CHAPTER

16

Linking Diverse Resources to Action Control

E.J. Masicampo[1], *M.L. Slepian*[2]

[1]Wake Forest University, Winston Salem, NC, United States; [2]Columbia University, New York, NY, United States

The capacity to make decisions and exert control over one's behaviors is one of the defining features of human life. This capacity for control, however, seems limited. Over the past two decades, research in psychology has yielded evidence that the capacity for control operates as if relying on a limited resource (eg, Baumeister, Bratslavsky, Muraven, & Tice, 1998). Many dozens of psychological studies have yielded evidence that after people exert self-control, an apparent state of self-control fatigue ensues, causing decrements in self-control performance on subsequent tasks (Hagger, Wood, Stiff, & Chatzisarantis, 2010).

This pattern of self-control fatigue has been the subject of much theorizing in recent years. The main aim of these theories has been to explain the mechanism underlying self-control fatigue effects (eg, Beedie & Lane, 2012; Gailliot & Baumeister, 2007; Inzlicht, Schmeichel, & Macrae, 2014; Kurzban, Duckworth, Kable, & Myers, 2013). While the various theories are in general agreement that self-control diminishes with use, they disagree on precisely why that occurs and on whether an actual limited resource (blood glucose) is involved. The starting point for the present chapter is in the place where the theories agree, rather than where they disagree. The general consensus is that people's self-control behaviors do operate *as if* relying on a limited resource (although for a contrary view, see Carter, Kofler, Forster, & McCullough, 2015). Furthermore, people generally report believing that their own self-control ability diminishes with use (though a minority diverges from this view; see Job, Dweck, & Walton, 2010). Given that self-control is treated as, and operates as if, it relies on a limited resource, we considered in the present chapter how other,

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nonmental resources may affect the willingness to exert self-control. The present chapter considers how self-control fatigue effects—independent of how they arise—are influenced by factors beyond those directly implicated in self-control processes—specifically, other, nonmental resources.

Action control is merely one means by which a person may achieve desired outcomes. A person may draw on other personal resources as well to achieve desired ends, including social or monetary resources. We argue that the various resources people draw on are, to a degree, substitutable. Furthermore, given this substitutability, we argue that the availability of nonmental resources may influence whether a person is willing to engage in mentally effortful action control. In this chapter, we will review the evidence consistent with this line of thought, discuss possible future work on this topic, and explore implications of this theory for action control.

LINKING MENTAL AND NONMENTAL RESOURCES

People cultivate a wide range of mental capacities, including intelligence, creativity, social aptitude, and memory. However, our main focus in this chapter is on self-control capacity as a mental resource, primarily because this is the mental capacity that people most commonly conceive of as a limited resource. The empirical evidence suggests that self-control behavior diminishes with use as if relying on a limited resource (Baumeister et al., 1998; Muraven, Tice, & Baumeister, 1998), and people's lay beliefs also assume that self-control relies on a limited resource (see Chapter 9 for further discussion). Self-control thus operates and is treated as a resource, even if there is no tangible, exhaustible resource underlying it (eg, Kurzban, 2009).

Self-control also provides numerous benefits. By drawing on the capacity for self-control, people are able to avoid unwanted impulses, regulate their emotions, focus in the face of distraction, and resist short-term rewards in favor of larger, long-term benefits. As a result, people high in self-control tend to have better physical health, mental health, social relationships, academic success, and career success than people low in self-control (Moffitt et al., 2011; Tangney, Baumeister, & Boone, 2004). Self-control represents a highly beneficial commodity.

In this section, we explore mental resources (ie, self-control resources) and nonmental resources and draw links between the two. While people may achieve desired ends by drawing on limited mental resources, they may also achieve desired ends by drawing on other, nonmental resources, such as family, friends, or finances. Furthermore, we propose that mental and nonmental resources are substitutable. A student who wants to excel in school may draw on personal self-control efforts by focusing and persisting on schoolwork; alternatively, the student may draw on

social resources by asking friends to serve as study partners or monetary resources by hiring a tutor. If self-control and other resources are interchangeable, the availability or lack thereof of any one resource may influence the willingness to conserve or use up the others.

Limited Mental Resources

Making decisions, exerting self-control, or engaging in other volitions operates as if drawing on a common resource that becomes exhausted with use (Baumeister et al., 1998; Muraven et al., 1998). Initial studies in support of this view demonstrated that exerting effortful control for as little as 5 min can lead to a temporary state in which people are less willing or less able to exert self-control, a state often referred to as "ego depletion" (Baumeister et al., 1998). In the nearly three decades since the initial demonstrations of ego depletion, hundreds of studies have documented evidence of ego depletion's effects (Hagger et al., 2010).

The limited capacity for control constrains a wide range of mental faculties. Self-control behaviors such as controlling thoughts, regulating emotions, and resisting impulses have all been shown to produce ego depletion effects. Ego depletion effects are also produced by making decisions (Vohs et al., 2008), memory updating, and inhibiting responses (Schmeichel, 2007). Regardless of the type of executive function being used, using control leads to a state of ego depletion, and control suffers when people are in a depleted state (see Chapter 6).

Explaining Ego Depletion

There have been numerous, often competing theories for *why* mental resources seem limited. The glucose model argues that the limited resource on which control relies is glucose in the bloodstream (Gailliot et al., 2007). Across several studies, Gailliot and colleagues found that blood glucose levels dropped significantly more after self-control tasks than after other tasks; low blood glucose levels after initial self-control exertion predicted decreases in performance on subsequent self-control tasks; and boosts in blood glucose via sugary drinks counteracted the ego depletion effect. The authors concluded that self-control and other volitional acts rely on the limited availability of glucose in the blood and brain.

The glucose model has, however, been challenged on numerous fronts. First, it has been argued that the glucose model is not neurophysiologically feasible (Kurzban, 2009). Second, the studies that Gailliot and colleagues published in support of the glucose model have been argued to suffer from numerous methodological deficiencies (Kurzban, 2009; Schimmack, 2012). Third, numerous empirical findings have cast doubt on the glucose model. Some of this work has found that self-control tasks do not significantly decrease blood glucose (Molden et al., 2012; Study 1).

Other work has demonstrated that simply tasting sugary drinks without swallowing them can counteract ego depletion (Hagger & Chatzisarantis, 2013; Molden et al., 2012; Sanders, Shirk, Burgin, & Martin, 2012), suggesting that metabolization of sugar is unnecessary to restore self-control. These challenges have prompted numerous alternative accounts of ego depletion.

Most alternative theories have emphasized a motivational account of ego depletion patterns. One theory, termed the process model, argues that ego depletion occurs because people seek to balance labor and leisure (Inzlicht et al., 2014). Another model, the opportunity cost model, argues that ego depletion occurs when people withdraw working memory resources from demanding self-control tasks that are deemed not to be worth the investment (Kurzban et al., 2013). Both theories explain ego depletion effects as occurring not from the limited availability of some self-control resource but instead from the motivational switching to alternative tasks.

Another alternative account to the glucose model is the notion that lay beliefs underlie ego depletion effects. Many people endorse the theory that willpower is limited, and when these people exert self-control, they show the standard depletion effect (Job et al., 2010). In contrast, the minority of people who hold the view that willpower is nonlimited tend *not* to show the ego depletion effect. Experimental work confirms a causal effect of these beliefs (see Chapter 9).

The idea that people's beliefs about self-control depletion are the key driver of depletion effects has also received support in other work. Perceived self-control exertion has been shown to be more predictive of subsequent self-control decrements than actual self-control exertion (Clarkson, Hirt, Jia, & Alexander, 2010; see also Chapter 19). Moreover, the mere belief that an event or object can restore willpower has been shown to eliminate ego depletion effects (see Chapter 20). Thus, some evidence suggests that ego depletion occurs, in part, because people expect it to.

Convergence Across Models

As is clear from the number and variety of models attempting to explain ego depletion, the notion of limited mental resources is a controversial one. Our aim is not to propose a resolution of this controversy but instead to focus on where the different perspectives converge. Regardless of whether the mechanism underlying ego depletion is one of glucose availability (Gailliot & Baumeister, 2007), motivated task switching (eg, Inzlicht et al., 2014; Kurzban et al., 2013), or consequential lay beliefs (Job et al., 2010), it is apparent that self-control acts *as if* mentally effortful tasks rely on a limited resource. Indeed, people generally view self-control in this way (Job et al., 2010).

The various models overlap in other respects as well. There is agreement that ego depletion is a domain-general phenomenon, affecting a wide range of mental faculties. Indeed, numerous tasks that involve mental effort (self-control, decision-making, executive functions, etc.) are diminished with continued use. There is also agreement that successful use of these mental faculties affords numerous positive benefits, such as healthfulness, happiness, achievement, and good relationships (Moffitt et al., 2011; Tangney et al., 2004).

Thus, we assume that every individual has mental capacities that are experienced and treated as limited (ie, self-control and other executive functions), and that are helpful for achieving desirable outcomes. If this is true, then these mental resources should be perceived of and managed in ways that are similar to other kinds of resources.

Other Limited Resources

Mental resources are only one of many resources that individuals may use to achieve desirable outcomes. We focus on three nonmental resources that share certain features with mental resources: each is helpful for achieving desirable outcomes and the availability of each fluctuates over time. These resources are bodily resources, social resources, and money.

Bodily Resources

The body is the most basic means by which animals, including humans, satisfy needs and goals. If wanting to achieve some desired end, a person can often bring that about through sheer physical work. This seems a truism for countless, quotidian acts, such as showering or pouring a bowl of cereal. Likewise, larger goals such as moving into a new home, which are often accomplished by recruiting help from or hiring others, can be accomplished through self-imposed manual labor.

Bodily resources are limited and fluctuate across time. A primary constraint on the body is physical energy, which waxes and wanes throughout the day. If people are sleep deprived, physically fatigued, hungry, or ill, then physical energy may be low. In contrast, if they are well rested, well fed, and in good health, physical energy may be high. Bodily resources are also affected by physical capacities. People who are physically strong, fit, and able have more bodily resources at their disposal than those who are relatively weak, unfit, or incapacitated.

Social Resources

The notion that humans are inherently social creatures, whose biological imperative is to connect with and rely on others, has become a common axiom in psychology (eg, Baumeister & Leary, 1995). Thus, for any individual, other people are an essential resource. People go to family,

friends, and others in their social networks for many kinds of help, including help with physical labor, emotional support, information, and advice.

Crucially, the availability of social resources fluctuates over time. As people enter into marriages, grow their families, and develop strong friendships, social resources increase. Likewise, as people ascend the hierarchies of their various social groups, they wield greater power over others. Social resources can just as easily decrease. People may move to new cities or start new jobs, or lose friends and partners, in which case social capital may be in short supply.

Money

Money is essentially a type of social resource. That is, money is an alternative means by which one can obtain goods and services from others in the absence of any prior social relationship, such as an ongoing friendship. Thus, rather than ask for social favors, one can use money to pay other people for what one needs.

As with social resources, however, the availability of money is prone to fluctuations. People generally begin their lives with little access to money and gradually accumulate money over time when they start their careers, acquire higher salaries, invest, and save. Of course, the availability of money can be quickly diminished with large expenses, job loss, investments that depreciate, or other major life changes.

Substitutability Between Resources

We propose that the resources people draw from to satisfy their goals are partly substitutable. Substitutability between resources has important implications for action control. A person whose only resource is money will likely be a penny pincher. But if the person amasses far reaching social influence, then money will become less needed and the person may be more willing to spend it. Likewise, a person who is relatively rich in various resources may be more willing to spend rather than conserve limited mental resources. The relative scarcity or abundance of any resource will affect the value placed on other, substitutable resources.

It is easy to think of everyday examples of substitutability between the various nonmental resources of bodily resources, social resources, and money. Take a person whose lawn needs mowing. If he has the strength and energy, he can do it himself. Alternatively, he can ask a friend to do it for him, or he can hire a professional landscaping company to do it for pay. Thus, bodily resources, social resources, and money can be substituted for the same end.

There are many examples in which bodily resources, social resources, and money can be substituted with each other. There are also many

examples in which these nonmental resources can be substituted with mental resources, which we review later.

Bodily Resources

Recent empirical work points to the substitutability between mental resources and bodily resources. Rosenbaum, Gong, and Potts (2014) assigned participants a simple task: pick up a heavy bucket and carry it to the end of an alley. Participants could choose between two buckets, the only difference between them being that one was farther from the participant and thus closer to the end of the alley. One might predict that participants would choose the bucket nearest the end of the alley, because that would mean carrying it a shorter distance. However, across several variants of this paradigm, participants repeatedly chose the bucket that was closer to their starting point, which meant having to carry the bucket a farther distance. In other words, participants were voluntarily doing more work than was necessary. The authors' explanation for this phenomenon was that participants wanted to reduce the cognitive load involved in remembering their assigned goal. Rather than hold the task in mind, people preferred to start the task earlier, even though it meant exerting extra physical work.

This parallels common, everyday decisions. A person might carry around a book, gym clothes, and extra pair of shoes inside her bag wherever she goes, even on days when not needing any of these items. Rather than take the time to think about and decide what she might specifically need, she can avoid mental effort by grabbing the items, and not thinking further.

Social Resources

Recent work suggests that people rely on help from others as a substitute for one form of mental effort: self-control exertion (Fitzsimons & Finkel, 2011). In that work, participants withdrew self-regulatory efforts at maintaining good health if reminded of a supportive other who helps them to achieve that goal. Thus, if a close other will ensure successful pursuit of health, then there is no need to spend the mental energy doing so one's self.

Transactive memory, the idea of shared memory between people, is another example of people outsourcing mental efforts (Wegner, 1987). Memorization takes considerable effort, insofar as long-term retention of information requires elaborate encoding processes (Craik & Tulving, 1975). One study on transactive memory gave romantic couples a collaborative memory task in which they had to memorize a series of facts. In the study, participants scaled back efforts at remembering facts from domains that their romantic partners knew well (Wegner, Erber, &

Raymond, 1991). Thus, people may draw on social resources as a substitute for expending mental effort.

Money

Money may also substitute for mental resources. While we are not aware of direct tests of this process, modern life offers numerous examples of people paying money to achieve goals that others attain via mental effort. For example, people hire personal trainers at the gym, which reduces the need for self-motivation and effortful planning. People also pay for cosmetic surgeries such as liposuction and bariatric surgeries such as stomach stapling, which reduce the need for self-restraint in eating.

One indirect link between mental resources and money comes from research linking poverty to decrements on cognitive functioning (Mani, Mullainathan, Shafir, & Zhao, 2013). The authors found that people who were poor tended to perform worse than those who were well-off on a number of cognitive tasks. The authors' reasoning was that people with little money are forced to use up mental resources when making difficult financial decisions that the relatively wealthy do not have to make (eg, being able only to spend a certain amount at the grocery store, and figuring out how to meet that budget). In this way, money serves for the wealthy as a substitute for what would otherwise be a tiresome and effortful mental process—making difficult decisions about limited finances. For the poor, what they are unable to afford with money they must pay for with mental work, which then impairs their mental performance elsewhere.

Summary

For each of the nonmental resources we have reviewed, there are at least some instances in which that resource can substitute for mental effort. Thus, rather than spend mental resources to achieve some desired end, people can often draw on bodily resources, social resources, or money. Due to this degree of substitutability between mental and nonmental resources, we propose that the abundance and scarcity of nonmental resources can influence people's willingness to exert mental effort and, ultimately, to engage in action control.

LINKING NONMENTAL RESOURCES TO ACTION CONTROL

Due to the substitutability between resources, we make two predictions about how nonmental resources might affect mental resources, or more specifically how they might affect action control. First, we predict that as nonmental resources become scarce, people will conserve mental

resources and therefore be less willing to control their behaviors. We refer to this as the *linked scarcity hypothesis*. Second, we predict that as nonmental resources become abundant, people will be more willing to use up mental resources and therefore be more willing to control their behaviors. We refer to this as the *linked abundance hypothesis*.

The Linked Scarcity Hypothesis

The linked scarcity hypothesis predicts that when any one resource is low, the other resources will increase in value. In other words, people will become less willing to spend and more motivated to replenish the other resources. This is intuitively true when considering any one resource in isolation. If a person is low on money, then every dollar the person has will take on greater value (eg, Cialdini, 1993). Moreover, the person should be less willing to spend money and more motivated to gain money. Likewise, we predict that in the context of multiple resources, if one resource is low, then the other resources become more valuable.

There is evidence to support the linked scarcity hypothesis when looking at interactions between the various nonmental resources. Research suggests that money and bodily resources are linked in this way (Briers, Pandelaere, Dewitte, & Warlop, 2006). When bodily resources are low (eg, people are hungry), people become less willing to part with their money. Conversely, when people are manipulated into desiring money, they tend to consume more food. Thus, monetary resources and bodily resources (more specifically, caloric resources) are linked. When one is scarce, the other is more valued.

There have also been many demonstrations of linked scarcity between mental resources and nonmental resources. We review such evidence later. In most cases, the original findings we describe were not explained by the original authors in terms of linked scarcity of resources, but the data nevertheless follow the basic pattern of the linked scarcity hypothesis.

Scarce Bodily Resources

There are numerous kinds of evidence of linked scarcity between mental resources and bodily resources. Some of this work has examined people with Type 2 diabetes, a disorder in which metabolization of glucose is impaired. Common symptoms include fatigue and constant hunger. Among Type 2 diabetics, then, bodily resources are chronically low. Furthermore, consistent with the linked scarcity hypothesis, people exhibiting Type 2 diabetic symptoms show evidence of low self-control. They exhibit greater aggressiveness, seemingly due to impaired self-control (DeWall, Deckman, Gailliot, & Bushman, 2011). They also exhibit less forgiveness and less cooperation, which are both prosocial acts that require self-control (DeWall, Pond, & Bushman, 2010).

Other work has examined natural fluctuations in blood glucose, with lower levels indicating lower bodily energy. Here too, numerous findings support the linked scarcity hypothesis. Low blood glucose levels predict increased aggression in married couples (Bushman, DeWall, Pond, & Hanus, 2014), so that when bodily resources are low, people are less likely to control their aggressive impulses (see also Chapter 5). Likewise, when blood glucose levels are low, people are more likely to prioritize small immediate rewards over larger long-term rewards (Wang & Dvorak, 2010). Thus, when bodily resources are low, people are less likely to favor the long-term over the short-term, a defining feature of successful self-control (Fujita, 2011).

Other evidence for linked scarcity comes from the literature on physical fatigue. A large number of studies have manipulated physical fatigue via periods of intense exercise and tested the effects on mental functioning. The literature contains many apparently contradictory findings, with some studies suggesting that physical exercise facilitates cognitive functioning (eg, Aks, 1998; Arcelin, Brisswalter, & Delignieres, 1997) and others suggesting that it impairs it (eg, Cian et al., 2000). Recent theorizing has attempted to reconcile the contradiction. Specifically, one theory proposes that the link between physical exercise and cognitive functioning fits an inverted-U pattern (Tomporowski, 2003), such that brief periods of intense exercise (eg, 20–40 min) improve cognitive functioning and extended periods of intense exercise (eg, 1–2 h or more) impair it. One reason for this pattern is that brief periods of exercise may actually energize and invigorate the body and therefore the mind, whereas extended periods of exercise may induce fatigue and therefore impair the mind. Thus, when a person is fatigued and thus bodily resources are scarce, performance on mental tasks suffers.

Even more consistent with the linked scarcity hypothesis, research suggests that extended periods of intense exercise impair not all cognitive functions but specifically the type that is resource limited—effortful cognitive control. After an hour of intense exercise, impairments are seen in tasks requiring cognitive control but not in similar tasks that do not require cognitive control (Dietrich & Sparling, 2004). When bodily resources are low, it is specifically the tasks that require considerable mental resources that are impaired.

There is also indirect evidence of linked scarcity between bodily resources and mental resources in research on time-of-day effects. Research suggests that people exert less self-control late in the day as fatigue sets in. People are less ethical as the day wears on (Kouchaki & Smith, 2013), which is a characteristic behavior of those low in self-control. Judges also rely on decision defaults more as the day wears on (Danziger, Levav, & Avnaim-Pesso, 2011), thus making easy rather effortful decisions. During times of day when bodily resources are low, people seem to conserve mental resources.

Scarce Social Resources

People also seem to conserve mental resources when social resources are low. Much of the evidence for this comes from research on social exclusion. When people are socially excluded, and so they are low in social resources, they exhibit reduced self-control in diverse laboratory tests of self-control (Baumeister, DeWall, Ciarocco, & Twenge, 2005). Socially excluded people are also more likely to behave aggressively, due perhaps to failing to restrain aggressive impulses (Twenge, Baumeister, Tice, & Stucke, 2001). Socially excluded people are less likely to act prosocially (Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007), which prior work has shown requires mental effort (DeWall, Baumeister, Gailliot, & Maner, 2008). Thus, across a wide range of behaviors, those low in social resources (ie, socially excluded people) seem to conserve rather than expend mental resources.

Another situation in which social resources are scarce is when people lack power (ie, influence over others). Being low in power is linked to decreased executive functioning, which could be the by-product of conserving mental resources (Smith, Jostmann, Galinsky, & van Dijk, 2008). Participants who were manipulated to feel low (vs high) in power were less effective at an n-back task requiring information updating, a Stroop task requiring response inhibition, and the Tower of Hanoi task that requires planning and problem solving.

Scarce Money

Empirical work linking scarce money to engagement in mentally effortful tasks is almost nonexistent. However, what little work we found was supportive of the linked scarcity hypothesis. Spears (2011) manipulated whether people felt relatively rich or poor in a simulated store task. He found that people in the poor condition exhibited less cognitive control than people in the rich condition on subsequent tests, a Stroop task and a hand grip persistence task. This is consistent with the notion that when money is scarce, people are less willing to expend mental effort.

Scarce Mental Resources

If nonmental resource scarcity causes the value of mental resources to increase, then the reverse should also be true: mental resources scarcity should cause the value of nonmental resources to increase. Stated differently, when people are mentally depleted, they should value bodily resources, social resources, and money more.

Here the evidence is sparse, but there is some evidence that people value money more when they are mentally depleted (Schmeichel, Harmon-Jones, & Harmon-Jones, 2010). In that work, mentally depleted people showed greater attentional tuning than nondepleted individuals to dollar signs but not to other symbols. Elsewhere, evidence suggests being

mentally depleted can lead to interest in products that can increase bodily resources (ie, those that might restore energy). Specifically, recent work found that mentally depleted people showed greater interest in rest and in rest-conducive objects (eg, comfortable armchairs) than nondepleted people (Job, Bernecker, Miketta, & Friese, 2015).

Summary

There are numerous kinds of evidence for linked scarcity between mental resources and nonmental resources. Whenever any nonmental resource is low, people seem less willing to expend mental effort. When bodily resources, social resources, and money are scarce, decisions and behaviors become more automatic and less controlled.

The Linked Abundance Hypothesis

Just as one scarce resource should increase the value of other resources, one abundant resource should *decrease* the value of other resources. This is the idea behind the linked abundance hypothesis. Namely, if a person is rich in any one resource, then that person should be more willing to spend the other resources and less motivated to conserve or acquire them.

There is evidence for linked abundance between the various nonmental resources. Perhaps the most direct evidence draws connections between social resources and money. When people are randomly assigned to feel high (vs low) in social support, those people subsequently report caring less about making money and are more willing to part with their money (Vohs, Lasaleta, & Chaplin, 2015). At the same time, the wealthier people are (as measured by household income), the less time they report spending with family (Bianchi & Vohs, 2016). According to the authors of that work, having ample money means not needing to invest in supportive family relationships. As the linked abundance hypothesis suggests, when one resource is abundant, other resources lose value. People are more willing to spend those resources and less motivated to acquire and conserve them.

In this section, we focus on the linked abundance between mental and nonmental resources. Specifically, we review the evidence that when any one nonmental resource is abundant, people are less motivated to conserve mental resources. If this is true, then when any nonmental resource is plentiful, it should mean that people are more willing to engage in mentally effortful acts such as making effortful decisions and exerting self-control.

Abundant Bodily Resources

Evidence for linked abundance between mental resources and bodily resources comes from a variety of sources. Several studies have now linked consumption of sugary drinks, which increases physical energy,

to increased willingness to exert mental effort. Specifically, drinking a sugary drink, but not a similar drink containing artificial sweeteners, has been shown to eliminate the ego depletion effect, thereby restoring self-control performance (Gailliot et al., 2007) and effortful decision-making (Masicampo & Baumeister, 2008). Thus, a boost in bodily resources motivates people to expend greater mental effort.

Recent experiments have demonstrated that simply tasting sugary drinks, but not drinks containing artificial sweeteners, can eliminate the ego depletion effect (Hagger & Chatzisarantis, 2013; Molden et al., 2012; Sanders et al., 2012). These experiments are also consistent with the linked abundance hypothesis. The mouth senses whether an incoming beverage contains sugar or not. The detection of sugar in the oral cavity is a fairly reliable signal that energy is incoming and bodily resources are being replenished. Consistent with the linked abundance hypothesis, bodily energy is on the rise, and so the person is more willing to use up mental resources.

Evidenced of linked abundance between bodily resources and mental resources has also been found in court decisions by judges (Danziger et al., 2011). An analysis of judges' parole decisions indicated that as the day wears on, judges relied more and more on the easy, default decision not to grant parole. However, after a food break, the odds of being granted parole returned to its original level. Thus, when bodily resources were restored with food, judges were more willing to make the effortful and risky decision of granting people parole.

Abundant Social Resources

There is some empirical evidence that having plentiful social resources promotes exertion of mental effort. This evidence comes from the finding that reminders of family promote better self-control (Stillman, Tice, Fincham, & Lambert, 2009). When people were exposed to family-related words or to images of their families, they exhibited greater persistence and performance on a difficult problem-solving task and greater restraint in eating unhealthy snacks. Reminders of social resources promoted spending mental resources.

Research on power also supports the idea that abundant social resources predict greater expenditure of mental resources. When participants were experimentally induced to perceive themselves as high in power (ie, having social influence over others), they increased their efforts and performance on various self-control tasks (DeWall, Baumeister, Mead, & Vohs, 2011). Thus, again, abundance in social resources promoted expenditure of mental resources.

Abundant Money

The most direct evidence of linked abundance between money and mental resources comes from the same work that we described previously

as offering support for the linked scarcity hypothesis. Specifically, Spears (2011) manipulated participants into feeling relatively rich or poor, and those feeling relatively rich performed better on two self-control. Ample monetary resources seem to promote spending mental resources.

Other, more indirect evidence of linked abundance comes from research on the effects of mere reminders of money. Recent work demonstrated that simply reminding people of money is sufficient to eliminate the ego depletion effect (Boucher & Kofos, 2012). To be sure, reminding a person of money is not the same as making a person feel as though they have abundant access to money. However, other work does suggest that mere reminders of money can make people feel greater vitality (eg, Zhou, Vohs, & Baumeister, 2009) and make them rely less on nonmonetary resources, such as social support (Vohs, Mead, & Goode, 2006). Thus, the effects of money reminders seem more consistent with making people feel rich than with making them feel poor. If so, then the fact that mere reminders of money (and potentially the perception of monetary wealth) cause people to expend more mental effort (Boucher & Kofos, 2012) is consistent with the linked abundance hypothesis.

Abundant Mental Resources

If mental and nonmental resources are experienced as substitutable, then it may also be the case that when mental resources are abundant, people become more willing to spend nonmental resources. One way in which mental resources might increase is through self-control exercise. A common metaphor invoked for the benefits of such exercise is that of physical exercise. With repeated physical exercise, muscles can grow, leading a physical task that once was extremely effortful (picking up a heavy weight) to eventually become less effortful and fatiguing. Likewise, with repeated self-control, self-control might become less effortful and fatiguing (Baumeister et al., 1998; Muraven & Baumeister, 2000). Thus, with repeated exercise of spending mental resources, a task that was once mentally effortful and fatiguing (eg, solving an algebra problem), can become less so. Indeed, this kind of mental exercise (such as from repeated studying; Oaten & Cheng, 2006) leads people to perform better at a cognitive task following a depletion manipulation. Moreover, after undergoing this exercise to increase mental resources, individuals were more willing to spend nonmental resources, such as bodily resources, by doing more household chores and increasing physical exercise (Oaten & Cheng, 2006).

Mindfulness interventions are another form of self-control exercise that might increase mental resources (Masicampo & Baumeister, 2007). Mindfulness interventions encourage people to control and alter their default responses to certain stimuli, and thus correspondingly encourage self-control practice. Mindfulness leads people to be more willing to spend nonmental resources. For example, when people high in mindfulness intend to exercise, they actually engage in physical exercise more than

do people low in mindfulness who have the same exercise intentions (Chatzisarantis & Hagger, 2007). Thus, the mindful who may have more mental resources are more willing to spend bodily resources toward a goal of improved health.

Summary

As with the linked scarcity hypothesis, there seem to be a large number of diverse findings consistent with the linked abundance hypothesis. When any nonmental resource is high, regardless of the resource, evidence suggests that people are more willing to expend greater mental effort.

Explaining the Links Between Resources

There seems to be ample evidence in support of both the linked scarcity and the linked abundance hypotheses. However, what remains unclear is whether the resources truly are linked in terms of sharing some underlying mechanism. It is possible that there is some general phenomenon by which the abundance versus scarcity of a person's resources affects behavior, and that this applies across types of resources (eg, Shah, Mullainathan, & Shafir, 2012). One alternative possibility is that the various resources are linked by a shared mechanism but that the mechanism is not specific to resource regulation and, in fact, is much broader. A second alternative possibility is that the numerous resources only appear to be linked and that there are many, distinct mechanisms occupying the different spaces between linked resources, with each pair of resources being linked through a different underlying process.

Possible Shared Mechanisms

One possibility is that there is a shared subjective component to the experiences of scarcity and abundance across the various resources. When any of a person's resources is scarce, the person may feel tired, fatigued, or otherwise unwilling to act. When resources are abundant, the person may feel energetic and active. These subjective experiences seem undeniably true for bodily resources. When bodily resources are low, people experience fatigue; when bodily resources are abundant, people experience vitality. For mental resources as well, the intuition seems to be that scarcity and abundance are experienced via fatigue and vitality. For the other resources (money and social), the subjective experience may be a bit more difficult to imagine. However, there is some empirical evidence of similar subjective experiences here as well. Social exclusion, an extreme case in which social resources are low, has been demonstrated to cause lethargy (Twenge, Catanese, & Baumeister, 2003). Likewise, counting large sums of money, thus creating a sense of monetary abundance, has been shown to increase sense of vitality (Zhou et al., 2009). Thus, all resources may

influence how energetic and active people feel, thereby affecting the motivation to spend versus conserve resources.

Another candidate for a shared mechanism across resources is approach and avoidance motivations. Approach and avoidance motivations refer to the drives toward success and away from failure, respectively. Approach and avoidance orientations are fundamentally about one's resourcefulness. When a person has high expectations of success, then an approach orientation is endorsed; when a person has low expectations of success, an avoidance orientation is endorsed (Elliot & Church, 1997). In terms of resource availability, people are more likely to adopt approach orientations when resources are abundant and avoidance orientations when resources are scarce (Schnelle, Brandstätter, & Knöpfel, 2010). Furthermore, when people are in an avoidance mind-set, they are more motivated to conserve resources than when they are in an approach mind-set (Roskes, Elliot, Nijstad, & De Dreu, 2013). Thus, the various resources may each be linked via this shift toward motivational avoidance during times of resource scarcity and toward motivational approach during times of resource abundance. When a resource like money is low, this may heighten avoidant tendencies, which may in turn motivate conservation of social resources, bodily resources, and mental resources.

General and Nonresource-Specific Mechanisms

It may also be the case that a shared mechanism explains the various links between resources but that the mechanism is not specific to resource regulation. For example, it may be the case that acquiring and maintaining valuable resources is rewarding and results in a positive emotional state, whereas spending or losing resources is aversive and results in a negative emotional state. Moreover, people who are in positive moods seem more willing spend resources. Happy people are more willing to spend time and energy to help others (Isen & Levin, 1972; Weyant, 1978); more willing than other people to spend money (Spies, Hesse, & Loesch, 1997); and more willing to exert effortful self-control (Tice, Baumeister, Shmueli, & Muraven, 2007).

Thus, it may be that resource abundance (vs scarcity) induces positive emotions, which then increases spending of other resources. This would qualify as a shared mechanism across resources. However, it is not unique to resource regulation. For example, watching a funny movie does not alter one's resources, but it can induce a positive emotional state and may therefore increase willingness to spend resources. If emotional experiences are driving the linked abundance and scarcity patterns, then those patterns are not unique but rather are a special case of a much broader phenomenon.

Numerous Distinct Mechanisms

Another possible explanation for the linked scarcity and abundance patterns is that there are many distinct mechanisms driving the various links between resources. We reviewed evidence that whenever any nonmental

resource is scarce, people become less willing to expend mental resources. Thus, due to linked scarcity, whenever bodily resources, social resources, or money are scarce, the desire to conserve across resources increases, and people exert less mental effort. However, it is possible that the links between nonmental resource scarcity and reduced mental effort are different across nonmental resources. When social resources are scarce (eg, people have been socially excluded), self-control efforts may wane due to the fact that people are ashamed and avoid thinking about themselves, which is difficult, thus making it difficult to exert self-control (Baumeister et al., 2005). When money is scarce, self-control efforts may wane due to the fact that poor people have more difficult decisions to make than wealthy people (Mani et al., 2013), thereby resulting in decision fatigue (Vohs et al., 2008). Thus, the reductions in mental effort that occur under scarcity may not be due to a central scarcity process but instead to numerous, disparate processes.

Other Issues With a Linked Resource Approach

There are a variety of factors that are likely to be relevant to the connectedness between mental resources, nonmental resources, and action control. These other factors are beyond the scope of the current chapter, but they do bear mentioning at least briefly. First, situational factors could influence the connectedness between resources. For example, the substitutability between resources is more apparent for certain goals than for others. Second, there may be stable individual differences in terms of the resources people think about or draw from. For example, extraverts or people high in status seeking may be especially attuned to other people as a social resource and so may be more sensitive than others to shifts in social resource availability. Third, there may of course be other resources that we have overlooked. Potentially any valuable means toward achieving desired ends, if limited, can be thought of and treated as a limited resource. If that resource can furthermore be interpreted as substitutable with mental resources and other resources, then linked scarcity and abundance effects may be likely to occur.

MOVING FORWARD: LOOKING BEYOND MENTAL RESOURCES IN UNDERSTANDING ACTION CONTROL

We proposed that the availability of nonmental resources may influence a person's willingness to expend mental resources or, in other words, to exert self-control. When nonmental resources are abundant, people may be more willing to exert self-control. When nonmental resources are scarce, they may be less willing to exert self-control.

The present chapter thus presents a new approach to thinking about the link between limited resources and action control. Much of the recent work on effortful control has focused on the underlying cause of self-control depletion effects, with the main point of contention involving whether an actual limited resource underlies effortful mental processing and if so, what it is (Beedie & Lane, 2012; Gailliot & Baumeister, 2007; Inzlicht et al., 2014; Job et al., 2010; Kurzban et al., 2013). Our starting point for the current chapter was at the place in which the competing theories converge, which is the notion that effortful control declines with use and is at least thought of and treated by people *as if* it relies on a mental resource (Job et al., 2010). Our work thus seeks to expand the discussion of mental resources and action control by taking a broad view rather than by narrowing in.

The framework we have proposed of connectedness between mental and nonmental resources provides numerous hypotheses to test. First, there are many testable predictions that follow from the linked scarcity and linked abundance hypotheses. Though we reviewed multiple kinds of evidence for these hypotheses, the evidence was sparse for the link between certain resources, and much of the evidence was indirect. Future work can provide direct tests of whether perceived scarcity or abundance of any given nonmental resource has a direct causal effect on expenditure of mental resources. Given the number and variety of resources that may be substitutable with mental resources, there are many novel predictions to test.

Second, there are many potential mechanisms underlying the linked scarcity and linked abundance patterns that remain to be tested. As reviewed earlier, there are multiple candidates for a shared underlying mechanism between the various resources. Future work can test whether such a shared mechanism exists, be it subjective experiences of fatigue and vitality, shifts in approach and avoidance motivations, or some other process. Future work can also test whether there are other, distinct mechanisms linking unique pairs of resources. There might be an underlying process linking mental resources to social resources that is specific to those two resources. Here too, there are a large number of novel predictions to test.

The present framework also holds numerous real-world applications. Self-control capacity is predictive of many important life outcomes, and decrements in self-control are at the heart of many serious life problems, such as drug abuse, obesity, criminality, and issues with relationships, school, work, and finances (Elfhag & Morey, 2008; Moffitt et al., 2011; Perry & Carroll, 2008; Tangney et al., 2004). If the willingness to exert self-control is linked not only to perceived mental resources but also to the perceived availability of other resources—bodily resources, social resources, and monetary resources—then the current framework exposes

many new problems as well as potential new solutions to a range of life challenges.

CONCLUSION

Self-control is essential for a life well lived. People who are successful at exercising self-control are happier, healthier, more successful and have better relationships than people who are less successful at exercising self-control (Moffitt et al., 2011; Tangney et al., 2004; Vohs, Finkenauer, & Baumeister, 2011). Most people seem limited in their ability to exert self-control, however. After initial self-control exertions, subsequent self-control behavior typically suffers (Muraven et al., 1998). Self-control thus operates as if relying on a limited mental resource (Muraven & Baumeister, 2000). A major challenge for people seeking to control their behaviors is finding ways to manage and cope with these limited mental resources.

Mental resources are just one of many diverse resources people draw from to pursue their goals. To the extent that these diverse resources are substitutable, the availability of any one resource may influence a person's willingness to conserve versus spend the other resources. Thus, scarce resources elsewhere may motivate a person to conserve mental resources, while abundant resources elsewhere may make a person more willing to expend mental resources. The amount of resources at a person's disposal—whether bodily resources, social resources, monetary resources, or otherwise—may have a profound influence on a person's willingness to exert self-control.

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