CHAPTER

12

Restoration Effects Following Depletion: Adventures in the Uncanny Resilience of Man

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One of the more intriguing aspects of mental depletion is its ubiquity; we can all relate to the experience of depletion in our professional and personal lives. As academics, we routinely feel depleted as we write journal articles (and book chapters!), develop grant proposals, review manuscripts, prepare talks, give lectures, and grade assignments. Furthermore, in spite of the obvious importance of these tasks, we collectively share in the consequences of this mental depletion. For instance, we are all familiar with the experience of realizing we have no memory of the last few pages we have been reading or of being unable to maintain a consistent train of thought—and we collectively label these ubiquitous experiences with such colorful phrases such as "my brain is fried" and "my mind is on strike."

How then do we respond when we become aware of this experience of mental depletion? In some situations, as when we are under a strict and imminent deadline, we may have to simply "push through" and attempt as best we can to maintain our productivity despite our depleted mental faculties. Indeed, despite the robustness of the deleterious effects of depletion on subsequent task performance, evidence suggests that with sufficient incentives and motivation, we can overcome the effects of mental depletion (Muraven & Slessareva, 2003), at least temporarily (Vohs, Baumeister, & Schmeichel, 2012).

More often, though, we simply feel the need to stop and take a break. That is, we decide that it would be in our best long-term interest to pursue

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efforts to rest and/or replenish our mental resources, as replenishment offers the potential to return to the task at hand with renewed focus and vigor. Thus, rather than trying to fight through the difficulties with concentration and mental fatigue resulting from depletion, we disengage from our current activity and seek out available means to restore our mental energy. Though seemingly straightforward, the process of mental restoration is much more complex than mere rest, food consumption, and/or sleep. Indeed, what has intrigued us and our collaborators for several years are the range of activities that people pursue to restore their mental resources (see Chapter 4 for further insights in factors that influence mental restoration).

In our earliest foray into this area of work, we gave students several scenarios in which they might experience mental fatigue and asked them to indicate what method or methods they would use to restore their mental energies and reengage in mental tasks. As might be expected, there were some obvious methods that respondents consensually believed would serve as effective mechanisms for mental restoration. For instance, respondents consistently referenced the use of caffeinated beverages (eg, coffee, soda, energy drink), with the logic that caffeine would provide a sufficient mental energy boost to both stave off mental fatigue and complete the task.

Similarly, the bulk of respondents indicated that a nap would be helpful. However, this consensual response was not without a considerable amount of variation. First, while many respondents raved about the effectiveness of naps for mental restoration, several directly stated doubts about their efficacy. For instance, some individuals believed that naps would leave them feeling even more tired and groggy than they were before the nap (and thus counterproductive for mental restoration). Second, even among the majority of those who indicated a nap would be helpful, we saw considerable variation in the duration of the nap that was deemed "optimal" for mental restoration. For instance, some reported 20 min as the optimal duration for replenishment, whereas others reported 60 min or longer.

Finally, there were activities for which respondents were unequivocally split. A prototypical example here was physical exercise (eg, going for a run, working out). Interestingly, though there were a considerable number of respondents who believed that exercise would rejuvenate their mental energy, an equal number of respondents believed that exercise would only exacerbate their mental fatigue by increasing their physical fatigue.

Thus, we witnessed certain activities for which there was clear consensus concerning their restorative potential. However, even with consensus, there were other activities where we witnessed immense diversity in respondents' beliefs about the optimal conditions for the activity to achieve restoration. Additionally, there were activities where respondents

were strongly divided to a point that the same activity was viewed as either productive or counterproductive for mental restoration. For us, then, these data were striking in that they illustrated the subjective nature of people's lay beliefs about the process of mental restoration and the means used to attain it.

THE UNDERLYING ROLE OF PERCEPTUAL PROCESSES

So far, we have illustrated the idiosyncratic nature of what devices individuals pursue to restore their mental energies. However, the choice of which solution will effectively achieve one's goal of restoration is only one facet of the problem; researchers must also consider how long one must engage in these activities to get the desired outcome. If I sleep too long, will it backfire on me and ruin me for the rest of the day? If I exercise too hard, will I end up mentally as well as physically drained? What is the correct dosage level for these activities to restore me back to my baseline level of mental energy?

While a full consideration of these issues is beyond the scope of the current chapter, this analysis highlights critical questions about the degree of introspective awareness we have about our own level of mental energy. In other words, how well can we assess our own level of mental depletion?

Early work on ego depletion found that people's ability to self-report their own level of depletion and mental fatigue was relatively mixed. Indeed, although it was commonplace for depletion studies to include manipulation checks following depletion manipulations, many studies failed to find reliable differences on these self-report measures, suggesting that people may not be very good at introspecting about their own depletion (cf. Baumeister, 2014; Hagger, Wood, Stiff, & Chatzisarantis, 2010). We should not find this result particularly surprising, given the wealth of evidence detailing people's limitations in accurately introspecting about their own attitudes and decision-making processes (Nisbett & Wilson, 1977; Wilson et al., 1993). Moreover, when it comes to reporting our own emotional states, there is plenty of research to show that we often misattribute the source of our emotional arousal to plausible extraneous causes like the weather (Schwarz & Clore, 1983), the lighting in the room (Gonzalez & Cooper, 1976), or are influenced by the responses of others around us (Hatfield, Cacioppo, & Rapson, 1993; Schachter & Singer, 1962).

Our early foray into this area of work centered on the role that perceptions play in driving our self-regulatory behavior. When someone says "you look tired," we tend to engage in biased hypothesis testing processes (Trope & Liberman, 1996) and can more often than not recruit evidence from memory that supports the current hypothesis (eg, did not sleep

well last night, worked out hard earlier in the day). However, given the same actual state of depletion, someone given the hypothesis that they look energized rather than tired can recruit evidence consistent with that hypothesis, resulting in a completely different assessment of their current level of mental energy. Thus, we argued that individuals' perceptions of depletion, independent of their actual level of depletion, should determine their subsequent self-control performance.

To test these predictions, Clarkson, Hirt, Jia, and Alexander (2010) manipulated participants' level of depletion using the "e-crossing" task (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Importantly, the passages used for the task were printed on yellow paper, and we later provided participants with feedback about the alleged effects of the yellow paper on their level of mental energy. Half of the participants were told that the yellow paper should make them feel energized and alert, whereas the other half were told that the same yellow paper should make them feel lethargic and tired. After the feedback manipulation, participants were asked to perform a self-control task, ranging from persistence at a multiple solution anagram to evaluation of a persuasive counterargument.

Our results consistently indicated that, independent of one's *actual level of depletion*, participants who perceived themselves to be depleted showed poorer subsequent performance than did participants who perceived themselves to be replenished. Importantly, those who had actually been depleted but could blame their depletion on the yellow paper (and thus could misattribute their depletion to an external cause) outperformed participants who had not been depleted but were told that the paper should make them feel lethargic and tired. Indeed, this work was also able to show that perceptions of depletion served as the critical mediator of these downstream performance consequences. Moreover, later work (Clarkson, Hirt, Chapman, & Jia, 2011) illustrated that these perceptions of depletion manipulations served to expand or contract participants' working memory capacity, a pivotal component for self-control performance that Schmeichel (2007) has shown to be profoundly affected by depletion (for a more detail discussion of this research, see Chapter 10).

EXPECTANCIES OF RESTORATION

Given that perceptions of depletion seemed to be so powerfully altered by our feedback manipulation, we then hypothesized that perceptions of recovery or replenishment should be similarly malleable. Consistent with this perspective, the depletion literature is replete with instances of manipulations that have been shown to enable previously depleted individuals to recover unavailable or otherwise inaccessible resources. For instance, research has illustrated that positive mood (Tice, Baumeister, Shmueli, &

Muraven, 2007), interpersonal power (DeWall, Baumeister, Mead, & Vohs, 2011), self-affirmation (Schmeichel & Vohs, 2009), and exposure to nature (Kaplan & Berman, 2010) only sample the factors shown to rapidly restore the subsequent performance of previously depleted individuals to a level commensurate with that of nondepleted controls.

These demonstrations of spontaneous resource recovery (SRR) are no doubt intriguing and certainly beg the question of the mechanism(s) responsible for these effects. In searching for explanations, researchers have posited (and at times demonstrated) a range of different physiological and psychological mechanisms for these results. Some of these mechanisms make intuitive sense. For instance, the idea that certain factors can heighten individuals' state of physiological arousal (Tice et al., 2007) or the manner in which the self-control task is construed (Schmeichel & Vohs, 2009) seem plausible. However, other mechanisms are less intuitive. For instance, blood glucose (Gailliott et al., 2007) has been thought to be a physiological correlate on depletion. Yet the amount of time necessary to metabolize glucose renders it implausible as the primary mechanism responsible for these instances of SRR. Moreover, recent studies have effectively challenged the validity of the glucose hypothesis (Beedie & Lane, 2012; Molden et al., 2012) and in doing so provide a motivational mechanism for the presence of SRR.

Notwithstanding the potential validity of any or all of these hypothesized mechanisms, we offer the possibility that expectancies derived from shared lay beliefs about the energetic consequences of these different manipulations may be a common mechanism at the root of these findings. Consistent with the work of Job, Dweck, and Walton (2010; see also Chapter 11), which has illustrated that lay theories of willpower moderate susceptibility to depletion effects, we argue that specific lay beliefs about the effects of specific experiences (eg, positive mood, interpersonal power) could serve as the basis for expectancies of their restorative consequences.

To address this possibility, we embarked on a series of studies to see whether people did in fact share consensual beliefs about the energetic effects of these SRR manipulations. This initial study explored four such inductions (ie, positive mood, interpersonal power, self-affirmation, and immersion in nature). Specifically, we asked participants to respond to a set of four questions ($\alpha = .95$) of the format "____ gives me more mental energy than normal." We found that there was considerable consensus among participants that positive mood, high power, and immersion in a natural setting reliably led to increased mental energy, whereas negative mood, low power, and immersion in an urban setting reliably led to decreased mental energy (see Table 12.1). The same pattern held true (albeit to a lesser—though still significant—extent) for self-affirmation. Thus, our initial results suggested that there was considerable agreement among

TABLE 12.1 Expectancy of Mental Energy Change as a Function of Spontaneous Resource Recovery Variable

Variable	Mean (SD)
Positive mood	7.33 (0.88)
Negative mood	3.69 (1.21)
High power	7.40 (1.84)
Low power	2.00 (1.41)
Self-affirmation	5.86 (1.57)
No affirmation	4.33 (1.37)
Natural setting	7.14 (1.56)
Urban setting	3.28 (1.93)

Note. Responses were given on a 9-pt scale ranging from 1 (Strongly disagree) to 9 (Strongly agree).

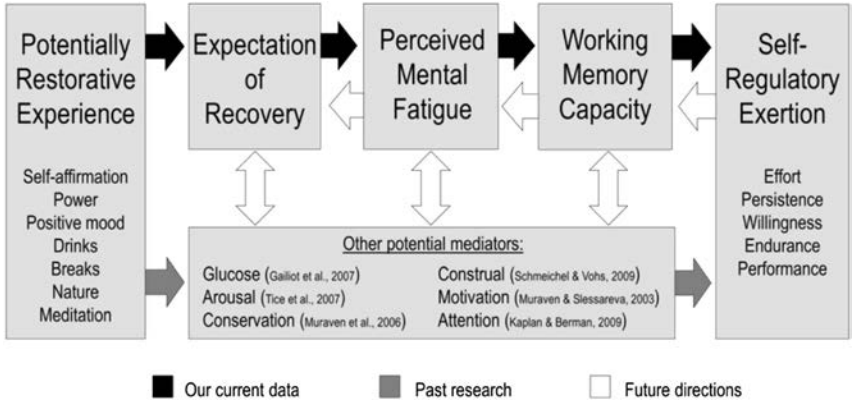

FIGURE 12.1 Model of spontaneous resource recovery.

individuals in their expectancies of the mental energy consequences of these variables critical to the emergence of (spontaneous) replenishment.

From this promising vantage point, we then sought to explicate our model of the SRR process (see Fig. 12.1). Building upon the past work by Clarkson et al. (2010), and Clarkson, Hirt, et al. (2011), we propose that these instances of spontaneous resource recovery are rooted in expectations of replenishment derived from lay beliefs about mental energy change. These expectations, in turn, should elicit a systematic influence on mental restoration. That is, depleted individuals who expect a particular experience to lead to mental restoration should subsequently experience a reduction in perceived mental fatigue or depletion. Moreover, as we have shown (Clarkson, Hirt, et al., 2011), lower perceived depletion

drives expansion of working memory capacity, which then culminates in improved subsequent self-regulatory performance. While our model does not (nor is intended to) preclude the potential contributions of other mediators, it serves to unify the litany of observed instances of SRR under a single umbrella, arguing that the effectiveness of these SRR experiences results at least in part from individuals' beliefs in their mentally restorative effects.

To explore the sequelae of our model, we embarked on a series of studies to elucidate the role of expectancies of recovery in documented instances of SRR. Given that we had already documented that people share consensual beliefs about the mental energetic consequences about these effects, our general approach in these investigations was to then replicate the SRR effect and index that these expectations of recovery lead to corresponding changes in perceptions of mental fatigue. From there, we examined the consequences of these changes in perceptions of depletion for both working memory capacity and self-regulatory performance.

THE RESTORATIVE EFFECT OF MOOD: THE ROLE OF EXPECTANCIES OF MENTAL ENERGY CHANGE

In one of the most well-cited instances of SRR, Tice et al. (2007) demonstrated that exposing depleted individuals to a positive mood induction can counteract depletion effects, restoring their performance on subsequent self-control tasks to a level commensurate with nondepleted controls. These authors posited that the general emotional arousal (Thayer, 1989) associated with positive mood may counteract the negative effects of depletion and lead to replenishment. However, recall that we found that individuals shared the consensual belief that positive mood led to increased mental energy, whereas negative mood led to decreased mental energy. Thus, in our initial test of our model, we examined the extent to which the restorative effects of positive mood can stem from individuals' expectancies about the restorative properties of positive mood (see Table 12.1).

Specifically, Egan, Clarkson, and Hirt (2015, Study 3) had participants complete a thought-listing task for 5 min in which they were allowed to think freely about anything they wanted, except for a white bear. This thought-suppression task, modeled after the famous work of Dan Wegner and his colleagues (Wegner, 1994; Wegner, Schneider, Carter, & White, 1987), has been shown in past work to successfully induce depletion given the self-control required to inhibit the unwanted thought (see Clarkson et al., 2010; Muraven, Tice, & Baumeister, 1998). Following this depletion induction, participants were given an autobiographical memory task in which they were asked to write about either a positive or negative emotional experience. This procedure has been used in past research to

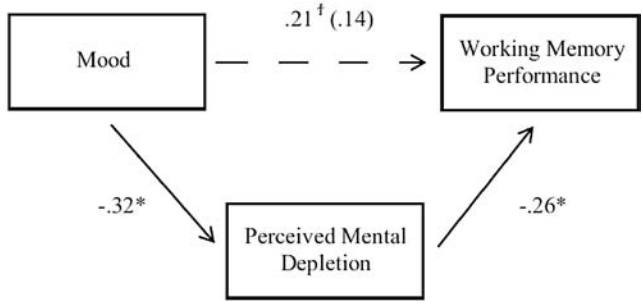

FIGURE 12.2 Path analysis of positive mood and working memory capacity through perceptions of mental fatigue. *Reproduced from Egan, P.M., Clarkson, J.J., & Hirt, E.R. (2015). Revisiting the restorative effects of positive mood: an expectancy-based approach to self-control restoration.* Journal of Experimental Social Psychology, 57, *87–99, Study 3.*

reliably induce changes in mood (Bless et al., 1996; Fishbach & Labroo, 2007; Schwarz & Clore, 1983). We then measured participants' perceived mental fatigue and their working memory capacity. In particular, we were interested in demonstrating whether the restorative effects of positive mood on working memory capacity were mediated by changes in perceptions of mental fatigue.

As predicted, inducing a positive mood reduced depleted participants' perceived mental fatigue, relative to negative mood participants. Interestingly, the amount of perceived mental fatigue of positive mood participants did not differ significantly from that of nondepleted control participants, whereas the perceived mental fatigue of negative mood participants remained at a level consistent with that of depleted control participants. Thus, the positive mood induction appeared to restore depleted participants back to their baseline level of mental energy. Furthermore, examination of the effects of our mood induction on working memory capacity revealed that positive mood participants showed enhanced working memory capacity compared to their negative mood counterparts. Again, the working memory capacity exhibited by positive mood participants was commensurate with the nondepleted controls, suggesting that the positive mood restored working memory capacity back to baseline. Finally, a test of the mediational role of perceived mental fatigue in the observed changes in working memory capacity as a function of mood indicated that perceptions did mediate these effects (see Fig. 12.2).

While these results were clearly quite promising, we sought a more stringent test of our model by directly manipulating participants' expectancies about the restorative effects of *positive* and *negative* mood. That is, if we could actually manipulate participants' lay beliefs about the effects of both mood states on mental energy (rather than rely on their own idiosyncratic

beliefs about the effects of these states), we could more confidently illustrate the causal role that these beliefs and expectancies play in SRR.

Of course, we wondered if these lay beliefs would be so firmly held that they would be relatively immune to experimental manipulation. However, past research has illustrated that lay beliefs can be successfully manipulated experimentally (Job et al., 2010; Molden & Dweck, 2006; Nussbaum & Dweck, 2008; Petrocelli, Clarkson, Tormala, & Hendrix, 2010). For instance, in Nussbaum and Dweck (2008, Study 1), participants were given a brief *Psychology Today*-style scientific article that either supported an entity or incremental theory of intelligence. The entity theory passage described research which reliably showed that "almost all of a person's intelligence is either inherited or determined at a very young age"; conversely, the incremental theory passage described parallel but opposite research which reliably showed that "intelligence can be increased substantially over the lifespan." Thus, based on past precedent, we were confident that we could devise similar passages to manipulate participants' beliefs about the restorative effects of positive and negative mood.

Indeed, in Egan et al. (2015, Study 4), we ambitiously attempted to orthogonally manipulate initially depleted participants' mood state and their mood-relevant expectancies. As in our earlier studies (see Egan et al., 2015), we manipulated mood via an autobiographical memory task in which they recalled either a positive or negative experience. The mood-relevant belief manipulation used passages modeled after those of Nussbaum and Dweck (2008). Specifically, half of the participants read a passage describing research that reliably showed positive mood is beneficial for mental energy (eg, it makes people optimistic, willing to explore their environment and take risks) whereas negative mood is detrimental to mental energy (eg, it makes people pessimistic, leads to rumination about past failures and transgressions). Conversely, the other half of participants read a passage describing research that reliably showed positive mood is detrimental to mental energy (eg, it makes people complacent, focusing only on maintaining and basking in their good mood, using low effort and heuristic strategies for decision-making) whereas negative mood is beneficial for mental energy (eg, it signals danger and threat, mobilizing resources aimed at problem solving and safety, using effortful and systematic processing strategies for decision-making).

Readers will note that these effects refer directly to actual research findings in the mood literature, and pretesting revealed that they were highly effective at manipulating participants' expectancies about the restorative consequences of either positive or negative mood (depending on condition). Armed with this potent expectancy manipulation, we sought to demonstrate the causal effect of these expectancies on perceived mental depletion, working memory capacity, and self-control performance (here, measured by performance on a multiple solution anagram task).

Importantly, we predicted that in the positive mood is restorative condition, we should replicate the findings of Tice et al. (2007) and our earlier study (Egan et al., 2015, Study 3), illustrating the restorative effects of positive mood. Negative mood, on the other hand, should not restore participants' mental energy back to baseline levels. Conversely, in the negative mood is restorative condition, we expected to find a complete reversal of these prior results, such that now negative mood should restore participants' mental energy back to baseline levels. Positive mood, on the other hand, should not restore participants since participants should hold the expectancy that positive mood is detrimental to mental energy.

Consistent with these hypotheses, we observed a significant interaction between mood state and expectancy condition for perceived mental fatigue. In short, when positive mood was expected to restore mental resources, the induction of a positive mood led to less mental fatigue than did the induction of a negative mood; however, the reverse pattern was illustrated when negative mood was expected to restore mental resources, as here the induction of a negative mood led to less mental fatigue than did the induction of a positive mood. These results are important as they demonstrate any psychological or physiological effects associated with positive mood are independent (or at least can be superseded by) the effect of individuals' expectations of restoration on mental fatigue.

Further examination of the implications of these changes in perceived mental depletion for working memory capacity and anagram performance revealed that the downstream consequences of our manipulations translated to self-control performance. Enhanced working memory capacity and anagram performance was observed for participants induced into a positive (versus negative) mood when positive mood was expected to be restorative. These findings directly replicated the results obtained in Egan et al. (2015, Study 3) and the anagram performance data are conceptually consistent with Tice et al. (2007). Nonetheless, these findings were reversed when negative mood was expected to restore mental resources, as those in the negative (as opposed to positive) mood condition now showed enhanced working memory capacity and anagram performance.

We believe that these findings provide strong support for our proposed model of SRR effects more broadly and the efficacy of expectancies about restorative experiences in particular. Indeed, participants who held the expectancy that positive mood is conducive to mental energy restoration displayed reduced perceptions of mental depletion following a positive mood induction. These changes in perceived depletion, in turn, led to enhanced working memory capacity, which could then be applied to a subsequent self-control task (resulting in better anagram performance). Moreover, recall this expectancy was consensually shared by participants in our initial exploration of the restorative expectancies associated with several experiences (Table 12.1). Indeed, the consistency of results across

the studies reported in Egan et al. (2015) provides a cogent rationale why the Tice et al. (2007) findings related to the restorative consequences of positive mood appear to be so robust.

However, when we manipulated participants' expectancies such that we led them to believe that negative (rather than positive) mood is restorative, we found that positive mood no longer displayed any restorative effects, whereas negative mood suddenly exhibited restorative consequences. Specifically, those who experienced a negative mood induction reported less mental fatigue than did those who experienced a positive mood induction—and these changes in perceptions of depletion resulted in corresponding reversals in working memory capacity and subsequent anagram performance. Through this expectancy perspective, then, we were able to not only eliminate the documented effects of positive mood for mental restoration but also demonstrate when negative mood can be beneficial for mental restoration. Indeed, although our initial results indicated that most individuals personally believe negative mood undermines mental restoration, we were able to show that these expectancies are both malleable and manipulable (eg, Job et al., 2010; Nussbaum & Dweck, 2008), such that we can directly observe the powerful role that these expectancies play in instances of SRR.

THE RESTORATIVE EFFECT OF INTERPERSONAL POWER: THE MODERATING INFLUENCE OF BELIEF STRENGTH

While we were pleased to find such strong and consistent support for our model in the case of the efficacy of positive mood as an avenue for SRR, we wanted to replicate these findings for other instances of SRR to establish the ubiquity of these effects. Thus, in our next set of studies, we embarked on an exploration of the restorative effects of interpersonal power. DeWall et al. (2011, Study 2) demonstrated that a power manipulation can successfully counteract the effects of depletion. In their research, they had participants complete an attention regulation task adapted from Gilbert, Pelham, and Krull (1988), in which they watched a video clip (without audio) of a woman being interviewed by an off-camera interviewer. While participants watched the interview, neutral words irrelevant to the interview were presented in the bottom corner of the screen. Participants were instructed to ignore the words and to direct their attention to the woman being interviewed. Thus, they had to exert self-control to regulate their attention. Following this depletion induction, DeWall et al. manipulated power by placing participants into either a high power (manager) or low power (subordinate) position on a group task, a procedure used successfully in past research on power (Anderson & Berdahl, 2002;

Galinsky, Gruenfeld, & Magee, 2003). Subsequent self-regulatory performance was measured using a dichotic listening task in which participants were asked to ignore the incoming information presented to their right ear and write down each word spoken in his or her left ear that contained the letters *m* or *p*.

These authors found that while depletion undermined the performance of low power participants, it had no effects on the performance of the high power participants. Thus, high power seemed to make participants immune to depletion effects. DeWall et al. (2011) posit that these effects might be due to either the increased motivation level of participants in the high power condition (a condition associated with greater action orientation, cf. Galinsky et al., 2003) or the tendency for high power to be associated with a higher, more abstract construal level (Fujita, Trope, Liberman, & Levin-Sagi, 2006; Lammers, Galinsky, Gordijn, & Otten, 2008; Magee & Smith, 2013). While power may indeed have these effects on participants, we would argue that the SRR effects of power may simply reflect the consensual expectancy that high power leads to increased mental energy. Thus, to test this hypothesis, we followed the approach we utilized in Egan et al. (2015) regarding the restorative effects of positive mood, but instead examined the role of expectancies about the energetic effects of interpersonal power.

Importantly, although we found that there was a considerable amount of consensus in people's lay beliefs about the energetic effects of conditions like positive mood, power, immersion in natural environments, and self-affirmation, we readily acknowledge that there is likely to be considerable variability in the ***strength*** with which these particular beliefs are held. For instance, the literature on attitude strength has highlighted the fact that there are individual differences in the degree to which particular attitudes are chronically accessible (Bargh, Bond, Lombardi, & Tota, 1986), held with greater extremity (Jarvis & Petty, 1996), and vary in their stability (see Krosnick & Petty, 1995). Thus, it seemed incredibly naïve of us to ignore the potential moderating influence of individual differences in belief strength as we moved forward in this line of research.

A perusal of the interpersonal power literature revealed a number of relevant individual difference variables that have been shown to moderate the effects of an experimental power manipulation, including power motivation (Magee & Langer, 2008), personal dominance (Maner & Mead, 2010), relationship orientation (Chen, Lee-Chai, & Bargh, 2001), dispositional anxiety (Maner, Gailliot, Menzel, & Kunstman, 2012), and approach/avoidance tendencies (Sassenberg, Ellemers, & Scheepers, 2012). However, the factor that served as the focus of our interpersonal power work has been social dominance orientation (*SDO*; Pratto, Sidanius, Stallworth, & Malle, 1994).

High SDO individuals legitimize status differential as a necessary part of society and effective group organization, and thus value powerful

social roles to a significantly greater extent than do low SDO individuals. Given high SDO individuals place greater value on interpersonal power, we hypothesized they might also have stronger and more stable (ie, less malleable) beliefs in the positive effects of power for mental energy. We further posited that these differences in belief strength would then translate into more pronounced SRR effects among high SDO individuals. Indeed, Maner et al. (2012) showed that low anxiety individuals expected power-inducing actions to be more rewarding than did high anxiety individuals. Furthermore, these expectancies then mediated the downstream effects of interpersonal power on such measures as greater willingness to take risks and greater sexual attraction to a partner. Thus, there seemed to be past precedent to the notion that expectancies based on individual difference variables might moderate the effects of interpersonal power on subsequent outcomes.

To address these hypotheses, we first sought to directly assess whether individual differences in SDO predicted expectancies about the restorative effects of interpersonal power. In an initial study (Egan & Hirt, Study 1), we assessed participants' level of SDO and then presented them with a series of power-inducing experiences (eg, being a leader) and power-reducing experiences (eg, following orders). Participants were asked to simply report their expectancies of mental energy change resulting from each experience [on a 1–7 scale anchored from 1 (very mentally depleting) to 7 (very mentally restorative)] as well as their confidence in these beliefs [again, on a 1–7 scale anchored at 1 (not at all confident) to 7 (extremely confident)].

Our results supported our intuitions and indicated that SDO significantly predicted participants' expectancies of power-inducing tasks, such that higher SDO scores were associated with stronger beliefs in the restorative potential of interpersonal power ($\beta = .41$, $p < .001$). In addition, SDO predicted participants' confidence in their expectancies regarding these power-inducing tasks, with higher SDO scores corresponding to increased confidence ($\beta = .23$, $p = .05$). Importantly, in this same study, we assessed participants' expectancies concerning the mental energy impact of several other experiences, including positive mood, self-affirmation, and consuming an energy drink, as well as their confidence in those expectancies. We found that SDO did not predict the expectancies or expectancy confidence in these other domains, suggesting that the relationship of SDO to our expectancy and confidence data was unique to power-relevant experiences and not simply a reflection of greater belief of strength or confidence (regardless of domain) on the part of high SDO individuals.

Given that high SDO participants appear to hold stronger expectancies that power restores mental energy, we then tested whether SDO moderates the SRR effects of power. Adopting a paradigm similar to Egan et al. (2015, Study 3), we first had all participants complete a standard depletion

task, and then exposed them to a power manipulation, in which they were assigned to assume the role of the leader (high power condition) or a follower (low power condition) on a joint task (cf. Galinsky et al., 2003). In this joint task, the leader and follower each independently answered a set of difficult problems (taken from the Culture Fair Intelligence Test; Cattell & Cattell, 1960), but the leader ultimately had the final say in terms of which response was given by the team. After this power manipulation, participants completed a perceived depletion measure and then performed a computerized Stroop task as our key index of subsequent self-control performance.

Regression analyses performed on the perceived depletion measure revealed a main effect of condition, such that the high power condition predicted less overall perceived depletion ($\beta = -.20$, $p = .06$). However, this main effect was qualified by an interaction between condition and our individual difference measure of SDO ($\beta = -.29$, $p = .01$). To interpret this interaction, we broke down participants into those high (+1 SD), medium (0 SD), and low (−1 SD) in SDO, and looked at the effects of the power manipulation for each group of participants. For high and medium SDO participants, higher power predicted less perceived depletion (high SDO $\beta = -.54$, $p = .001$; medium SDO $\beta = -.22$, $p = .03$). For low SDO participants, however, the power manipulation had no effect on perceived depletion ($\beta = .09$, ns). Indeed, a closer examination of these data revealed that for high SDO participants, not only did high power lead to a decrease in perceived depletion, but also low power led to an increase in perceived mental depletion. Clearly, then, these results suggest that the stronger expectancies held by individuals higher in SDO influenced their perceived level of depletion more robustly and intensely than it did for individuals lower in SDO.

Did these changes in perceived depletion then translate into differences in subsequent self-control performance? To address this question, we calculated a measure of Stroop performance by subtracting the mean response time on incongruent trials [in which the font color did not match the word name (eg, the word "red" printed in green font)] from the mean response time on the congruent trials [in which the font color matched the word name (eg, the word "red" printed in red font) using only trials for which the participant provided a correct response]. Past work in the depletion literature has often used such a measure of Stroop interference as an index of self-control performance (eg, Clarkson et al., 2015; Job et al., 2010; Webb & Sheeran, 2003), with lower scores reflecting better self-control performance. Paralleling the findings on our measure of perceived depletion, we found that high power predicted less Stroop interference ($\beta = -.22$, $p = .04$), nicely replicating and extending the findings obtained by DeWall et al. (2011). However, as we saw with the perceived depletion data, this effect was qualified by an interaction between

condition and SDO ($\beta = -.26$, $p = .01$), such that again it was only the high ($\beta = -.51$, $p = .001$) and medium ($\beta = -.24$, $p = .02$) who showed improved Stroop performance in the high power condition. No effect of power was observed among low SDO participants ($\beta = .04$, ns).

Finally, consistent with our model, mediational analyses performed on these data indicated that, as in Egan et al. (2015, Study 3) investigating the SRR effects of positive mood, the self-control performance differences observed as a function of the power manipulation and SDO were mediated by the changes in perceived depletion. Thus, it appears that the SRR effects of interpersonal power, like those of positive mood, are a consequence of the expectancies of mental energy change and the corresponding changes in perceived depletion that result from those expectancies. However, this particular investigation added another important wrinkle to that account, attesting to the role that individual differences play in the magnitude of these effects. Specifically, the present work powerfully showed that the SRR effects of interpersonal power only apply for high and medium SDO individuals, who hold stronger and more confident expectations about the beneficial aspects of power for mental energy.

While we were encouraged by these findings, we again sought to experimentally manipulate (rather than simply measure) expectancies of mental energy change concerning interpersonal power to demonstrate the robustness of expectancies in driving these effects. Thus, in Egan and Hirt (2015, Study 3), we followed a similar approach to that detailed earlier in Egan et al. (2015, Study 4) and orthogonally manipulated both power (high/low power condition) as well as expectancies toward power (high power is restorative/high power is depleting) to more thoroughly examine the role that expectancies play in these perceptual and performance-based consequences of mental restoration.

As in Egan et al. (2015, Study 4), all participants were first depleted and then given the power manipulation. In this study, we used a widely used experiential writing task (cf. Smith, Jostmann, Galinsky, & van Dijk, 2008) in which participants wrote for 5 min about an experience in which they either controlled one or more other people (high power condition), or were controlled by one or more other people (low power condition). Following the power manipulation, participants received the power-relevant expectancy manipulation, again modeled after Nussbaum and Dweck (2008).

Specifically, participants read a passage of information regarding recent research concerning power's effects. In the power is restorative version, participants read that high power has been shown to be associated with increased mental energy and improved cognitive performance, whereas low power is associated with decreased mental energy and diminished cognitive performance. In the power is depleting version, participants read the opposite—that high power is associated with decreased mental energy and diminished cognitive performance, whereas low power

is associated with increased mental energy and improved cognitive performance. Pretesting had again revealed that these passages were highly effective at manipulating participants' expectancies about the mental energetic consequences of high and low power.

Armed with this potent expectancy manipulation, we sought to demonstrate the causal effect of these expectancies on perceived mental depletion, working memory capacity, and self-control performance (here, measured by performance on a multiple solution anagram task: Baumeister et al., 1998; Egan, Hirt, & Karpen, 2012). Importantly, we predicted that in the power is restorative condition, we should replicate the findings of DeWall et al. (2011) and those of our earlier study (Egan & Hirt, 2015, Study 2), illustrating the restorative effects of high (but not low) power. Conversely, in the power is depleting condition, we again expected to see a reversal of the pattern observed in past studies, such that low (but not high) power should restore participants' mental energy back to baseline levels.

However, the intriguing question raised by Egan and Hirt (2015, Study 2) was whether this power expectancy manipulation would be equally effective for individuals at high and low levels of SDO. That is, would this situational manipulation be powerful enough to overwhelm and replace the strong expectancy between high power and mental restoration held by those high in SDO (Egan & Hirt, Study 1)? Although to our knowledge, past research has not directly explored the interaction between situationally induced and individual difference-based expectancies, the robustness of these situational manipulations would seem to imply that they should hold for individuals at all levels of this and other relevant personality dimensions. The present study hence provided us with an ideal opportunity to explore this potential interaction.

Looking first at the perceived depletion measure, we found the predicted two-way interaction between power and expectancy ($\beta = .25$, $p = .03$), such that when participants in the high power condition reported less mental depletion (ie, felt restored) when they were told that power is restorative rather than power is depleting. Conversely, when participants were in the low condition, they reported less mental depletion when they were told that power is depleting rather than restorative. Thus, our situational manipulation of power-relevant expectancy led to corresponding changes in perceived depletion among participants in response to the power manipulation. However, these findings were qualified by a significant three-way interaction between power, expectancy, and SDO ($\beta = -.29$, $p = .01$). As can be seen in Fig. 12.3 (top panel), the predicted interaction between power and expectancy only held for individuals who were low in SDO. That is, low SDO participants were sensitive to the expectancy manipulation and perceived their level of depletion in a manner that matched their expectancy. High SDO participants, on the other hand, were unaffected by the expectancy manipulation. Instead, they simply reported

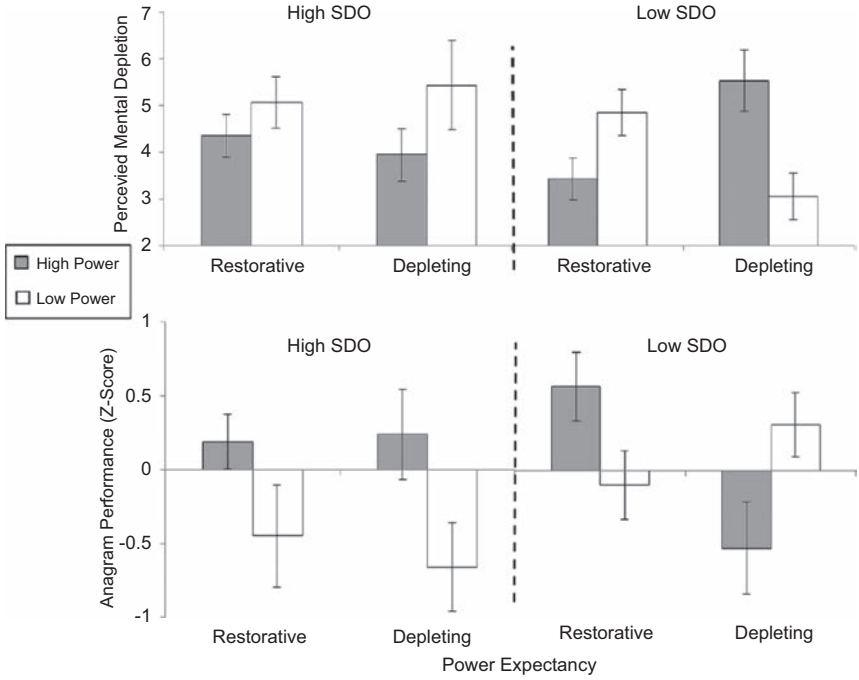

FIGURE 12.3 Perceptions of mental fatigue (top panel) and anagram performance (bottom panel) as a function of interpersonal power, expectancy, and social dominance orientation. *Reproduced from Egan, P.M., & Hirt, E.R. (2015). Flipping the switch: power, social dominance, and expectancies of mental energy change.* Personality & Social Psychology Bulletin, 41, *336–350, Study 3.*

less mental depletion in the high power condition, regardless of whether they were told that power is restorative or depleting.

This same pattern of results was revealed on the anagram measure, our key index of self-regulatory performance (see Fig. 12.3, bottom panel). Again, we found a significant two-way interaction between power and expectancy ($\beta = .23$, $p = .04$), with high power participants exhibiting better anagram performance when they read that power was restorative rather than depleting (the performance of low power participants was basically equivalent in the power is depleting and power is restorative conditions). However, we again obtained a three-way interaction between power, expectancy, and SDO ($\beta = -.21$, $p = .06$), which indicated that the expectancy manipulation only influenced the self-regulatory performance of the low SDO participants (see Fig. 12.1, bottom panel). The anagram performance of the high SDO participants was unaffected by the expectancy information; high SDO individuals consistently exhibited better anagram performance when in the high power than the low power condition.

Consistent with our model, this research provided supporting evidence for hypothesized role that expectancies of mental energy change play in the SRR effects of interpersonal power. By directly manipulating participants' expectancies about the restorative or depleting effects of power, we were able to illustrate corresponding changes not only in participants' perception of their own state of mental depletion, but also their subsequent self-regulatory performance. Importantly, as we found in our past studies, these performance differences were again mediated by changes in perceived depletion, attesting to their power of perception to drive the cognitive and behavioral sequelae associated with depletion (see Clarkson et al., 2010).

Nonetheless, while this research fits well within our model and nicely replicates the findings of Egan et al. (2015) regarding the SRR effects of positive mood, the findings adds a critical caveat to our model by highlighting the importance of belief strength as a moderator of SRR effects. That is, we found individual differences in the strength of participants' expectancies alter the magnitude of SRR effects. Specifically, high SDO individuals, shown to hold stronger and more confident beliefs about the restorative effects of interpersonal power, exhibited greater changes in perceived depletion and performance following a power manipulation. Furthermore, unlike their low SDO counterparts, these high SDO individuals were quite resistant to a situational manipulation of their expectancies.

How such individuals were able to counterargue and dismiss such a strong persuasive message is an interesting and important question for future research. It may be that these high SDO individuals have had more direct experience with high power situations, and direct experience has been shown to result in stronger and more accessible attitudes that are highly resistant to change (Fazio & Zanna, 1978). Alternatively, perhaps these individuals may be willing to admit that power may be depleting for others (after reading the power is depleting manipulation) but still staunchly defend the belief that in their own personal experience power has restorative effects for me (cf. Hendrix & Hirt, 2009)? Regardless of the mechanism by which these individuals are able to resist the situational manipulation, our work highlights an important boundary condition to the efficacy of these (and similar) expectancy manipulations (Egan et al., 2015; Job et al., 2010; Molden & Dweck, 2006; Nussbaum & Dweck, 2008).

EMERGING QUESTIONS

We believe that the present work provide nice support for our model of expectancy-based processes driving the SRR effects observed in the literature. As we noted earlier, many potential psychological and physiological mechanisms have been suggested to underlie various examples of these

SRR effects. While we would clearly agree that these mechanisms may play a contributing role in some of these cases, our evidence provides initial evidence that lay beliefs about mental energy change and the expectancies that derive from these beliefs are sufficient to produce SRR effects. To date, we have investigated two of these SRR variables (positive mood, interpersonal power) in detail, but we hypothesize that these same expectancy-based processes should be operative for any of the other SRR effects noted in the literature. Obviously, direct empirical testing of this hypothesis awaits future research. However, based on our model, we would further conjecture that these same processes can and should underlie the success of any other potentially restorative experience. Thus, we hope that this model can serve as a springboard for the exploration and identification of other heretofore unidentified variables that produce SRR effects.

Expectations of Restoration versus Exhaustion. The astute reader will note that our model denotes lay beliefs about mental energy *change* and the expectancies derived from them. Notably, changes in mental energy can be in the positive (restorative) or negative (depleting) direction. In the present work, we have focused primarily on positive changes in mental energy that result in the restoration of individuals' mental energy following depletion. Indeed, we initiated this line of work with the explicit purpose of understanding the role of perceptions in instances of SRR. However, it is important to point out that our model is far broader than this and encompasses instances of lay beliefs of negative (as well as positive) mental energy change. That is, such beliefs should result in expectations of depletion and the corresponding changes in (greater) perceived mental depletion, (impaired) working memory capacity, and (poorer) performance on subsequent self-regulatory tasks. In fact, we have found evidence of these same expectancy-based processes in the creation and maintenance of depletion with the feedback manipulation of Clarkson et al. (2010), as well as in the negative mood conditions of Egan et al. (2015) and the low power conditions of Egan and Hirt (2015) discussed earlier. Furthermore, our model could be further expanded to include other instance of depleting experiences, experiences already noted in the literature such as ostracism/social exclusion (Ciarocco, Sommer, & Baumeister, 2001) or thought/stereotype suppression (Macrae, Bodenhausen, Milne, & Jetten, 1994; Wegner et al., 1987), or ones that have yet to be identified and studied. Hence, we think that our model could prove useful in not only integrating and explaining documented instances of depletion and restoration effects, but also could be generative for the exploration of novel instances of these same phenomena.

The Impact of Awareness. One question that we have yet to address to this point is how conscious and aware people are of these effects. Indeed, we directly asked people about their lay beliefs of mental energy change and they seem to be quite able to self-report their beliefs and expectancies

accurately. But recall that we began the chapter by alluding to situations in which people perceive themselves to be depleted and actively choose activities that they believe will restore them. Such situations reflect not only that people can accurately self-report their beliefs and expectancies when queried, but actually access and utilize them when making choices about what activities to pursue when they are or are not feeling depleted. While we have yet to tackle this question directly, the work of Michelle vanDellen and her colleagues (vanDellen, Shah, Leander, Delose, & Bornstein, 2015) suggests that people are at least somewhat aware of the resource demands of various tasks during their day and actively plan their day according to the anticipated level of depletion at particular times of the day. Furthermore, Jia, Hirt, and Fishbach (2016; Chapter 8) find evidence that depletion serves as signal for individuals that their ability to complete future tasks may be compromises, and thus motivates counteractive control processes (Fishbach & Trope, 2007) to prioritize goal pursuit and redirect their limited resources toward their most important goal(s). As Carnevale and Fujita (Chapter 5) noted, individuals can and do engage in many types of proactive and/or efficient forms of self-control to successfully pursue their goals. Extrapolating from this work, we might surmise that people may in fact actively consult their lay beliefs and expectancies when depleted to select and pursue activities that might effectively restore them. These are questions that we hope to address in our future research efforts.

Expectancies or Placebos? Whenever we have talked about our model and its account for these SRR effects, one consistent comment that gets raised is whether our expectancy-based process reduces this phenomenon to another example of placebo effects. That is, we have known for decades that patient's expectancies about the efficacy of some treatment (eg, a sugar pill), even if it has no actual physiological effects, can seemingly produce observable positive physiological and behavioral outcomes (Colloca & Benedetti, 2005; Finniss, Kaptchuk, Miller, & Benedetti, 2010; Meissner et al., 2011; Morton, El-Deredy, Watson, & Jones, 2010; Stewart-Williams & Podd, 2004). For instance, restorative expectancies concerning a particular medical treatment predict analgesic responses rivaling direct physiological intervention (Aslaksen & Flaten, 2008; Morton et al., 2010). Furthermore, these types of expectancy effects are found across multiple domains, such as sleep recovery (Draganich & Erdal, 2014), cardiovascular improvement (Crum & Langer, 2007; Stoate, Wulf, & Lewthwaite, 2012), pain reduction (Kam-Hansen et al., 2014), and hunger satiation (Crum, Corbin, Brownell, & Salovey, 2011).

Certainly, our model and its predictions have some clear links to the work on placebo effects. Our work makes a compelling case that people's expectancies about the energetic effects of these SRR manipulations determine their efficacy. However, this observation does not preclude the possibility that these manipulations may and likely do have actual

physiological or psychological effects on their own. Thus, the extent to which these expectancies merely document the actual or perceived effects of these manipulations from an individual's own past experiences is clearly an important question that we must address. Indeed, the fact that high SDO participants illustrated resistance to the "power is depleting" expectancy manipulation in Egan and Hirt (2015, Study 3) suggests that individuals do relate a given expectancy to their own personal experience in determining whether they believe that particular expectancy applies to them. If there is a clear mismatch between their own experience and the implication of the manipulation, participants will not blindly accede to the manipulated expectancy, but will instead adhere to their own strongly held and confident beliefs. Thus, there seems to be a potentially complex interplay of processes that may determine the success of any particular expectancy induction in driving perceptions of depletion and subsequent changes in working memory capacity and/or self-regulatory behavior.

CODA

What do these perceptual effects mean for the dominant resource model of depletion? Collectively, our research suggests that independent of the actual amount of cognitive resources available to individuals, their perceptions of their state of depletion and/or restoration will determine their subsequent self-regulatory performance. As was true for the classic models of misattribution (Schachter & Singer, 1962), to the extent that people's perceptions of their state of depletion are accurate and isomorphic with their actual state of resource availability, our model makes similar predictions to the resource model. However, as we have seen from this research, there are many situations in which actual and perceived state of depletion and restoration diverge. Moreover, the inherent ambiguity of our internal state of mental energy affords the possibility that our expectancies will shape our interpretation of our own subjective experience. In this way, our model seems entirely consistent with Inzlicht and Schmeichel's (2012) process model, which posits that motivational and/or attentional shifts occur following depletion that drive subsequent self-regulatory behavior. Individuals' perceived amount of available resources are likely to determine both when the motivation to exert (Muraven & Slessareva, 2003) or conserve (Muraven, Shmueli, & Burkley, 2006) their self-control resources as well as the prioritization of those resources (Inzlicht & Schmeichel, 2012; see Chapters 18, 8). While the specific details of how these models interface awaits future research, we believe that the dynamic ways by which perceptions of mental energy guide self-regulatory behavior is an important lens by which we will be able to progress further in our understanding of the psychology of restoration.

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