Attentional and Motivational Mechanisms of Self-Control

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Reaching for an apple instead of a chocolate bar, refraining from yelling back at your boss, and foregoing the after-dinner cigarette. Although seemingly disparate, all these behaviors require a person to relinquish their immediate impulses in the service of a more important goal. And, as anyone who has tried to reach a personal goal knows, self-control does not always work – people choose the chocolate, yell back at their bosses, spouses and children, and continue to smoke despite deteriorating health. Why, then, is self-control so often not applied? In this chapter, we discuss the motivational and attendant attentional processes that underlie the extent to which a person uses self-control.

Although there is some discrepancy regarding the definition of self-control (e.g., Fujita, 2011), we define self-control as the effortful inhibition of an immediately gratifying behavior or impulse. In this way, self-control is related to, but distinct from the broader term self-regulation, which we use to describe any actions in the service of a focal goal. Self-regulation thus includes both effortful control of behavior (i.e., self-control), but also effortless, automatic, or habitual forms of goal directed behavior (Fishbach & Shen, 2014; Fujita, 2011). Self-control, then, includes controlling behavior in a variety of situations ranging from not acting on one's emotions to inhibiting automatic key presses in lab studies. Self-control dilemmas typically involve an immediate impulse or hedonic temptation (e.g., chocolate ice cream, reading words) that competes with a distal goal (e.g., maintaining one's weight, naming colors). While such dilemmas can be experienced non-consciously, and are frequently resolved without conscious awareness (e.g., when someone passes an ice cream shop without thinking of going in, or when a person reaches for a cookie without a spare thought to the effects on one's health), inhibitory self-control is frequently mobilized when we become aware of the dilemma. In these cases,

successfully applying self-control implies choosing the option that will benefit the distal goal, while self-control failure is inferred from choosing the proximal temptation.[i]

In this chapter, we first describe how self-control has typically been conceptualized using a resource metaphor and discuss how this model is incompatible with many research findings. We then describe an alternate model of self-control, which we call the shifting priorities model, and highlight the attentional and motivational mechanisms that underlie effective self-control. We then discuss how self-control can be improved, and highlight future research directions based on the shifting priorities model of self-control.

The resource model of self-control

For years, the predominant model of self-control proposed that self-control was a limited resource that would get depleted with use (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Similar to fuel in a car, it was argued that the resource that powers self-control runs out after prolonged use, at which point further self-control becomes impossible. This was thought to be the reason why a person at the end of a long day would stay home and watch TV instead of going to the gym, or why someone who had to restrain themselves at work would come home and yell at their spouse – their self-control was depleted and further control was simply not possible.

Support for this model comes from research showing that exerting self-control on one task impairs subsequent self-control on a second (usually different) subsequent task. For example, using self-control to resist eating chocolate (and eating radishes instead) leads people to give up faster when faced with unsolvable puzzles (Baumeister et al., 1998).That is, there appears to be a *refractory period* that follows self-control exertion, during which further self-control is not used. A meta-analysis of over 200 published studies using this sequential priming paradigm with various tasks has shown that exerting self-control at time one does indeed lead to reduced self-

control at time two (Hagger, Wood, Stiff, & Chatzisarantis, 2010). Although there is reason to question the robustness of this effect, including evidence of publication bias in the published literature (Carter & Mccullough, 2014) and a large-scale pre-registered study failing to replicate the basic effect (Hagger et al., in press), others have suggested that the effects of self-control are real, albeit likely smaller than previously suggested (Inzlicht & Berkman, 2015).

Although the resource model has been used to explain these findings of the sequential task studies, the proposed mechanism – the depletion of an actual resource – has never been reliably demonstrated. More importantly, no biologically plausible candidate resources have been proposed. While glucose has been found in one series of studies to underlie the depletion effect, others have failed to replicate these studies (Molden et al., 2012) or to reproduce these findings upon re-analysis of the data (Kurzban, 2010). More importantly, since mental effort consumes insubstantial amounts of brain glucose relative to what is available in the brain (Raichle & Mintun, 2006), is it is not biologically feasible for a drop in glucose to be responsible for the refractory period in self-control.

In addition to an inability to identify the central resource, many other findings have accumulated that challenge the resource model. Numerous studies have now shown that self-control can be maintained in the presence of incentives and increased motivation (e.g., Muraven & Slessareva, 2003). In the sequential task paradigm, more autonomous motivation for the first task leads people to maintain self-control in the second task (Moller, Deci & Ryan, 2006). Similarly, rewards and incentives for completing the second task lead people who have just exercised self-control (and thus should have been 'depleted') to perform equally well on that task as those who did not exercise self-control (Muraven & Slessareva, 2003). In addition, allowing a rewarding experience in the interval between the two tasks, such as watching an enjoyable

television show (Derrick, 2012) or meditating (Friese, Messner & Schaffner, 2012), also prevents reduced self-control in the second task. Such incentives work to counteract the effects of depletion even after prolonged or intense cognitive work (Boksem, Meijman, & Lorist, 2006). Such findings are incompatible with a resource model.

Other research has found that people's perceptions and construals are consistently better predictors of self-control use than prior self-control application. For example, people who perceive that they are depleted exert less self-control on a task while those who perceive that they have energy and stamina exert more self-control, independently of their prior self-control use (Clarkson, Hirt, Jia, & Alexander, 2010). Similarly, when people believe that self-control declines with time, they show such a decline, while those who believe that self-control is renewable do not (Job, Dweck, & Walton, 2010).

Together, these findings call into question the resource account of self-control, casting doubt on whether a resource is truly necessary to explain self-control's refractory period. That is, while the refractory period exists, and people DO frequently exert less self-control after initial self-control use, this does not have to be because some resource gets depleted. One alternate explanation centers around motivation – that is, rather than being unable to exert further self-control, people are simply unwilling to do so, and chose to forgo further self-control in favor of indulgence. This explanation for the refractory period has been called the process model of self-control, or more descriptively, the shifting priorities model (Inzlicht, Schmeichel, &Macrae, 2014).

The shifting priorities model of self-control

The shifting priorities model of self-control integrates research from a variety of areas (including social, cognitive, and motivational psychology, evolutionary science, neuroscience,

and economics) to explain what occurs when self-control is exerted and to provide an alternate, more plausible mechanism responsible for the decline of self-control over time. If, in line with our earlier definition, self-control is effortful, then enacting self-control requires a decision to expend that effort in favor of the distal goal. Such a decision can be based on numerous inputs reflecting the relative value of both indulgence and restraint; this has been termed valuation (Berkman, Livingston, Kahn, & Inzlicht, 2015). Specifically, valuation is the process of integrating various inputs regarding the subjective values (i.e., the pros and cons) of each possible choice in a self-control dilemma. For example, a dieter might be torn between eating a chocolate bar, eating an apple, or waiting another two hours until supper; each of these choices will have pros and cons (the hedonic value of the chocolate and the guilt that is expected after indulging; the positive identification as someone who can wait and the gurgling stomach). Although self-control dilemmas pit a distal goal against an immediate temptation, competing distal goals could bolster the value of the temptation. For example, indulging in the chocolate bar, while incompatible with the health goal, might be perfectly compatible with the distal goal of enjoying life to the fullest; bringing that goal to mind could bolster the value of indulging. Each choice can thus have a variety of value sources that can shift over time; this is illustrated in Figure 1.
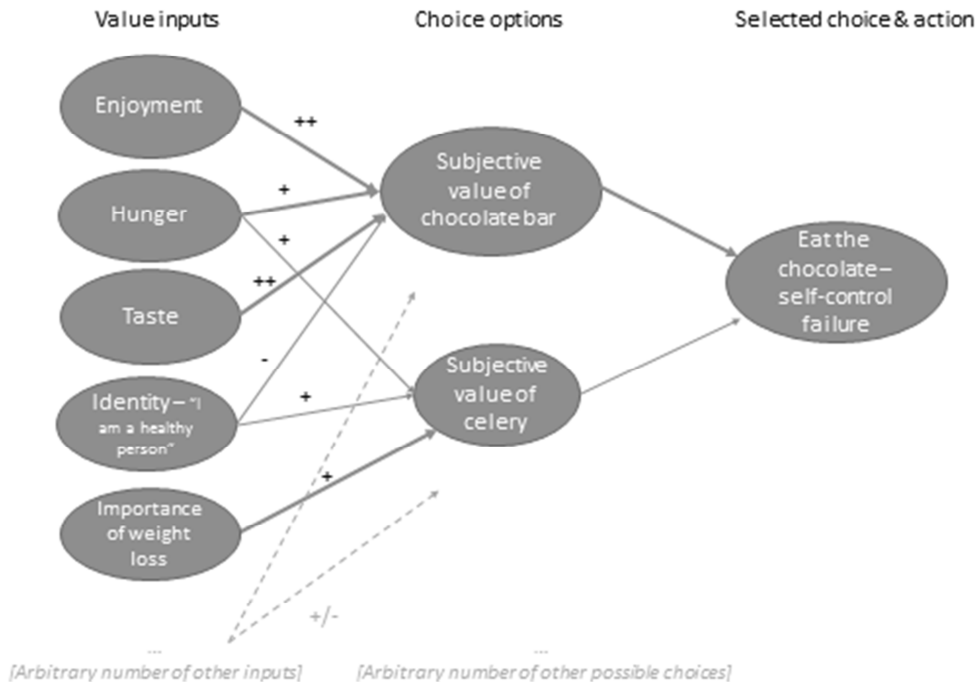
Figure 1. An example of valuation in the self-control dilemma of choosing between eating a chocolate bar or celery (adapted from Berkman et al., 2015). An arbitrary number of input processes such as rewards, hunger, effort costs, and identity (left) contribute to the subjective value (middle) of the impulsive (i.e., chocolate bar) and 'self-control' (i.e., celery) response options, leading to the enactment of the choice with the highest value (right). There can be an arbitrary number of input sources and response options. The values shift over time and are influenced by attentional and motivational processes. Immediacy determines which choice option is considered the impulsive option; the effortful inhibition of that option represents self-control.

Contrary to traditional views of self-control as 'good' and indulgence as 'bad', the shifting priorities model represents a less moralizing take on self-control. In our view, self-control is the

attempted effortful inhibition of an immediately gratifying behavior. Such a gratifying behavior is not inherently good or bad, and the same behavior could be considered as either immediately gratifying in some instances or as serving a distal goal in others. For example, the dilemma of whether to go for a run or watch TV with my partner can be construed in two ways: If the run is the more proximally tempting option that competes with my goal of spending time with my partner, successfully exerting self-control would mean staying home to watch TV. Alternatively, if the TV show is perceived as more immediately gratifying, then exerting self-control means going for the run. The values attributed to these options, including their immediacy, can shift over time.

Situational and temporal changes in the subjective values of each option can be explained by shifts in motivation – that is, the goal(s) that is (are) currently most salient for the individual. Motivation can shift based on both situational and internal factors – for example, hunger (an internal state) results in a goal to seek food. Motivation, in turn, drives attention (e.g., focus on the smell of food when hungry) and can affect perception (e.g., bacon might smell delicious even to a vegetarian) and memory (we may forget our goal of losing weight). These shifts in motivation (and attendant shifts in attention, memory, perception, etc.) then drive the valuation processes. For example, a growling stomach can shift our attention towards our hunger and increase the subjective value of food. Similarly, the perceived effort required for an action will decrease its subjective value – a person is less likely to go for a jog if they believe that a lot of effort is required than if they perceive the action as easy. Although the valuation process occurs implicitly and automatically (Lebreton, Jorge, Michel, Thirion, & Pessiglione, 2009), explicit processes can draw attention to certain features of the choices (e.g., the importance of the distal goal, or the delicious smell of the chocolate brownies), thereby influencing the valuation process

(Sullivan, Hutcherson, Harris, & Rangel, 2015). Additionally, the reasons for pursuing the goal (the 'why' of motivation) can influence these processes, as will be seen below.

The role of attention

Attention plays a role in self-control in two ways – by bringing the self-control dilemma into conscious awareness, and by selectively making the value sources of each choice salient. As mentioned earlier, the valuation process and corresponding choice can occur implicitly and automatically. In these instances, we may not even be aware of the dilemma. Attention, then, first becomes relevant to self-control by making a person aware of the existence of the self-control dilemma. Indeed, researchers have argued that in many cases, we are not aware of a conflict and either restrain or indulge automatically (Fishbach & Shen, 2014).The existence of such automatic self-regulation or goal-pursuit is supported by a large body of literature, the review of which is beyond the scope of this chapter. When the choice is easy, with the value of one choice overshadowing the other, conflict is not consciously experienced but is automatically resolved in favor of the more valuable choice. However, when the choice is difficult (as is usually the case when the choices have similar value in that moment), our attention is drawn to the dilemma. This is in line with theories of automaticity that state that our unconscious drives most of the behavior, with our consciousness stepping in when we hit a roadblock or difficult situation or decision (Baumeister & Bargh, 2014).

In cases where the decision relates to a conflict between similarly valued indulgences and distal goals, attention needs to be paid, and effortful self-control needs to be exercised. By paying attention to features of a situation that can make the choice difficult, individuals are more likely to experience conflicts, which are necessary to engage self-control. This can be seen in studies of mindfulness, which leads people to pay attention to cues in their environment. That is,

mindful individuals are more aware of external and internal cues that signal the necessity for control, thereby leading to greater control (Teper, Segal & Inzlicht, 2013). Additionally, paying attention to specific internal and external cues, such as how tired one is, or the fact that an effortful activity was recently undertaken, can shift the value of distal and proximal choices and weaken self-control. For example, after construing a walk as exercise vs. leisure (i.e., paying attention to the fact that it was exercise, which is typically construed as effortful), participants in a series of studies ate more (that is, they used less control to refrain from indulging; Werle, Wansink, & Payne, 2014).

Actively paying attention to external and internal cues to monitor both for temptations and for discrepancies between current and desired goal state can further mobilize self-control. This has been shown in both neuroscience studies that examine how people monitor their errors on tasks of cognitive control, and in behavioral studies examining long-term goal pursuit. In the former, research using electroencephalography (EEG) has shown that an amplified error-related negativity (ERN) signal, a brain potential that occurs immediately following the commission of an error, corresponds to better performance. That is, people whose brains show a stronger response following an error are then able to perform better on tasks of executive control – they are more likely to notice or feel the errors, and thus to exercise greater control (Inzlicht & Gutsell, 2007). Similarly, individuals who monitor their progress towards important goals (e.g., losing weight) are better able to notice when progress is lacking and then use self-control when necessary to attain their distal goal (see Harkin et al., 2016, for review and meta-analysis). Monitoring thus involves a shift in attention, whether conscious (as in progress monitoring) or unconscious (as in the ERN), which then affects the application of self-control by signaling that there is a conflict and self-control is needed.

A second way in which attention can affect the valuation process and influence self-control is by putting more weight onto some sources of value relative to others. For example, our growling stomach can cause us focus on our hunger and thereby weigh it more heavily than the importance of losing weight. This is especially seen in preferential attention towards the present versus the future, and towards immediate versus long-term rewards. Research in behavioral economics has consistently demonstrated that proximal rewards are valued more than distal rewards, primarily because proximal outcomes are more certain (Kahneman & Tversky, 1979). Evolutionarily, proximal rewards are also more beneficial, as it is advantageous to ensure that immediate needs are met before searching out future rewards. This is the reason why immediate impulses have stronger pull than the long term goals – the anticipation of the delicious chocolate bar right now overshadows the future health benefits of restraint. Shifting attention onto a broader picture, including thinking of a goal in abstract terms, can increase the value of the distal goal thereby increasing self-control (Fujita, Trope, Liberman, & Levin-Sagi, 2006).

The role of motivation

While attention affects the salience of the self-control dilemma and the valuation of choices, motivation directly contributes to the subjective valuation of each choice. Here, we refer to the 'why' of motivation, or the reasons why people select and pursue a given goal (Ryan & Deci 2000). Motivation can come from multiple sources: external incentives, interpersonal or societal pressure or standards ('shoulds'), intrinsic enjoyment, personal importance, and unmet needs. Each of these can shift the value placed on each choice and shift the balance in favor of either self-control or indulgence.

External incentives refer to monetary or other tangible rewards that can be received for engaging in a behavior or as a result of pursuing (and attaining) a distal goal. This could be a

well-paying job after finishing a prestigious degree, money promised to study participants for performance, or the potential money that a gambler could gain by playing the slot machine. Similarly, pressure from others or from what one 'ought' to do reflect a motivation external to the behavior itself. Examples of this are pressure from your spouse to lose weight, working long hours to finish a project to please your boss, or a teenager taking drugs because of peer pressure. Together, external rewards and interpersonal pressure can be considered *have-to* motivation – doing something because you feel like you have to or to get something out of it. In the short-term, such motivation can be beneficial for self-control. For example, people exercise greater self-control, even after initial depletion, if they are paid for their performance (Muraven & Slessareva, 2003). However, these might not be tenable in the long term – when the external incentives are no longer there, the value of the behavior would decrease (Ryan & Deci, 2000).

On the other hand, motivation can also stem from *want-to* reasons. These include both personally important reasons for engaging in a behavior and the intrinsic enjoyment of the activity itself. Personally important goals or behaviors are those that are tied to the person's core self and deeply held beliefs. If I think of myself as an active person, then engaging in active behavior will have a high motivational value in maintaining my positive self-image. Indirect evidence for this comes from self-determination theory, where research has found that goals that are pursued because of personal importance and reflect the true self are easier to implement and regulate (Milyavskaya, Inzlicht, Hope & Koestner, 2015) and are more likely to be attained (Sheldon & Elliott, 1998; Werner, Milyavskaya, Foxen-Craft, & Koestner, 2016). Additionally, experimental self-control tasks that are chosen freely by the participant (and thus pursued for want-to reasons) lead to less fatigue than self-control tasks assigned by the experimenter (and thus pursued for have-to reasons; Moller et al., 2006) Similarly, interest, which is an important

component of want-to motivation (Ryan & Deci, 2000), leads to greater persistence following depletion (Thoman, Smith, & Silvia, 2011).

Finally, the rewards inherent in the behavior itself reflect a type of want-to motivation. This could be the runners' high experienced while exercising, the delicious taste of the chocolate ice cream, or the relaxation resulting from slacking off rather than working hard. Due to their hedonic nature, temptations are usually high in intrinsic value; this is typically what makes them tempting in the first place. A dieter who dislikes chocolate will not experience a self-control dilemma when presented with the opportunity to indulge in chocolate cake. In contrast, distal goals and the behaviors they entail are typically less enjoyable in the moment.

Typically, behaviors or goals will have multiple sources of motivation – for example, the goal of losing weight can be motivated both by personal importance and the knowledge that one can win the office weight loss contest. The subjective value of each of these different motivations contributes to the valuation of each choice. As previously described, attention can be used to highlight some sources of motivation rather than others – for example, reminding a person of the enjoyment they usually get from exercise rather than focusing on the long-term benefits (Woolley & Fishbach, in press) can help self-control. Additionally, although motivational contributors usually lead to some sort of gain (in external value, enjoyment, or identity-consistent self-image), motivation can also result from potential losses. For example, one study has found that imposing a monetary cost for self-control failures can increase self-control successes (Schwartz, Mochon, Wyper, Maroba, Patel, & Ariely, 2014).

Similar to want-to motivation, research on psychological needs has also shown that these needs can be powerful sources of motivation. For example, when relatedness is threatened, people will work to regain it (Maner, DeWall, Baumeister, & Schaller, 2007). Similarly, when

autonomy is threatened, it becomes a more salient motivation (Radel, Pelletier, Sarazzin, & Milyavskaya, 2011); people then make choices that allow them to 'restore' autonomy. Additionally, needs can drive the distal goals that people set in the first place (Milyavskaya, Nadolny & Koestner, 2014), leading to want-to goals that receive more weight in the valuation process. Overall, the reasons *why* a person pursues a given outcome (whether proximal or distal) affect the value placed on each choice, therefore resolving the self-control dilemma by shifting the balance in the direction of either the immediately pleasurable behavior, the distal goal, or, in some cases, another alternative choice.

Why does self-control wane across time?

One consistent finding in the self-control literature is that self-control naturally wanes across time (but see Carter & Mccullough, 2014; Hagger et al., in press). According to the shifting priorities model, this decline in self-control is due to shifts in motivation away from the task demands and towards the tempting behavior(s). Prior exertion of self-control influences the valuation process by shifting both the value of exerting further effort and the value of indulging. First, exerting self-control on one task may shift the value attributed to further exerting self-control, leading a person to choose the proximal hedonic option instead of the distal goal. Essentially, after exerting mental effort (required in most instances of self-control), the value of exerting further effort becomes reduced, while the value of giving in to the tempting impulse is increased, such that the latter predominates (Kool & Botvinick, 2014). Although exerting self-control is usually beneficial and thus valuable, this value becomes overshadowed by the immediate costs of exerting this self-control. This occurs firstly because exerting self-control is aversive (Kool, McGuire, Rosen, & Botvinick, 2010), and the more time is spent engaging in effortful control, the more aversive it becomes (Kool & Botvinick, 2014). This is thought to be

evolutionarily adaptive, as it helps humans balance the needs for exploitation (exploiting an established source of rewards) and exploration (exploring the environment for other opportunities) by balancing task engagement and disengagement. Persevering at something for too long, then, may have not been evolutionarily adaptive (Kurzban, Duckworth, Kable, & Myers, 2013), and such perseverance became aversive (Kool et al., 2010).

Another way of looking at this is to consider the diminishing marginal utility of applying effort. A principle of economics, diminishing marginal utility describes how each additional unit of gain leads to a progressively smaller decrease in subjective value (Kahneman & Tversky, 1979). This can also be seen in studies that demonstrate the licensing effect – after successful restraint, people frequently give themselves permission to indulge (De Witt Huberts, Evers, & De Ridder, 2014). In both cases, engaging in a have-to behavior makes want-to behaviors more attractive, thereby changing the valuation of these behaviors (compared to the self-control option). That is, when one is depleted, motivation shifts to want-to, rather than have-to actions – if I want to eat the chocolate bar, and have to eat the apple, then the value of that chocolate bar will increase when I am depleted, making me more likely to indulge. However, if I truly want to eat the apple, this decision will be easier to make, and I will eat the apple even when depleted.

Improving self-control and self-regulation

The perspective on self-control described in this chapter also points to instances when self-control can be regained, and how it can be enhanced (see also, Inzlicht, Legault, & Teper, 2014). As can be expected, the shifting priorities model of self-control makes different predictions for improving self-control than the resource model. According to the resource model, self-control resembles a muscle that grows with exercise, such that small, repeated acts of self-control (e.g., using your non-dominant hand to brush your teeth) can build self-control in other domains

(Muraven, Baumeister & Tice, 1999). Although some studies have found these effects, others have not been able to replicate them, and a meta-analysis of published papers suggests that the overall effect is either negligible or unstable (Inzlicht & Berkman, 2015). The shifting priorities model, on the other hand, does not provide one recipe for enhancing self-control, but proposes that self-control and self-regulation can be increased to the extent that the balance of the relative values of indulgence and control can shift in favor of self-control(i.e., of the distal goal). When these shifts are slight, such that a decision is still required, self-control is improved. When these shifts are larger and the balance tips so much that one choice is automatically enacted, effortful inhibition (and thus self-control) is no longer necessary, although self-regulation is improved. Specifically, since the decision is based on the relative value of giving in to temptation or exerting self-control, increasing the value of applying self-control or decreasing the value of indulging should both bolster self-regulation. This can be done by targeting motivation, attention, and/or effort required for each of the competing behaviors.

The most intuitive way to improve self-control is by increasing the value of the distal option by shifting motivation. This can be done by adding extrinsic or interpersonal rewards – for example, when participants are given money or provided with interpersonal reasons for engaging in self-control, they are more likely to do so even after prior depletion (Muraven & Slessareva, 2003). It can also be done by enhancing want-to motivation, by either setting goals that are tied to one's identity or by bolstering the inherent enjoyment of the distal 'self-control' option. For example, making the self-control alternative more inherently enjoyable, such as making healthy food taste good, can increase its value and ultimately result in successful self-control (Woolley & Fishbach, in press). Importantly, increasing want-to motivation for distal goals would likely be a more effective solution because although extrinsic rewards are effective

in bolstering momentary self-control, they are not often tenable in the long-term (Ryan & Deci, 2000). Indeed, research on successful self-regulation has consistently demonstrated that people are more likely to attain want-to rather than have-to goals (Sheldon & Elliott, 1998).

Besides increasing the subjective value of the distal choice, another way to enhance self-control is to remove some value from the hedonic tempting choice. This can be done by imposing immediate consequences to the choice – for example imposing a payment for self-control failure (e.g., a swear jar). Increasing the costs to the hedonic tempting choices is the essence of pre-commitment strategies, such as forfeiting a substantial monetary discount when not increasing their purchases of healthy foods (Schwartz et al., 2014), or promising a friend to meet her at the gym. In these situations, indulging in the hedonic choice (e.g., buying unhealthy food; staying home instead of going to the gym) comes with a cost (forfeiting the rebate, disappointing your friend). One extreme example of this is the use of Antabuse in the treatment of alcoholism: patients take a drug (disulfiram) that makes them have a negative physical reaction (intense nausea and vomiting) when alcohol is consumed (Hughes & Cook, 1997), thereby attaching a real physical cost to immediate indulgence. By decreasing the value of the indulgence (by attaching a cost to it), the relative value of the distal goal is increased, thereby increasing the likelihood that it will be chosen and thus the likelihood of self-control.

In addition to manipulating the values of the choices, self-control can be improved by drawing attention to different aspects of the choices (including different sources of motivation, different costs and benefits, and different levels of abstraction). For example, framing a goal as intrinsic (i.e., related to helping the community) can lead to increased persistence in a learning context (Vansteenkiste et al., 2008), while repeatedly drawing attention to people's motivations for quitting smoking helps maintain abstinence (Whittaker et al., 2012). Additionally, research

has found that inducing high levels of construal (e.g., getting people to think about why, rather than how, they are pursuing a goal, or generating superordinate category labels) lead to increased self-control (Fujita et al., 2006). Overall, anything that shifts attention to the features of the situation that highlight the value of self-control or decrease the value of indulging should increase the relative value of the self-control option and thus results in greater self-control or greater self-regulation (when the distal option is chosen automatically).

Finally, one other way to increase self-regulation is to change the effort required for the different behaviors. Since the effort required for each option contributes to the valuation process, making self-control easier can help shift the balance in favor of self-control, or even eventually make it automatic (thereby no longer requiring self-control but improving self-regulation). One way to do this is by setting implementation intentions – specific if-then plans to make the behavior automatic (e.g., when I am hungry, I will take a fruit; Gollwitzer, 1999). Implementation intentions thus bolster self-regulation by reducing the effort required to engage in self-control or removing the necessity of exerting control altogether: if the action occurs automatically, less (or no) effort is required. This can also be done by anticipating the self-control dilemmas and setting up one's environment in such a way as to facilitate self-regulation. For example, keeping fresh fruits in plain sight, and the candy on a high shelf – more effort is necessary to reach the candy, and less effort to reach the fruit, favoring that option (Wansink, 2007). Such strategies also affect attention (out of sight, out of mind), thereby preventing the dilemma from requiring effortful self-control in the first place.

Directions for future research

Although the shifting priorities model builds on past research to present a specific mechanism of self-control, many of its components have not been directly evaluated. Much of

the research on motivation has focused on self-regulation more broadly, showing that goals that are pursued for want-to reasons, that are tied to one's identity, and that are accompanied with implementation intentions, are more likely to be attained (Ryan & Deci, 2000; Sheldon & Elliott, 1998; Gollwitzer, 1999). However, this does not directly speak to the self-control processes underlying increased goal progress. Future research can examine how shifting values of the alternative choices influence self-control decisions, and how these in turn are related to effective self-regulation more broadly.

Another important avenue for research is to test interventions based on the shifting priorities model. Currently, most interventions to increase self-control have been based on the resource model, which states that self-control can be trained like a muscle. That is, by applying self-control, people can build their capacity for exercising self-control in the future (the fuel tank gets bigger). However, the success of such self-control interventions is highly variable; few studies have been published, and many unpublished studies have not replicated the effects. According to the shifting priorities model, training self-control may be successful, not because it increases our capacity for self-control but by decreasing the effort required, or our lay beliefs about the possibility of exerting effort (Job et al., 2010). As described above, other interventions that either bolster the value of the distal goals, reduce the value of indulging, or shift attention to better notice the value of self-control should be more likely to succeed. While studies examining such interventions have been done looking at self-regulation more broadly (e.g., Schwartz et al., 2014; Harkin et al., 2016), the specific momentary resolutions of self-control dilemmas have not been examined. For example, would reminding a person throughout the day of their motivation for their valued goal(s) help them resist competing temptations? Some research on smoking cessation suggests that that is indeed the case – in multiple studies, participants who received

either text messages or used an app with advice and motivational messages were more likely to quit smoking (Whittaker et al., 2012). The messages received likely bolstered the value of self-control by reducing the effort required to exert self-control, reinforcing the 'want-to' motives for quitting; however, these specific mechanisms need to be further explored.

Finally, motivation can also reduce the pull of the tempting alternatives, removing the necessity for self-control in the first place. Recent research has found that people experience fewer temptations conflicting with their want-to goals (Milyavskaya et al., 2015), and perceive the pursuit of such goals as more effortless (Werner et al., 2016). In these cases, it may be that attention is shifted away from the tempting options in the first place such that self-control is not necessary. Or it may be that want-to motivation shifts the valuation balance so drastically that the choice in favor of the distal goal becomes automatic. This may be why people who pursue autonomous goals experience less frequent temptations – it may be that conflicts are consciously experienced only when the scales are relatively even. When the scales tip more heavily in one direction than another, conflict is not consciously experiences but is automatically resolved in favor of the more valuable choice (Fishbach & Shen, 2014). Future research is needed to further examine how and when these self-control dilemmas are experienced (or not experienced) and resolved in people's day-to-day lives.

Conclusions

In this chapter, we looked at the mechanism underlying effective self-control. Although self-control has long been considered a resource, direct evidence for this perspective is lacking. We described an alternative model that construes self-control as a choice, and the frequently observed reduction in self-control across time as the product of attentional and motivational processes that change the choices that people make over time. We demonstrated how existing

evidence supports this view, and highlighted areas where further evidence is needed. In sum, the evidence reviewed suggests that self-control will be most effective when the distal goal is tied to the person's identity, is pursued for want-to rather than have-to reasons (and these reasons are salient), and requires little effort. Self-control improvement strategies are most likely to be effective if they shift the valuation process in favor of the distal goal by either increasing the value of the distal goal, or decreasing the value of indulging, including shifting the amount of effort required for the competing choices. The shifting priorities model of self-control thus makes specific predictions about the role of attention and motivation on self-control dilemmas, including why self-control appears to be limited, and what can be done to improve self-control.

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[i] This distinction between proximal temptation and distal goal is somewhat arbitrary - depending on the goals themselves, a 'self-control' failure might actually be a success if it supports another distal goal. For example, going to a party instead of studying might be seen as self-control failure if the distal goal is getting good grades, but not if the distal goal is a social goal (e.g., having many friends, finding a romantic partner, etc.).