HANDBOOK OF SELF-REGULATION

RESEARCH, THEORY, AND APPLICATIONS

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CHAPTER 10

Beyond Limited Resources

Self-Control Failure as the Product of Shifting Priorities

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For much of the history of psychology, psychologists have been trying to isolate that skill or ability that predicts important life outcomes such as academic achievement, job success, health, and criminality. For much of this time, the pinpointed factor was general intelligence, which indeed predicts a large array of positive life outcomes (Gottfredson & Deary, 2004; Moffitt, Gabrielli, Mednick, & Schulsinger, 1981; Neisser et al., 1996). More recently, researchers have discovered that self-control also confers many personal and societal benefits, often contributing to positive outcomes as much as or more than intelligence (e.g., Duckworth & Seligman, 2005; Moffitt et al., 2011). For example, self-control fosters the ability to stay on-task when our minds would rather wander; it allows people to restrain momentary desires to reach cherished long-term goals; and it allows groups of people to work together. In short, researchers have discovered that self-control sustains the "better angels" of our nature, allowing us to live the good life (Baumeister, Heatherton, & Tice, 1994; de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012).

DEFINING SELF-CONTROL

Self-control, known colloquially as "willpower" and related to executive function or cognitive control (Robinson, Schmeichel, & Inzlicht, 2010), refers to the mental processes that allow people to override thoughts, emotions, or behaviors that compete with their overarching goals (Baumeister, Vohs, & Tice, 2007). At its heart, self-control is instigated when a person faces a conflict between two competing desires or response tendencies—say, when an ex-smoker is conflicted by the desire to smoke; when a religious Jew is overpowered by the delightful smell of bacon; or even when a study participant is conflicted

between naming the color of a word and reading that word in a Stroop task. Such conflict is subjectively aversive (Saunders, Milyavskaya, & Inzlicht, 2015) and can lead people to inhibit or suppress one set of responses and replace them with the second set (Inzlicht, Bartholow, & Hirsh, 2015). Self-control is thought to be applied when people choose to inhibit their immediate desires (e.g., cigarette smoking, delightful bacon, word reading) and to replace them with behavior that is in line with their long-standing goals. Whereas some theorists have suggested that self-control can be effortless or automatic (de Ridder et al., 2012; Fujita, 2011; Gillebaart & de Ridder, 2015), in our view, effort is the hallmark of self-control, with more effortless varieties of restraint falling under the broader concept of self-regulation (Carver & Scheier, 1998).

Although the topic of self-control (and self-regulation) has been studied for quite some time—Walter Mischel's famous marshmallow studies, for example, were conducted in the 1960s and 1970s (Mischel, Ebbesen, & Raskoff Zeiss, 1972)—interest in self-control really began to take hold relatively recently. Figure 10.1 illustrates trends for academic publications on self-control from 1986 to 2014, and it clearly shows a spike of interest in the late 1990s and early 2000s. The timing of this spike was not haphazard—it coincided with (and was likely caused by) the arrival of a new and elegant theory by Roy Baumeister and his colleagues called the *resource* (or *strength*) *model of self-control* (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister et al., 1994; Baumeister & Heatherton, 1996; Muraven & Baumeister, 2000). The resource model captured the imagination of the field (and the lay public), and it should be credited with bringing to focus an important yet relatively neglected facet of mind.

One of the more striking things we have learned from the resource model is that self-control wanes over time, having an apparent refractory period (Baumeister & Heatherton, 1996; Hofmann, Vohs, & Baumeister, 2012; Muraven & Baumeister, 2000). According to the resource model, self-control is based on some finite resource or energy, such that effortful control has a natural limit, beyond which self-control can no longer be exerted as people find themselves in a state called *ego depletion* (Baumeister et al., 2007).

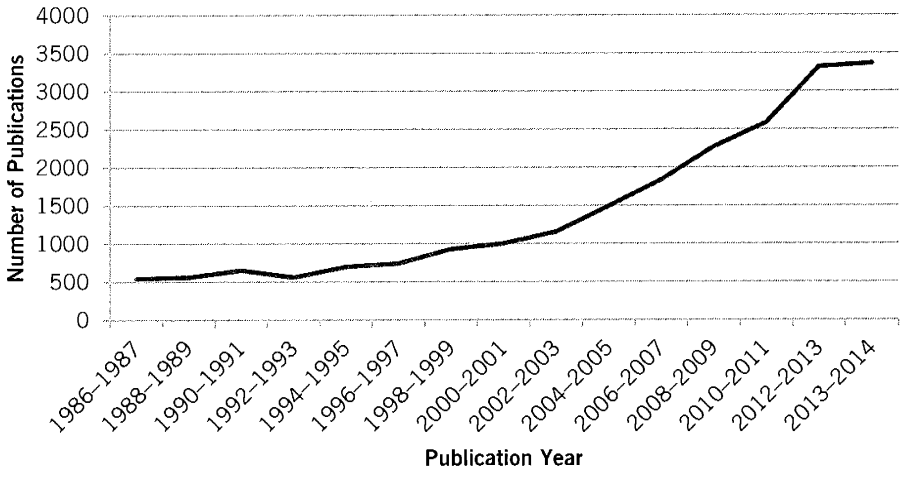

FIGURE 10.1. Self-control publication trends (1986–2014), based on PsycINFO search on March 6, 2015, for all publications using the term *self-control* or *self-regulation* in any search field.

Despite the prominence of the resource model, a precise understanding of how and why self-control wanes over time has been slow to develop, and it is clear that more theoretical and empirical work is needed (Inzlicht & Schmeichel, 2012). Here, we review the resource model of self-control and explore a number of empirical findings that are hard to reconcile with it. In commenting on the resource model, we review an alternative model that has little to do with resources and more to do with shifting priorities and motivations (Inzlicht, Schmeichel, & Macrae, 2014). According to this alternative, self-control wanes over time not because people become *unable* to restrain themselves, but because they are *unwilling* to restrain themselves, choosing to indulge in more leisurely pursuits instead.

The Resource Model of Self-Control

The original resource model of self-control suggests that self-control is based on a kind of fuel that powers the will (Baumeister et al., 1998; Baumeister & Heatherton, 1996; Muraven & Baumeister, 2000). This model made two major claims. First, self-control is claimed to draw upon a shared, central resource that underlies a vast array of behaviors. Although, on their surface, many behaviors appear different—snacking on carrots instead of chips, staying calm when hearing bad news, or saving money instead of spending impulsively—deep down they all involve the inhibition of some pressing urge or impulse. Whereas the idea that self-control is domain-general has not been controversial among social psychologists (e.g., Cohen & Lieberman, 2010), this idea in not without detractors, with some theorists suggesting that control might be domain-specific (e.g., Egner, 2008). It is nonetheless fair to say that there is a fair degree of consensus concerning the centrality of self-control for numerous behaviors.

The second major claim of the original resource model is that self-control is based on a limited resource or fuel that is consumed by use: "Self-control seems to rely on a limited energy or strength, such that engaging in a single act of self-control impairs subsequent attempts at self-control, as if some sort of energy had been used up during the initial act" (Gailliot et al., 2007, p. 325). Self-control, according to the resource model, "is best understood as a limited resource that becomes drained with use" (Vohs, Baumeister, & Schmeichel, 2012, p. 943). Engaging self-control is "followed by a period of scarcity, until [the resource] builds up again" (Muraven, Tice, & Baumeister, 1998, p. 775). In short, after initial acts of effortful control, people's "capacity to exercise further self-control becomes exhausted, leading to decreased performance on subsequent acts of self-control (Hagger, Wood, Stiff, & Chatzisarantis, 2010, p. 496). This model is thought to explain why people tend to eat junk food and sit on the couch after a long day—their self-control fuel is depleted and they simply cannot control themselves any more. To be clear, although more recent versions of the model have revised the strong version of this claim (Baumeister, 2014; see below), the original claim was that self-control wanes over time because self-control resources have become depleted or "spent" (Vohs & Faber, 2007, p. 537).

The main evidence in support of the limited resource model of self-control comes from studies using the sequential task paradigm, whereby exerting effortful control at time 1 impairs self-control performance on a different task at time 2. A meta-analysis of studies published between 1998 and April 2009 revealed that nearly 200 separate studies had used the sequential task paradigm (Hagger et al., 2010). Many more sequential

task studies have been conducted since then. All of these studies suggest that self-control wanes over time (however, see Carter & McCullough, 2014). For example, writing an essay while restricting one's use of certain common letters makes it more difficult to maintain items in working memory, tell the truth, act ethically, and learn simple categorization rules (Gino, Schweitzer, Mead, & Ariely, 2011; Mead, Baumeister, Gino, Schweitzer, & Ariely, 2009; Minda & Rabi, 2015; Schmeichel, 2007).

The sequential task paradigm has been used not only to demonstrate that self-control wanes over time but also to persuade researchers that self-control is limited and relies on a finite resource; that is, despite the fact that the sequential task paradigm remains silent about the precise processes that underlie self-control's refractory period—after all, self-control could wane at time 2 after effortful control at time 1 for a whole host of reasons (Hagger et al., 2010)—researchers have nonetheless concluded from it that self-control is based on a limited resource. To date, however, studies scrutinizing the precise processes via which self-control failure in the sequential task paradigm comes about have been lacking (Inzlicht & Schmeichel, 2012). It is possible that self-control wanes after initial exertion, but for reasons that have little to do with depleted resources.

The primary exception to the paucity of process evidence is research on glucose. In a highly influential paper Gailliot and colleagues (2007) found evidence to suggest that the resource powering the will is not some metaphorical entity but is in fact a simple carbohydrate circulating in the bloodstream that supplies energy to the body and brain, namely, glucose. The studies reported by Gailliot and colleagues supported three important ideas: (1) Self-control exertion leads to measurable drops in circulating blood glucose; (2) blood glucose covaries with and predicts self-control performance; and (3) ingestion of glucose-laden beverages can boost self-control. In combination, these three ideas provide powerful support for the resource model. The reason that self-control wanes after initial bouts of effort is that glucose levels have been depleted. In other words, effortful control literally depletes an essential physical resource that is finite in nature.

The resource model was a real advance in understanding the psychology of self-control. It taught us a number of new things about self-control: Appreciating self-control as a central skill, critical for many life domains, was a real innovation, and recognizing that self-control has a refractory period, waning slowly over time, was a legitimate breakthrough. It is no wonder, then, that the resource model has crossed disciplinary boundaries and is discussed not only in social psychology but also in cognitive psychology and human neuroscience (Heatherton & Wagner, 2011; Persson, Larsson, & Reuter-Lorenz, 2013; Shamosh & Gray, 2007), behavioral economics (Gino et al., 2011), and organizational/consumer behavior (Fennis, Janssen, & Vohs, 2009; Vohs & Faber, 2007). In brief, the resource model captured the imagination of more than a few fields and can be credited with changing the way we think of important societal issues, including, to name only one, intergroup interactions (Apfelbaum & Sommers, 2009; Inzlicht & Kang, 2010; Richeson & Shelton, 2003).

THE REVISED RESOURCE MODEL

Despite the smashing success of the original resource model, it became clear that the model needed to be updated and revised. A few studies, in particular, led resource theorists to revise the model by suggesting that complete resource depletion or exhaustion is

rare, with most instances of ego depletion reflecting only partial and temporary depletion (Baumeister & Vohs, 2007). Ego depletion, in other words, "does not mean that the brain has run out of fuel, as was first proposed" (Baumeister, 2014, p. 314). Instead, the revised resource model suggests that effortful self-control does not fully drain self-control resources until they are exhausted and spent; rather, effortful control is now thought to deplete the resource only partially and only slightly (Baumeister, 2014).

The first studies that led to this revision found evidence that motivational incentives could overturn the typical ego depletion effect. For example, people who were depleted by exertion on an initial task were able to control themselves effectively on a subsequent task if they were offered cash or interpersonal incentives for doing so (Muraven & Slessareva, 2003; see also Moller, Deci, & Ryan, 2006). If self-control resources are completely drained, it is difficult to understand how motivations (or any other sort of psychological stimulants) could possibly have an effect. Hence, a model based on the complete exhaustion of a resource is implausible, justifying the need for a revision to the model, whereby resources are only partly diminished. With this modification, people in a state of ego depletion can still control themselves if they are sufficiently motivated, such as when an important situation arises (Baumeister, 2014).

One powerful motive that is thought to drive how people behave after effortful control is the motive to conserve energy (Baumeister & Vohs, 2007). People are thought to withdraw effort in order to save their energy for some future pressing need or opportunity. Support for conservation of effort comes from evidence that whereas exertion at time 1 can lead to poor self-control at time 2, it leads to even poorer self-control when people expect to perform an additional important task at time 3 (Muraven, Shmueli, & Burkley, 2006). The anticipation of further effort leads people to restrain their current effort (and performance), presumably so that they have enough energy left over to perform the anticipated third task. In short, the revised resource model suggests that effortful control leads to ego depletion because people desire to conserve their limited energy stores.

Theoretical Problems with the Resource Model

The revised resource model was an important acknowledgment of some of the shortcomings of the original perspective on limited resources for self-control. The major advance, in our view, was the recognition that the ego depletion effect does not reflect an inability to exercise self-control, but rather reveals a motivated decision not to exercise further self-control without good reason. In this section, we take a more in-depth look at three thorny issues for the resource model before reviewing the process-based model of ego depletion.

What Is the Resource?

The first problem with the resource model is the inability to specify a *plausible* resource that fuels the will. Although there was much excitement about glucose as the physical resource that powers self-control (Gailliot et al., 2007), the glucose findings have proven to be controversial and have been challenged on multiple grounds (Kurzban, 2010; Schimmack, 2012).

First, the idea that self-control can consume inordinate amounts of brain glucose is biologically implausible (Kurzban, 2010). Studies using positron emission tomography, which directly measures localized changes in brain glucose metabolism, suggest that specific mental activities cause a local increase in glucose utilization of no more than 1% above resting levels (Raichle & Mintun, 2006). Mental effort, in other words, consumes very little brain glucose, and the little that it does use is readily circulating in the brain (Hockey, 2013). Confirming this implausibility, a series of experiments assessing carbohydrate metabolization with highly precise measurements repeatedly failed to replicate the finding that exerting self-control reduces levels of blood glucose (Molden et al., 2012).

In short, if exerting self-control does not reliably reduce blood glucose levels, then the idea that glucose is the physical manifestation of the metaphorical resource is in doubt. Revisions of the resource model have adapted to these facts, with new recognition that self-control failure is unlikely to be caused by shortages of blood glucose (Baumeister, 2014). Self-control may nevertheless operate, based on some limited inner resource, but the resource must be something other than glucose. The identity of the resource therefore remains unknown, leading us to wonder whether there is, in fact, a literal resource that powers the will.

Resource-Incompatible Findings

The second intractable problem with the resource perspective concerns findings that are incompatible with a resource account. These findings strain the necessity of a resource concept to explain self-control's refractory period (Inzlicht et al., 2014; Navon, 1984). The growing numbers of incompatible findings are of three varieties. The first variety reveals that self-control can be improved—not diminished—when other self-control tasks are performed in tandem; the second indicates that depletion can be moderated by subjective perceptions and construals; and the third shows that depletion effects can be overcome when some sort of rewarding activity is performed between the two tasks of the sequential task paradigm.

The first variety of resource-incompatible findings comes from provocative new work on the propagation of self-control, which indicates that self-control can be improved when a person performs multiple self-control tasks at the same time (Tuk, Zhang, & Sweldens, 2015; see also Tuk, Trampe, & Warlop, 2011). In one study, for example, participants performed better on a Stroop task, a canonical measure of attentional control, if at the same time they were asked to inhibit their desire to eat tasty potato chips; when they were free to eat as many chips as they liked, in contrast, their Stroop performance suffered (Tuk et al., 2015, Study 5). In another study, participants were successful at curbing their desire to eat potato chips when at the same time they were asked to avoid looking at words popping up on a video of a women being interviewed; yet they were less successful at curbing their appetites and ate more chips when their attention was free to roam on the salient words in the video (Tuk et al., 2015, Study 4). In short, self-control begets more self-control, at least when engaged concurrently. These findings are also broadly consistent with work on learned industriousness (Converse & Deshon, 2009) and conflict adaptation (Gratton, Coles, & Donchin, 1992; Kleiman, Hassin, & Trope, 2014), whereby short bouts of control have been found to induce mindsets that are conducive to further self-control success.

These sorts of studies are hard to reconcile with a resource account. If self-control truly relies on some limited, slowly replenishing resource that becomes depleted (even partially) after use, then it is difficult to understand how simultaneous acts of self-control can be successful. If self-control resources are consumed with use, or even if they are hoarded for some future pressing need, then how can more demands on this resource produce better control than fewer demands? Increasing the demands on a limited resource should make self-control less likely to succeed, not more. One solution is to conceive of self-control as not being bound to resources, but instead as being based on preferences for and willingness to exert effort (Inzlicht et al., 2014), which might wax and wane based on factors like habituation (Converse & Deshon, 2009) and labor-leisure tradeoffs (Kool & Botvinick, 2014).

The second variety of resource-incompatible findings comes from research showing that changing perceptions and construals can counteract ego depletion. For example, when people perceive themselves as being depleted despite not having engaged in previous cognitive work, they exhibit poor self-control; conversely, when people perceive themselves as having lots of energy and stamina, they show fully intact self-control (Clarkson, Hirt, Jia, & Alexander, 2010). Subjective perceptions of depletion and vitality, then, appear to drive self-control outcomes, although it is important to note that subjective perceptions are driven both by information from the environment and the actual application of effort. Similarly, lay theories about how self-control works and beliefs about whether it is based on a limited resource shape self-control (Job, Dweck, & Walton, 2010). When people believe that self-control wanes over time, they show typical depletion effects; however, when they believe that self-control is renewable, they show no noticeable drops in self-control over time. Furthermore, research suggests that the construal of effort itself can determine whether effort leads to depletion. When people construe an effortful activity as work, they tend to show subsequent failures in control; when they construe the same task as fun and enjoyable, they tend not to show these deficits (Laran & Janiszewski, 2011; Werle, Wansink, & Payne, 2015).

As with the research on the propagation of control, it is difficult to reconcile these studies with the resource model. If self-control fails because of the limits imposed by a real physical resource, then how can subjective perceptions and construals make a difference? According to the revised resource model, people consume some of their self-control resources as they exert themselves, after which they withhold subsequent effort to conserve these real, biologically based resources. Presumably, actual effort depletes actual resources, thereby limiting the further willingness to control. But the previously discussed research makes clear that even the illusion of being depleted can limit self-control (Clarkson et al., 2010), which suggests that the consumption of some physical resource is not needed to explain ego depletion, and that models based on easily shifting priorities and choices may suffice (Inzlicht et al., 2014; Kurzban, Duckworth, Kable, & Myers, 2013).

The third variety of resource-incompatible findings comes from work showing that self-control can be overturned by motivational incentives. We have already discussed how incentivizing self-control can knock out ego depletion (Moller et al., 2006; Muraven & Slessareva, 2003). Whereas this pattern is problematic for the original resource model, it is less problematic for the updated resource model, which makes clear that resources are typically only slightly depleted, allowing people to draw on their reserves and control themselves effectively when they are motivated to do so (Baumeister, 2014).

More problematic, however, is the increasing number of studies showing that the depleting effects of initial bouts of effortful control are undone by additional inputs and incentives (Masicampo, Martin, & Anderson, 2014). For example, in one remarkable study, if depleted smokers smoked one cigarette in the minutes after their initial round of effortful control, they showed no measurable downstream effects on subsequent control; smokers who were not given the opportunity to smoke between the time 1 and time 2 tasks showed the typical self-control decrements characteristic of ego depletion (Heckman, Ditre, & Brandon, 2012). Smoking, in other words, undermines depletion (at least for smokers). Nearly 40 studies in total have documented similar effects (Masicampo et al., 2014). Thus, watching a favorite television program (Derrick, 2013), receiving a surprise gift (Tice, Baumeister, Shmueli, & Muraven, 2007), affirming a core personal value (Schmeichel & Vohs, 2009), gargling with sugar (Hagger & Chatzisarantis, 2013; Molden et al., 2012), briefly meditating (Yusainy & Lawrence, 2015), and even praying (Friese & Wänke, 2014) have all been found to counteract the typical ego depletion effect.

These sorts of studies are hard to reconcile with the resource model, even with the revised resource model. If depletion is due to people withholding effort in a bid to conserve their limited energies, applying effort only when an important situation arises (Baumeister, 2014), then it is hard to understand how bouts of pleasure and gratification can reverse this depletion. Smoking a cigarette is not likely to make some mundane mirror tracing task any more meaningful or enjoyable (Heckman et al., 2012), and praying does not transform a Stroop task into something more pressing and important (Friese & Wänke, 2014). If smoking and praying do not transform tasks to become personally meaningful and important, how do they overturn depletion? In brief, if people are only willing to use their resources on meaningful and important things, it is difficult to understand why people would squander them on tasks that have neither of these qualities. What smoking and praying do accomplish, however, is to offset initial mental effort and cognitive work, thereby increasing people's willingness to engage in further work (Kool & Botvinick, 2014). This change in willingness has little do with conserving limited resources, and more to do with being rewarded and feeling appreciated for one's time and effort (Muraven, Gagné, & Rosman, 2008).

In our view, self-control failure has little to do with resources being fully or partially depleted. Instead, we suggest that it has to do with willingness and motivation to apply effort, with this willingness declining over time (Inzlicht et al., 2014; Inzlicht & Schmeichel, 2012). Willingness to apply effort does not always decline, however, and it can wax and wane depending on countervailing incentives (Kool, McGuire, Rosen, & Botvinick, 2010), construal of effort (Laran & Janiszewski, 2011), and adaptation to effort (Dang, Dewitte, Mao, Xiao, & Shi, 2013; Dewitte, Bruyneel, & Geyskens, 2009).

The Process Model: Depletion as Shifting Priorities

The process model of self-control failure—which may be more descriptively called the *shifting priorities model*—integrates research from multiple areas, including work on the aversiveness of control (Botvinick, 2007; Inzlicht et al., 2015; Kool et al., 2010), the opportunity cost model of effort (Kurzban et al., 2013), and the psychology of fatigue (Hockey, 2013). In our view, self-control is not that special; it is not based on some exceptional ability to power through adversity. Instead, we agree with others who liken

self-control to a decision to engage in one course of action over another (Hare, Camerer, & Rangel, 2009; Kurzban et al., 2013; Sullivan, Hutcherson, Harris, & Rangel, 2015). Crucially, decisions about which action or goal to pursue, like many other decisions, are based on factors such as the perceived effort of the action (Kool et al., 2010), opportunity costs for committing to the action (Kurzban et al., 2013), and the dynamically changing value of the action (Kool & Botvinick, 2014).

The model first attempts to address *why* self-control wanes over time. We propose that this temporal dynamic was evolutionarily selected to solve a recurrent problem in animal life (Tooby & Cosmides, 1992): the problem of balancing the needs for exploitation versus exploration, whereby the value of exploiting established sources of reward is pitted against the utility of exploring the environment for other opportunities (Cohen, McClure, & Yu, 2007; Tooby & Cosmides, 2005). Balancing this trade-off involves regulating the extent to which one favors task engagement (exploitation) versus task disengagement (exploration). Knowing when to persevere and when to change course is a balancing act—if the appropriate balance is not maintained, organisms may expend too much effort for too little reward or prematurely give up on an endeavor before some large payoff. The point here is that natural selection would have favored adaptations that minimize opportunity costs caused by a poor decision about whether to engage or to disengage from a task (Kurzban et al., 2013). One such adaptation is making effortful control aversive, so that it has inherent disutility (Kool et al., 2010).

Because effortful control is aversive, people not only tend to avoid it but also their desire to avoid it increases the more time they are engaged in effortful control (Kool & Botvinick, 2014). In other words, the inherent disutility of working to control one's responses accumulates the more one has already engaged in work. This is another way of saying that people increasingly prefer rest and leisure after engaging in effortful control and labor.

From this perspective, self-control's refractory period may be the motivated switching of task priorities, wherein all forms of mental effort become increasingly aversive, making mental leisure increasingly attractive (Job, Bernecker, Miketta, & Friese, 2015). What this means is that depletion may not be about some finite resource being exhausted, but about people's preferences and priorities changing. Specifically, initial bouts of effort may lead people subsequently to prefer engaging in "want-to" goals as opposed to "have-to" goals (Inzlicht et al., 2014); that is, people may experience a shift in motivation away from "have-to" or "ought-to" goals, which are carried out through a sense of obligation and duty, and instead come to prefer "want-to" goals, which are fun, personally enjoyable, and meaningful (Ryan & Deci, 2000; see also Milkman, Rogers, & Bazerman, 2008). Although this motivational shift was originally conceived as primarily influencing subsequent attention (Inzlicht & Schmeichel, 2012) or subsequent attention and emotion (Inzlicht et al., 2014), it likely affects all information-processing modalities (e.g., perception, memory, attention, emotion) given motivation's far reach (Touré-Tillery & Fishbach, 2014). Thus, depletion may affect not only effortful control but also what people pay attention to in their environment, as well as how they perceive, remember, and emotionally react to it (e.g., Schmeichel, Harmon-Jones, & Harmon-Jones, 2010).

Without some countervailing reward to offset the increasing aversiveness of work, people prefer to engage in activities they find more pleasurable (Inzlicht et al., 2014). Thus, self-control can be seen as the product of multiple inputs that either increase or decrease the value of engaging effortful control. Effort appears to have inherent disutility—that

is, effort itself is aversive—but this disutility can be countered by additional sources of value that may lead someone to decide to engage in effortful control, including being self-affirmed (Schmeichel & Vohs, 2009), gargling with sugar (Molden et al., 2012), smoking a cigarette (Heckman et al., 2012), or getting the opportunity to meditate (Yusainy & Lawrence, 2015). The disutility of effortful control can also be countered by framing it as a means toward some inherently fun and enjoyable end, thereby changing the value of effort itself, such as when walking is framed as sightseeing instead of as exercise (Werle et al., 2015). In this light, expectations about how self-control works (Job et al., 2010) and perceptions of fatigue and vitality (Clarkson et al., 2010; Draganich & Erdal, 2014) act as additional inputs that add or subtract value from the decision about whether to apply effort.

Strengths and Weaknesses of the Process Model

The process model is consistent with the view of self-control as a decision about whether or not to exert effort. It allows multiple inputs to influence this decision, including information about effortfulness, task importance, opportunity costs, countervailing rewards, and task framing. And because it recognizes that the inputs into decision change over time, including the dynamically changing valuation of labor versus leisure, it is not only consistent with the major discovery of the resource model, that self-control wanes over time, but it can also accommodate findings that are difficult to account for with a resource model (e.g., Clarkson et al., 2010; Dang et al., 2013; Heckman et al., 2012).

The process model has the benefit of accounting for the existing literature without reference to the problematic resource concept (Navon, 1984). The resource concept is of little use in explaining why 1 minute of mental effort (Halali, Bereby-Meyer, & Meiran, 2014)—which should have no noticeable impact on a resource—can still have measurable downstream consequences. The process model also makes predictions unanticipated by the resource model, such as effects related to the basic perception of stimuli that have nothing to do with self-control (Schmeichel et al., 2010). Finally, the process model is consistent with, and is indeed based on, modern theories of fatigue that make no reference to energy or resources, but instead are based on motivation (Hockey, 1997, 2013; Hockey & Earle, 2006).

Despite the positives of the process model, the model also has shortcomings. First, there is little direct evidence that depletion is mediated by changes in motivation, priorities, or goals (Baumeister, 2014); that is, the process model makes strong claims about self-control failure being the product of changing motivational priorities (and not depleted resources), yet there is little direct evidence in support of this view. We note that few researchers have bothered to examine this important issue (Inzlicht & Schmeichel, 2012), so the absence of evidence should not be confused with evidence of absence. And results of a few recent studies are very much consistent with the process model. For example, people in a state of depletion appraise their goals as less important and worthwhile, as being less of a priority (vanDellen, Shea, Davisson, Koval, & Fitzsimons, 2014). Similarly, people in a state of depletion report lower levels of commitment to their self-control goals, an effect that can be overcome by reminders of their goal commitment (Walsh, 2014). Thus, more research is accruing to suggest that depletion does indeed change people's appraisal of the importance of their self-control goals, including their

commitment to these goals. Given the clear relationship between goals and motivation (e.g., Kruglanski et al., 2002), we take these recent findings as evidence in favor of the process model. But more work is needed.

A second drawback of the process model—and one that we think confounds some people—is that self-control *feels* limited. The process model suggests that self-control is limitless if motivation and desire are high, but this seems to collide with common sense. After all, people do indeed get fatigued to the point of exhaustion when working on effortful tasks for extended periods, even the ones they enjoy. It is hard for people to sustain effort for long durations, giving credence to the idea that they have run low on energy. For example, air traffic controllers need to expend inordinate amounts of effort to stay vigilant to prevent tragedies, and there is no doubt that they are highly motivated not to make errors. Nevertheless, air traffic controllers do indeed become fatigued, with consequential flagging attention and as a remedy, mandatory leisure breaks.

The process model suggests that this flagging of effort is due to changes in motivation and priorities, and not due to some internal limit on how long effort can be sustained. This seems to fly against conventional wisdom and subjective experience. Yet modern theories of fatigue suggest that this is precisely what happens (Hockey, 2013). Even when people work on important tasks, tasks that they are highly motivated to complete, they can only sustain their effort for so long—this is the exploitation mode to which we referred earlier. The reason for this is that, over time, people become habituated to a task, finding it less interesting or important as they consider other possible tasks and activities that might come to seem more pressing (Kurzban et al., 2013)—this is the exploration mode. An ambitious student studying for a final can sustain her efforts to study in the library for only so long before her desire to eat, check e-mail, socialize with friends, or sleep come to dominate her attention. When she decides to take a break or to stop studying for the day, it is not because her energies are depleted, but because other goals have become more important. Despite self-control really seeming to be limited, we know of no evidence that directly corroborates this view (Hagger et al., 2010).

Is the Revised Resource Model a Motivational Model?

The idea that depletion is typically a slight diminishment of a resource (Baumeister, 2014) is an important turn for the resource model. Unlike the original model, the revised resource model suggests that ego depletion reflects a slight (but not complete) diminishment of a central resource; that is, self-control failures are now recast as efforts to preserve a resource that is only somewhat diminished. If depletion is mostly mild, however, with people having "ample reserves of energy" (Baumeister, 2014, p. 314), why would it lead to self-control failure at all? That is, if people have the resources needed to engage effortful control, what holds them back?

In our view, the revised resource model is hardly different than a model based on changing motivations and priorities (Inzlicht et al., 2014). If people indeed have ample energy (Baumeister, 2014), then the reason that self-control wanes over time is because people decide that some tasks are not sufficiently interesting, important, or worthwhile, and they choose not to apply effort; that is, depletion seems to have turned from a question of inability to a question of unwillingness. If the resource is still ample, then one cannot blame resource unavailability for subsequent self-control failure, at least at the

proximal level. For example, if restraining one's emotions leads people to overeat (Vohs & Heatherton, 2000), yet leaves the resources that power the will mostly intact, can we blame overeating on the unavailability of resources? We believe not.

We do not mean to imply that the resource concept is irrelevant; we simply think it plays no pivotal role as the proximal mediator of ego depletion. The process model—and it seems the revised resource model as well—suggest that the reason people do not control themselves at time 2 is that they do not deem the task at time 2 worthy of their efforts. But why do people generally deem the time 2 task unworthy? The resource model suggests that it is because people are motivated to save their dwindling supplies of self-control energy; in this view, resources are central. People have an idea, be that a lay theory (Job et al., 2010) or one based on actual fact, that their energies are finite, and because of this idea, they may ration it selectively, using it on tasks that they think are worthwhile. So while the revised resource model admits that people selectively use their self-control energies (based on preferences, choices, etc.), it also suggests an ultimate reason for this selectivity: because self-control is limited and eventually runs out. In short, the ultimate cause of depletion is limited resources, which then lead to changes in willingness to use that resource. The process model, in contrast, dispenses with the resource concept altogether.

Like the revised resource model, the process model suggests that the proximal cause of depletion is lack of willingness but, unlike the resource model, it suggests that this unwillingness stems from the desire to balance competing goals and motives (Inzlicht et al., 2014). At any one time, people have a number of goals that they desire to enact (Kruglanski et al., 2002). The problem is that at times these goals conflict, and sometimes choosing one goal precludes choosing another. One solution to competing goals is to have a mechanism in place that prevents people from perseverating on any one goal, so that they can sample other goals, which is to say that evolution needed to build a mechanism that allowed for a switching between task engagement and disengagement or between exploitation and exploration (Cohen et al., 2007; Tooby & Cosmides, 2005). By preventing the accumulation of opportunity costs (Kurzban et al., 2013), such a mechanism would foster intelligent decisions and goal commitments.

The point of all this is to say that the process model and revised resource model are in apparent agreement about the proximal cause of ego depletion: people's lack of willingness to exert more effort. The key difference between the models is the ultimate causes of this change in willingness: The resource model claims that this derives from a motivation to conserve limited resources, whereas the process model claims that it derives from a motivation to balance competing goals. The problem here is that it is often difficult to test different ultimate causes given the distance between the effect and the ultimate cause (e.g., Conway & Schaller, 2002). Nonetheless, there is evidence that is consistent with the conservation of energy account (Giacomantonio, Jordan, Fennis, & Panno, 2014; Muraven et al., 2006), and evidence that is consistent with an account based on switching motivational preferences (Job et al., 2015; Schmeichel et al., 2010), but more research examining these competing ultimate causes is needed.

CONCLUSION

The resource model of self-control should be celebrated. Not only did it bring much needed attention to a neglected area of psychology, it also revealed that self-control has

a refractory period. This finding is a legitimate breakthrough and has been influential in a number of subfields of psychology and beyond. Despite its influence and importance, basic questions remain about how and why ego depletion operates, with the original resource model unable to account for quite a few discrepant findings (Masicampo et al., 2014). These discrepancies have forced researchers to rethink core assumptions and have led to a revision of the original model (Baumeister, 2014) and spawned a number of competing models as well (Dang et al., 2013; Inzlicht et al., 2014; Kurzban et al., 2013). We believe that the revised resource model can successfully accommodate some of the discrepant findings, for example, findings on how motivation can counteract depletion (e.g., Muraven & Slessareva, 2003), but the model has difficulty with others. The resource model (both versions) has real trouble with recent findings that indicate concurrent demands can increase control (Tuk et al., 2015) and those showing that subjective perceptions, expectations, and mindsets drive self-control (Clarkson et al., 2010; Werle et al., 2015). In contrast, modeling self-control as a decision about whether to engage in effort allows self-control to be more flexible and to change based on the various inputs that go into any decision-making process.

Our goal in this chapter was to examine the theoretical underpinnings of the resource model and to focus on areas in which it appears to be lacking. Such a focus should not detract from our legitimate view that the resource model has been a boon to the field. Finding that self-control wanes over time is a real advance. We suspect that it will continue to inspire researchers for years to come.

References

Apfelbaum, E. P., & Sommers, S. R. (2009). Liberating effects of losing executive control. *Psychological Science, 20*(2), 139–143.

Baumeister, R. F. (2014). Self-regulation, ego depletion, and inhibition. *Neuropsychologia, 65*, 313–319.

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

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7*(1), 1–15.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation.* San Diego, CA: Academic Press.

Baumeister, R. F., & Vohs, K. D. (2007). Self-regulation, ego depletion, and motivation. *Social and Personality Psychology Compass, 1*, 115–128.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16*, 351–355.

Botvinick, M. M. (2007). Conflict monitoring and decision making: Reconciling two perspectives on anterior cingulate function. *Cognitive, Affective, and Behavioral Neuroscience, 7*(4), 356–366.

Carter, E. C., & McCullough, M. E. (2014). Publication bias and the limited strength model of self-control: Has the evidence for ego depletion been overestimated?. *Frontiers in Psychology, 5*, 1–11.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* New York: Cambridge University Press.

Clarkson, J. J., Hirt, E. R., Jia, L., & Alexander, M. B. (2010). When perception is more than reality: The effects of perceived versus actual resource depletion on self-regulatory behavior. *Journal of Personality and Social Psychology, 98*(1), 29–46.

Cohen, J. D., McClure, S. M., & Yu, A. J. (2007). Should I stay or should I go?: How the human brain manages the trade-off between exploitation and exploration. *Philosophical Transactions of the Royal Society of London B: Biological Sciences, 362*(1481), 933–942.

Cohen, J. R., & Lieberman, M. D. (2010). The common neural basis of exerting self-control in multiple domains. In R. Hassin, K. Ochsner, & Y. Trope (Eds.), *Self control in society, mind, and brain* (pp. 141–160). Oxford, UK: Oxford University Press.

Converse, P. D., & Deshon, R. P. (2009). A tale of two tasks: Reversing the self-regulatory resource depletion effect. *Journal of Applied Psychology, 94*(5), 1318–1324.

Conway, L. G., & Schaller, M. (2002). On the verifiability of evolutionary psychological theories: An analysis of the psychology of scientific persuasion. *Personality and Social Psychology Review, 6*(2), 152–166.

Dang, J., Dewitte, S., Mao, L., Xiao, S., & Shi, Y. (2013). Adapting to an initial self-regulatory task cancels the ego depletion effect. *Consciousness and Cognition, 22*(3), 816–821.

de Ridder, D. T. D., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review, 16*(1), 76–99.

Derrick, J. L. (2013). Energized by television: Familiar fictional worlds restore self-control. *Social Psychological and Personality Science, 4*, 299–307.

Dewitte, S., Bruyneel, S., & Geyskens, K. (2009). Self-regulating enhances self-regulation in subsequent consumer decisions involving similar response conflicts. *Journal of Consumer Research, 36*(3), 394–405.

Draganich, C., & Erdal, K. (2014). Placebo sleep affects cognitive functioning. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 40*(3), 857–864.

Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science, 16*(12), 939–944.

Egner, T. (2008). Multiple conflict-driven control mechanisms in the human brain. *Trends in Cognitive Sciences, 12*(10), 374–380.

Fennis, B. M., Janssen, L., & Vohs, K. D. (2009). Acts of benevolence: A limited-resource account of compliance with charitable requests. *Journal of Consumer Research, 35*(6), 906–924.

Friese, M., & Wänke, M. (2014). Personal prayer buffers self-control depletion. *Journal of Experimental Social Psychology, 51*, 56–59.

Fujita, K. (2011). On conceptualizing self-control as more than the effortful inhibition of impulses. *Personality and Social Psychology Review, 15*(4), 352–366.

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., et al. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology, 92*, 325–336.

Giacomantonio, M., Jordan, J., Fennis, B. M., & Panno, A. (2014). When the motivational consequences of ego depletion collide: Conservation dominates over reward-seeking. *Journal of Experimental Social Psychology, 55*, 217–220.

Gillebaart, M., & de Ridder, D. T. D. (2015). Effortless self-control: A novel perspective on response conflict strategies in trait self-control. *Social and Personality Psychology Compass, 9*(2), 88–99.

Gino, F., Schweitzer, M. E., Mead, N. L., & Ariely, D. (2011). Unable to resist temptation: How self-control depletion promotes unethical behavior. *Organizational Behavior and Human Decision Processes, 115*(2), 191–203.

Gottfredson, L. S., & Deary, I. J. (2004). Intelligence predicts health and longevity, but why? *Current Directions in Psychological Science, 13*(1), 1–4.

Gratton, G., Coles, M. G., & Donchin, E. (1992). Optimizing the use of information: Strategic control of activation of responses. *Journal of Experimental Psychology: General, 121*, 480–506.

Hagger, M. S., & Chatzisarantis, N. L. D. (2013). The sweet taste of success: The presence of glucose in the oral cavity moderates the depletion of self-control resources. *Personality and Social Psychology Bulletin, 39*(1), 28–42.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin, 136*(4), 495–525.

Halali, E., Bereby-Meyer, Y., & Meiran, N. (2014). Between self-interest and reciprocity: The social bright side of self-control failure. *Journal of Experimental Psychology: General, 143*, 745–754.

Hare, T. A., Camerer, C. F., & Rangel, A. (2009). Self-control in decision-making involves modulation of the vmPFC valuation system. *Science, 324*, 646–648.

Heatherton, T. F., & Wagner, D. D. (2011). Cognitive neuroscience of self-regulation failure. *Trends in Cognitive Sciences, 15*(3), 132–139.

Heckman, B. W., Ditre, J. W., & Brandon, T. H. (2012). The restorative effects of smoking upon self-control resources: A negative reinforcement pathway. *Journal of Abnormal Psychology, 121*(1), 244–249.

Hockey, G. R. J. (1997). Compensatory control in the regulation of human performance under stress and high workload: A cognitive-energetical framework. *Biological Psychology, 45*(1–3), 73–93.

Hockey, G. R. J. (2013). *The psychology of fatigue.* Cambridge, UK: Cambridge Univerity Press.

Hockey, G. R. J., & Earle, F. (2006). Control over the scheduling of simulated office work reduces the impact of workload on mental fatigue and task performance. *Journal of Experimental Psychology: Applied, 12*(1), 50–65.

Hofmann, W., Vohs, K. D., & Baumeister, R. F. (2012). What people desire, feel conflicted about, and try to resist in everyday life. *Psychological Science, 23*(6), 582–588.

Inzlicht, M., Bartholow, B. D., & Hirsh, J. B. (2015). Emotional foundations of cognitive control. *Trends in Cognitive Sciences, 19*(3), 126–132.

Inzlicht, M., & Kang, S. K. (2010). Stereotype threat spillover: How coping with threats to social identity affects aggression, eating, decision making, and attention. *Journal of Personality and Social Psychology, 99*(3), 467–481.

Inzlicht, M., & Schmeichel, B. J. (2012). What is ego depletion?: Toward a mechanistic revision of the resource model of self-control. *Perspectives on Psychological Science, 7*(5), 450–463.

Inzlicht, M., Schmeichel, B. J., & Macrae, C. N. (2014). Why self-control seems (but may not be) limited. *Trends in Cognitive Sciences, 18*(3), 127–133.

Job, V., Bernecker, K., Miketta, S., & Friese, M. (2015). Implicit theories about willpower predict the activation of a rest goal following self- control exertion. *Journal of Personality and Social Psychology, 108*(4), 637–647.

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion—is it all in your head?: Implicit theories about willpower affect self-regulation. *Psychological Science, 21*(11), 1686–1693.

Kleiman, T., Hassin, R. R., & Trope, Y. (2014). The control-freak mind: Stereotypical biases are eliminated following conflict-activated cognitive control. *Journal of Experimental Psychology: General, 143*(2), 498–503.

Kool, W., & Botvinick, M. (2014). A labor/leisure tradeoff in cognitive control. *Journal of Experimental Psychology: General, 143*(1), 131–141.

Kool, W., McGuire, J. T., Rosen, Z. B., & Botvinick, M. M. (2010). Decision making and the avoidance of cognitive demand. *Journal of Experimental Psychology: General, 139*(4), 665–682.

Kruglanski, A. W., Shah, J. Y., Fishbach, A., Friedman, R., Chun, W. Y., & Sleeth-Keppler, D. (2002). A theory of goal systems. *Advances in Experimental Social Psychology, 34*, 331–378.

Kurzban, R. (2010). Does the brain consume additional glucose during self-control tasks? *Evolutionary Psychology, 8*(2), 244–259.

Kurzban, R., Duckworth, A., Kable, J. W., & Myers, J. (2013). An opportunity cost model of subjective effort and task performance. *Behavioral and Brain Sciences, 36*(6), 661–679.

Laran, J., & Janiszewski, C. (2011). Work or fun?: How task construal and completion influence regulatory behavior. *Journal of Consumer Research, 37*(6), 967–983.

Masicampo, E. J., Martin, S. R., & Anderson, R. A. (2014). Understanding and overcoming self-control depletion. *Social and Personality Psychology Compass, 8*(11), 638–649.

Mead, N. L., Baumeister, R. F., Gino, F., Schweitzer, M. E., & Ariely, D. (2009). Too tired to tell the truth: Self-control resource depletion and dishonesty. *Journal of Experimental Social Psychology, 45*(3), 594–597.

Milkman, K. L., Rogers, T., & Bazerman, M. H. (2008). Harnessing our inner angels and demons: What we have learned about want/should conflicts and how that knowledge can help us reduce short-sighted decision making. *Perspectives on Psychological Science, 3*(4), 324–338.

Minda, J. P., & Rabi, R. (2015). Ego depletion interferes with rule-defined category learning but not non-rule-defined category learning. *Frontiers in Psychology, 6*, 35.

Mischel, W., Ebbesen, E. B., & Raskoff Zeiss, A. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of Personality and Social Psychology*, 204–218.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., et al. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences, 108*(7), 2693–2698.

Moffitt, T. E., Gabrielli, W. F., Mednick, S. A., & Schulsinger, F. (1981). Socioeconomic status, IQ, and delinquency. *Journal of Abnormal Psychology, 90*(2), 152–156.

Molden, D. C., Hui, C. M., Scholer, A. A., Meier, B. P., Noreen, E. E., D'Agostino, P. R., et al. (2012). Motivational versus metabolic effects of carbohydrates on self-control. *Psychological Science, 23*(10), 1137–1144.

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

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin, 126*(2), 247–259.

Muraven, M., Gagné, M., & Rosman, H. (2008). Helpful self-control: Autonomy support, vitality, and depletion. *Journal of Experimental Social Psychology, 44*(3), 573–585.

Muraven, M., Shmueli, D., & Burkley, E. (2006). Conserving self-control strength. *Journal of Personality and Social Psychology, 91*, 524–537.

Muraven, M., & Slessareva, E. (2003). Mechanisms of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin, 29*, 894–906.

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

Navon, D. (1984). Resources—a theoretical soup stone? *Psychological Review, 91*(2), 216–234.

Neisser, U., Boodoo, G., Bouchard, T. J., Boykin, A. W., Brody, N., Ceci, S. J., et al. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*(2), 77–101.

Persson, J., Larsson, A., & Reuter-Lorenz, P. A. (2013). Imaging fatigue of interference control reveals the neural basis of executive resource depletion. *Journal of Cognitive Neuroscience, 25*(3), 338–351.

Raichle, M. E., & Mintun, M. A. (2006). Brain work and brain imaging. *Annual Review of Neuroscience, 29*, 449–476.

Richeson, J. A., & Shelton, J. N. (2003). When prejudice does not pay: Effects of interracial contact on executive function. *Psychological Science, 14*(3), 287–290.

Robinson, M. D., Schmeichel, B. J., & Inzlicht, M. (2010). A cognitive control perspective of self-control strength and its depletion. *Social and Personality Psychology Compass, 4*(3), 189–200.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78.

Saunders, B., Milyavskaya, M., & Inzlicht, M. (2015). What does cognitive control feel like?: Effective and ineffective cognitive control is associated with divergent phenomenology. *Psychophysiology, 52*(9), 1205–1217.

Schimmack, U. (2012). The ironic effect of significant results on the credibility of multiple-study articles. *Psychological Methods, 17*, 551–566.

Schmeichel, B. J. (2007). Attention control, memory updating, and emotion regulation temporarily reduce the capacity for executive control. *Journal of Experimental Psychology: General, 136*(2), 241–255.

Schmeichel, B. J., Harmon-Jones, C., & Harmon-Jones, E. (2010). Exercising self-control increases approach motivation. *Journal of Personality and Social Psychology, 99*(1), 162–173.

Schmeichel, B. J., & Vohs, K. (2009). Self-affirmation and self-control: Affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology, 96*(4), 770–782.

Shamosh, N. A., & Gray, J. R. (2007). The relation between fluid intelligence and self-regulatory depletion. *Cognition and Emotion, 21*(8), 1833–1843.

Sullivan, N., Hutcherson, C., Harris, A., & Rangel, A. (2015). Dietary self-control is related to the speed with which attributes of healthfulness and tastiness are processed. *Psychological Science, 26*(2), 122–134.

Tice, D. M., Baumeister, R. F., Shmueli, D., & Muraven, M. (2007). Restoring the self: Positive affect helps improve self-regulation following ego depletion. *Journal of Experimental Social Psychology, 43*(3), 379–384.

Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of Culture* (pp. 19–136). New York: Oxford University Press.

Tooby, J., & Cosmides, L. (2005). Conceptual foundations of evolutionary psychology. In D. M. Buss (Ed.), *The handbook of evolutionary psychology* (pp. 5–67). Hoboken, NJ: Wiley.

Touré-Tillery, M., & Fishbach, A. (2014). How to measure motivation: A guide for the experimental social psychologist. *Social and Personality Psychology Compass, 8*(7), 328–341.

Tuk, M. A., Trampe, D., & Warlop, L. (2011). Inhibitory spillover: Increased urination urgency facilitates impulse control in unrelated domains. *Psychological Science, 22*, 627–633.

Tuk, M. A., Zhang, K., & Sweldens, S. (2015). The propagation of self-control: Self-control in one domain simultaneously improves self-control in other domains. *Journal of Experimental Psychology: General, 144*(3), 639–654.

vanDellen, M. R., Shea, C. T., Davisson, E. K., Koval, C. Z., & Fitzsimons, G. M. (2014). Motivated misperception: Self-regulatory resources affect goal appraisals. *Journal of Experimental Social Psychology, 53*, 118–124.

Vohs, K. D., Baumeister, R. F., & Schmeichel, B. J. (2012). Motivation, personal beliefs, and limited resources all contribute to self-control. *Journal of Experimental Social Psychology, 48*(4), 943–947.

Vohs, K. D., & Faber, R. J. (2007). Spent resources: Self-regulatory resource availability affects impulse buying. *Journal of Consumer Research, 33*(4), 537–547.

Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science, 11*(3), 249–254.

Walsh, D. (2014). Attenuating depletion using goal priming. *Journal of Consumer Psychology, 31*, 126–132.

Werle, C. O. C., Wansink, B., & Payne, C. R. (2015). Is it fun or exercise?: The framing of physical activity biases subsequent snacking. *Marketing Letters, 26*(4), 691–702.

Yusainy, C., & Lawrence, C. (2015). Brief mindfulness induction could reduce aggression after depletion. *Consciousness and Cognition, 33C*, 125–134.