beneficial, such as specific medical procedures (e.g., painful immunizations, mammograms, and invasive diagnostic tests such as colonoscopies). In light of our research, it may be advisable for medical practitioners to downplay the anticipation of the next procedure (e.g., your next shot) and instead focus on the completion of the first procedure (e.g., the shot you just had). In this way, patients are likely to remember the original experience as having been less aversive and are thus more likely to pre-commit to an often necessary follow up.

Questions and Limitations

Although our results strongly suggest that people who anticipate an unpleasant experience brace for the upcoming unpleasantness by remembering their prior exposure to that experience as more aversive (and thus prepare for the worst), our studies do not offer any evidence that remembering the experience as more unpleasant indeed leads to more pessimistic expectations about the upcoming experience. Whereas a positive relationship between

remembered aversiveness and expected aversiveness is almost trivial (given that the objective experience is identical), it would be interesting to compare expectations in the *More* conditions to those in the *Done* conditions. Unfortunately, that would imply comparisons between actual expectations and hypothetical expectations, which would differ for many reasons including different levels of construal (Trope & Liberman, 2003) and differential influence of lay beliefs (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Robinson & Clore, 2001, 2002).

Furthermore, perhaps more interesting than assessing the impact of the bracing process on the lowering of people's expectations, would be examining the next step in this causal chain: does bracing for the worst possible experience indeed limit people's distress during the actual experience? That question, however, will be left to future research.

As we mentioned earlier, people's memories of past aversive experiences tend to be overly 'rosy' (Mitchel et al., 1997), which may contribute to people's willingness to re-experience certain aversive experiences. However, the present findings indicate that, once people are expecting to re-engage in an experience, their memories actually become less rosy. This raises the question of whether bracing can undo the rosy view of memory and lead to *more accurate* memories. Some additional data we collected as part of Study 7 may shed some light on this question. In addition to asking women who were not experiencing their period how painful their last period was, we also asked the same pain related questions to women who were menstruating during the completion of the study, but in this case, we asked them about their current period rather than their last period. By using this actual (current) aversiveness as a baseline against which to compare other participants' remembered aversiveness, we can assess how the anticipation of the upcoming period affected the accuracy of participants' recollections. First, an ANCOVA on the pooled pain measure with the covariates listed above revealed that

women who were not menstruating remembered their last period as less painful ($M = 4.79$) relative to the pain reported by women who were currently menstruating ($M = 5.55$), $F(1, 484) = 12.90$, $p < .001$, suggesting that women tend to misremember their period as less painful than it actually was. However, in contrast to this general recall bias, the recollections of women for whom the next period was impending (i.e., less than three days away) were not different from the pain ratings of women who were actually menstruating, $F < 1$. These results suggest that, at least in the domain of menstruation, bracing for a returning unpleasant experience can counteract people's tendency to remember the unpleasant experience as less aversive than it actually was, resulting in a more accurate memory for the experience.

To examine the robustness of the observed effects, and to provide another test of the effect of bracing on the accuracy of people's perceptions, we conducted a second, very different field study with runners in New York City's Central Park. In this field study we asked 161 solo runners to indicate their level of aversiveness related to running up the most difficult part of the 6.1 mile running path that runs through the park, Harlem Hill. We either asked them before they got to the hill, when they were two thirds up the hill, or immediately after they finished the climb. A different sign was constructed for each of the three locations which asked runners to shout out their responses to one of the following questions (on a 5-point scale anchored by 1 = *Not Hard* and 5 = *Very Hard*): "How hard will it be to run up Harlem Hill?" (*More*), "Right now, how hard is it running up Harlem Hill? (*During*)", or "Just now, how hard was it running up Harlem Hill?" (*Done*)². Because of the time it takes to run the length of the loop in Central Park, no runners responded more than once at any point, and thus this was a between-subjects design.

This field study allowed us to make two critical comparisons. First, we can compare those runners who anticipate running up the hill (*More*) to those to those who have no more of

the hill to climb (*Done*). Second, we can compare both of these groups of runners to those who are engaged in running up the hill (*During*) in order to determine which group is more accurate, those who are about to run up the hill (and are thus bracing for the experience) or those who just completed running up the hill. A one-way ANOVA revealed a reliable main effect on aversiveness, $F(2, 158) = 7.83, p < .001$. First, we replicate the bracing effect in that those runners who were about to run up the hill (*More*; $M = 3.39$) thought that it would be more aversive than those runners who just completed running up the hill (*Done*; $M = 2.55$), $F(1, 158) = 14.98, p < .001$. Next, we can assess accuracy by comparing these two groups of runners to the group that was engaged in running up the hill. Consistent with the Study 7, we found that those bracing for the experience (*More*) reported aversiveness levels very similar to those who were actually engaged in the run of up the hill (*During*; $M = 3.13$), $F(1, 158) = 1.24, ns$. However, those who had completed running up the hill, misremembered the experience as having been less aversive than it actually was ($F(1, 158) = 6.43, p < .05$). Of course, an important assumption we make in interpreting these findings is that people in the *More* condition had previously run up the hill and could therefore rely on the remembered aversiveness of prior runs to judge the expected aversiveness of the upcoming run. Unfortunately, we could not verify this assumption with the runners who participated in our study. That said, to the extent that expectations are formed based on past experiences and to the extent that most of the runners in this field study had prior experience with Harlem Hill, these results suggest that, although our memory tends to offer a rosy view of our past aversive experiences, we may nevertheless remember their true aversiveness when we expect to relive them.

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Footnotes

1. It may seem surprising that such a disproportionately large number of women in our sample were experiencing their menstrual period, but it is less surprising when we consider that women were recruited for a study title “Menstruation Study.” It is easy to imagine that although the advertisement for the study clearly indicated that the only inclusion criteria was that the participant must be regularly menstruating, potential participants may have interpreted the name of the study to mean that they should only participate if they were currently mid-menstruation.
2. We decided on this simplified wording of questions and scale anchors to make sure the runners could easily process it while running.

Table 1

Field Study: Linear Regression on Remembered Pain

	Regression Coefficient	t-Statistic and Significance Level
Constant	4.09	$t = 3.57, p < .001$
Birth Control Dummy	-1.00	$t = -2.77, p < .01$
Trying to Get Pregnant Dummy	.45	$t = .36, ns$
Psychological Conditions Dummy	.04	$t = .08, ns$
Physiological Conditions Dummy	1.00	$t = 2.55, p < .05$
Medication Dummy	2.26	$t = 6.50, p < .001$
Tolerance for Pain	-.05	$t = -.64, ns$
Avg. Duration of Menstruation	.32	$t = 2.19, p < .05$
Age	-.03	$t = -1.48, ns$
Next Period (Days)	-.14	$t = -1.89, p = .06$
Next Period (Days) ²	.01	$t = 1.84, p = .07$

Figure Captions

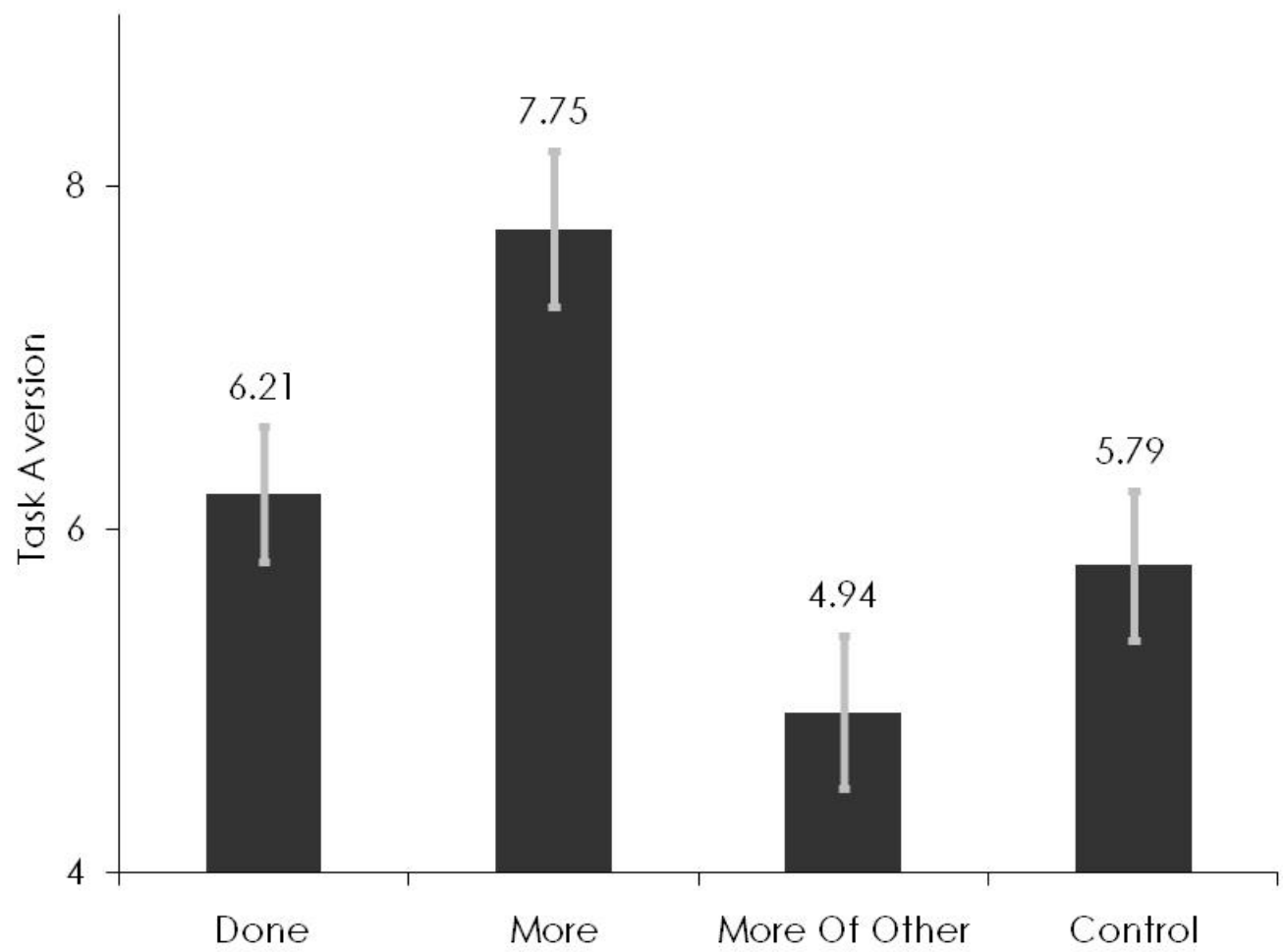
Figure 1: Study 3: Remembered Aversiveness

Figure 2: Study 4: Remembered Aversiveness

Figure 3: Study 5: Remembered Aversiveness

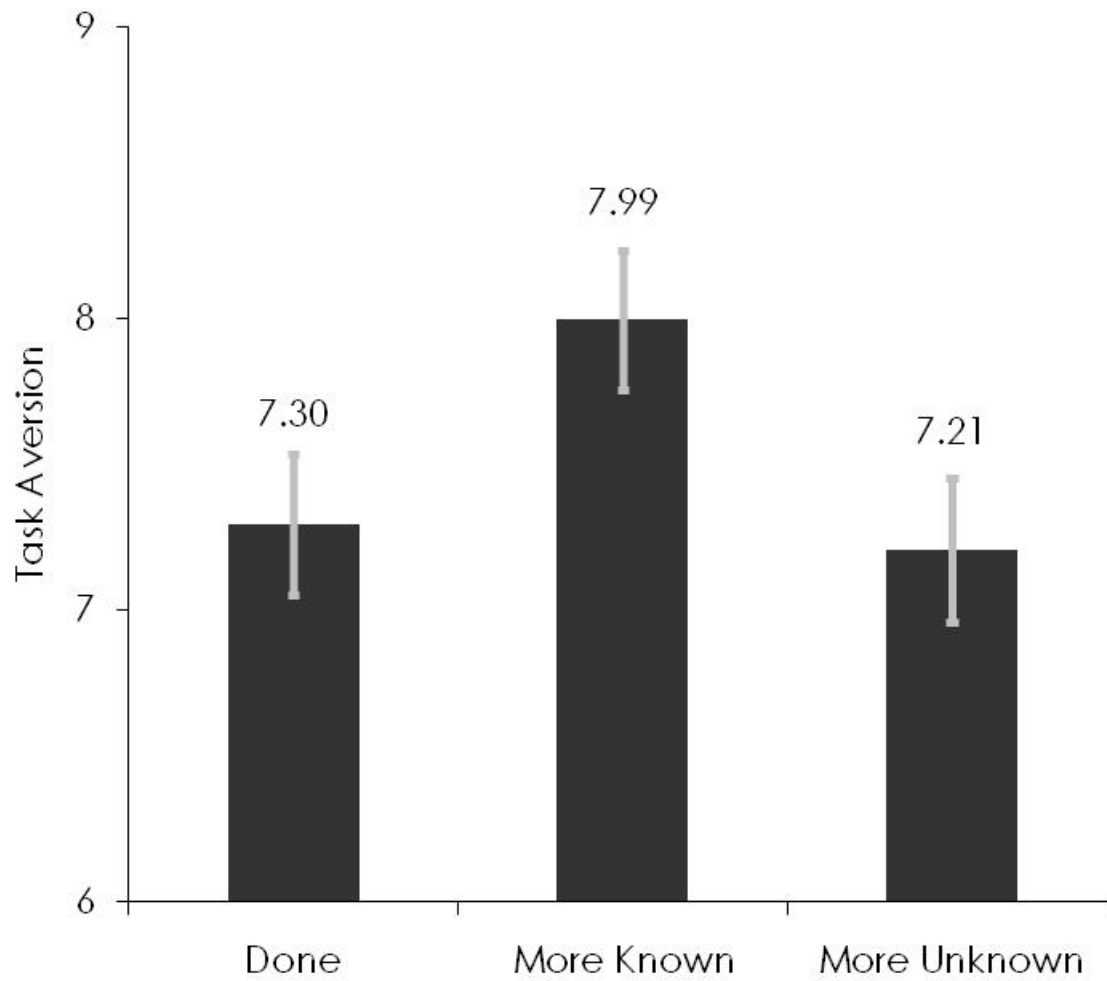
Figure 4: Field Study: Remembered Pain

Figure 1



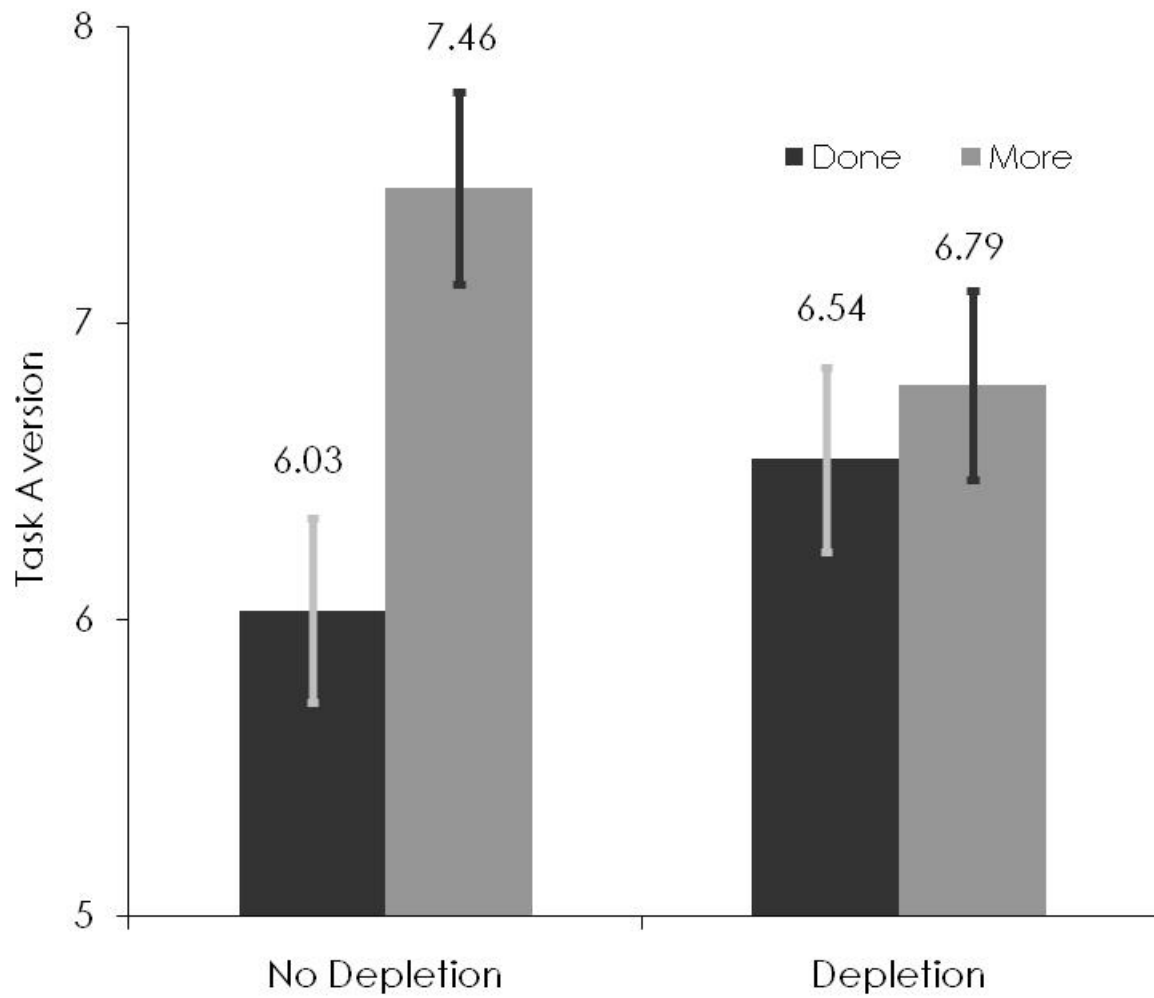
Note—Error bars represent standard errors.

Figure 2



Note—Error bars represent standard errors.

Figure 3



Note—Error bars represent standard errors.

Figure 4

