Perspectives on Psychological Science
2015, Vol. 10(5) 618–638

DOI: 10.1177/1745691615593382
pps.sagepub.com

On Integrating the Components of Self-Control

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Abstract
As the science of self-control matures, the organization and integration of its key concepts becomes increasingly important. In response, we identified seven major components or "nodes" in current theories and research bearing on self-control: *desire, higher order goal, desire–goal conflict, control motivation, control capacity, control effort*, and *enactment constraints*. To unify these diverse and interdisciplinary areas of research, we formulated the interplay of these components in an integrative model of self-control. In this model, desire and an at least partly incompatible higher order goal generate desire–goal conflict, which activates control motivation. Control motivation and control capacity interactively determine potential control effort. The actual control effort invested is determined by several moderators, including desire strength, perceived skill, and competing goals. Actual control effort and desire strength compete to determine a prevailing force, which ultimately determines behavior, provided that enactment constraints do not impede it. The proposed theoretical framework is useful for highlighting several new directions for research on self-control and for classifying self-control failures and self-control interventions.

Keywords
self-control, self-regulation, willpower, desire, temptation

> Science is built up with facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house.
> —Jules Henri Poincaré, *Science and Hypothesis*

Self-control has fascinated and perplexed many of the great thinkers of our past, dating back to Socrates (470–399 BC), Plato (437–347 BC), and Aristotle (384–322 BC). For millennia, such giants have asked the same quintessential question of self-control that we ask today: Why do we act on passion when reason knows better? Contemporary psychologists have been investigating the question now for almost half a century, beginning with Walter Mischel and his colleagues studying the ability of children to delay gratification (Mischel & Ebbesen, 1970; Mischel, Zeiss, & Ebbesen, 1972). Since then, many insights have been made, shedding light, bit by bit, on this unique part of the human condition.

Yet, researchers find themselves overwhelmed by a large collection of facts that do not easily cohere. One major challenge, a consequence of "zooming in," is that self-control involves several components that are often studied and discussed in isolation, making it difficult to grasp how they interconnect. For example, the construct of desire itself has recently received theoretical treatments on how it emerges and operates (Hofmann & Van Dillen, 2012; Kavanagh, Andrade, & May, 2005; see also Hofmann & Nordgren, 2015). Goals and goal pursuit have a long history in psychology (Carver & Scheier, 1982; Kruglanski et al., 2002). Intrapsychic conflict, pertinent to understanding incompatibilities between desires and higher order goals, has received considerable attention by cognitive neuroscientists (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Carter & Van Veen, 2007). Self-control motivation is a major topic in self-control research (Fujita, 2011; Muraven & Slessareva, 2003), with some explicitly pitting it against the idea that self-control relies on some depletable (physiological) resource or capacity (Beedie & Lane, 2012; Inzlicht, Schmeichel, & Macrae, 2014; Molden et al., 2012). Others assume depletable self-control resources explain

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failures at self-control (Baumeister, Vohs, & Tice, 2007; Heatherton & Wagner, 2011). Effort, per se, is the topic of a now classic article in psychology (Brehm & Self, 1989) and has recently received considerable attention (Kool & Botvinick, 2014; Kruglanski et al., 2012; Kurzban, Duckworth, Kable, & Myers, 2013). Behavioral constraints, important in understanding why people sometimes do not act on desire even when "internal constraints" fail, are catching the attention of behavioral economists interested in designing choice environments that facilitate self-control (Thaler & Sunstein, 2009; Wansink, 2004). All of these relevant research areas are not clearly connected, making it difficult to see how the components of self-control come together as a unified whole.

An opposite challenge, a consequence of "zooming out," is that research on self-control is often conveyed in vaguely defined terms such as "self-regulation," "willpower," and "ego" that impede progress toward a more rigorous, mechanistic view of self-control. We take the stance that self-control can be broken down into more clearly defined components. However, an integrative framework is needed to understand how these components work together. To this end, we drew on current theories and frameworks bearing on self-control to identify a coherent set of components involved and to formulate their interplay in what we call *integrative self-control theory* (SCT). We broadly review relevant empirical findings from various psychological disciplines to evaluate the model's various propositions. We then derive from its theoretical framework a classification system for self-control failures and self-control interventions.

Scope

SCT applies to all prototypical cases of self-control, which are characterized by the intrapsychic conflict between desire (colloquially referred to as "passion") and a higher order goal (colloquially referred to as "reason").[1] Human behavioral phenomena included are manifold and include the dieter tempted by a mouthwatering desert, the designated driver tempted by free cocktails, the faithful spouse tempted by an attractive colleague, the ex-smoker tempted by a pack of cigarettes, the frugal consumer tempted by fashionable but expensive clothes, and the student tempted to sleep in after another long day of exam preparations. The commonality among these cases is that they revolve around *desire–goal* (*D-G*) *conflicts*. We acknowledge a broader set of motivational/self-regulatory phenomena that includes, for example, *desire–desire* (*D-D*) *conflicts* (i.e., conflicts between two desires, such as to eat vs. to have sex) and *goal–goal* (*G-G*) *conflicts* (i.e., conflicts between two goals, such as to study vs. to do the laundry). However, we think that focusing on the "asymmetric" (Hofmann, Friese, & Strack, 2009; Scholer & Higgins, 2010) case at this time may have several benefits, including stimulating discussion of the characteristics and determinants of two qualitatively different psychological forces, their neuropsychological foundations (e.g., triggers and mechanisms of reward processing in the case of desire; executive operations in the case of higher order goal pursuit), and how they conflict; drawing attention to possible differences in how people deal with asymmetric D-G conflicts versus symmetric D-D or G-G conflicts (e.g., Hofmann, Fisher, Luhmann, Vohs, & Baumeister, 2014); suggesting qualitatively different ways through which self-control can fail or succeed (e.g., desire may be mentally overwhelming—a "hot" route—or commitment to higher order goals may be too weak—a "cold" route); and, finally, highlighting novel ways to improve self-control in the long run (e.g., changing desire experiences through evaluative conditioning or motivational retraining while boosting goal commitment through risk education programs). Moreover, as it is not yet clear how similar or different the D-D and G-G cases are to the D-G case, we decided to conservatively focus on the last case because it is most clearly about controlling a problematic desire (i.e., temptation). It is possible that the former cases are more about prioritization or time management, whereas only the latter involves self-control.

A Glance at the Seven Components

Before expounding SCT, it would be helpful to get acquainted with its main components.

1. *Desire*. Desire is a driving force that begins as a subcortically mediated visceral state of "wanting" (as defined by Berridge, Robinson, & Aldridge, 2009), usually followed by cognitive elaboration, that directs a person toward immediate reward-related stimuli.
2. *Higher order goal*. A higher order goal is a more cortically mediated and largely cognitive construct associated with an endorsed end state that motivates instrumental psychological (cognitive, affective, and behavioral) activity. Unlike desires, higher order goals are often pursued intentionally and associated with declarative expectations of long-term benefits.
3. *D-G conflict*. A D-G conflict is a form of response conflict caused by the coactivation of a given desire and an at least partly incompatible higher order goal. D-G conflict turns desire into temptation and the higher order goal into a self-control goal.
4. *Control motivation*. Control motivation is the aspiration to control desire. Thus, control motivation is determined by the higher order goal as well as additional sources.[2]

5. *Control capacity*. Control capacity is all the potential nonmotivational cognitive resources that a person possesses to control desire (e.g., directed attention, inhibitory capacity).
6. *Control effort*. Control effort is the effective use of control capacity.
7. *Enactment constraints*. Enactment constraints are environmental factors that limit one's behavioral options.

Insights From Earlier Theories and Frameworks

In this article, we draw on several current theories and frameworks regarding self-control and extend them by articulating how they synthesize. Here, we briefly review the main theoretical inputs of SCT.

Our conception of desire as a distinct construct was informed by Kavanagh et al.'s (2005) elaborated intrusion theory of desire and Berridge and Robinson's (1998) conception of wanting (also known as *incentive salience*). Kavanagh et al. (2005) described the conditions that trigger and fuel desire as well as how desire affects cognition and action. Their model distinguished between associative processes that trigger intrusive thoughts about reward-related stimuli and controlled processes of cognitive elaboration that usually follow those thoughts. Berridge and Robinson (1998) convincingly argued that dopamine systems specifically mediate wanting (also known as *incentive salience*), and not liking (also known as *hedonic impact*) or learning (also known as *predictive associations and cognitions*). Of these three processes, our conception of desire is most closely associated with wanting, and thus, we see it as possible to desire something without liking it or expecting to like it.

Regarding our conception of higher order goals, we drew on goal-systems theory (Kruglanski et al., 2002) that takes a cognitive approach to goals and motivation. Goal-systems theory assumes that goals systems, like other cognitive systems, have structural properties that stem from their cognitive interconnectedness and allocational properties that stem from limited attentional resources. These principles inform our conception of the interactions between higher order goals and desires. Specifically regarding violations of the higher order goal, cybernetic principles posit that such violations introduce serious disorder into the person as a goal-directed system, which may explain why control efforts are usually aimed at inhibiting desire in favor of maintaining the higher order goal (Carver & Scheier, 1982, 1990; Powers, 1973).

Our formulation of D-G conflict determination is informed by cognitive neuroscientific research on monitoring for and detecting response conflicts (Botvinick, Cohen, & Carter, 2004; Carter & Van Veen, 2007; Yeung, Botvinick, & Cohen, 2004). Specifically, in line with conflict-monitoring theory (Botvinick, Nystrom, Fissell, Carter, & Cohen, 1999), we hold that D-G conflict levels are affected by the activation strengths of the competing responses. We extend conflict-monitoring theory by discussing the implications of varying incompatibility. Further, like some other recent self-control models, we assume that conflict detection is the primary trigger for effortful self-control (e.g., Inzlicht & Legault, 2014; Myrseth & Fishbach, 2009).

With regard to control motivation and control capacity, we see these components as determining one's *potential* effort. Thus, their reduction from prior self-control exertion may limit subsequent self-control performance (Baumeister et al., 2007; Muraven & Slessareva, 2003). A current debate concerns the interplay and relative contribution of motivation and capacity processes to self-control (Hagger, Wood, Stiff, & Chatzisarantis, 2010; Inzlicht & Schmeichel, 2012). Furthermore, it was claimed that glucose is the key depletable physiological resource underlying self-control capacity (Gailliot et al., 2007). However, more recently, researchers have cast doubt on this hypothesis (Beedie & Lane, 2012; Inzlicht et al., 2014; Kurzban et al., 2013; Molden et al., 2012; see also Schimmack, 2012). In SCT, we do not make assumptions about the biological basis of the depletion of "control capacity." Rather, control capacity encompasses *cognitive* resources such as directed attention (also known as *executive attention*; Kane & Engle, 2002; Kaplan & Berman, 2010), the availability of which fluctuates depending on allocation and depletion. Therefore, whether the glucose hypothesis is correct has no bearing on our conception of control capacity and its interplay with control motivation.

Our analysis of self-control effort also integrated insights from cognitive energetics theory (Kruglanski et al., 2012). This theory illustrates how energetic forces determine goal-directed thinking, which is proposed to be propelled by a driving force and opposed by a number of obstacles (the restraining force). In this theory, a potential driving force represents how much energy a person possibly could invest, whereas an effective driving force represents how much energy a person actually invests. Potential driving force is determined by momentary goal importance and cognitive resources. Effective driving force represents the amount of energy one actually spends to try to overcome the restraining force. The magnitude of the restraining force is determined by a person's inclination to conserve mental resources, current task demands, and competing goals. In our exposition on self-control exertion, we explain how these concepts relate with self-control.

Finally, in regard to enactment constraints, we built on our earlier conception of *opportunity constraints* (Hofmann & Kotabe, 2012) and integrated research on *choice architecture* (Thaler & Sunstein, 2009)—the proactive designing of environments to facilitate better decision making—and *self-commitment* (Brocas, Carrillo, & Dewatripont, 2004;

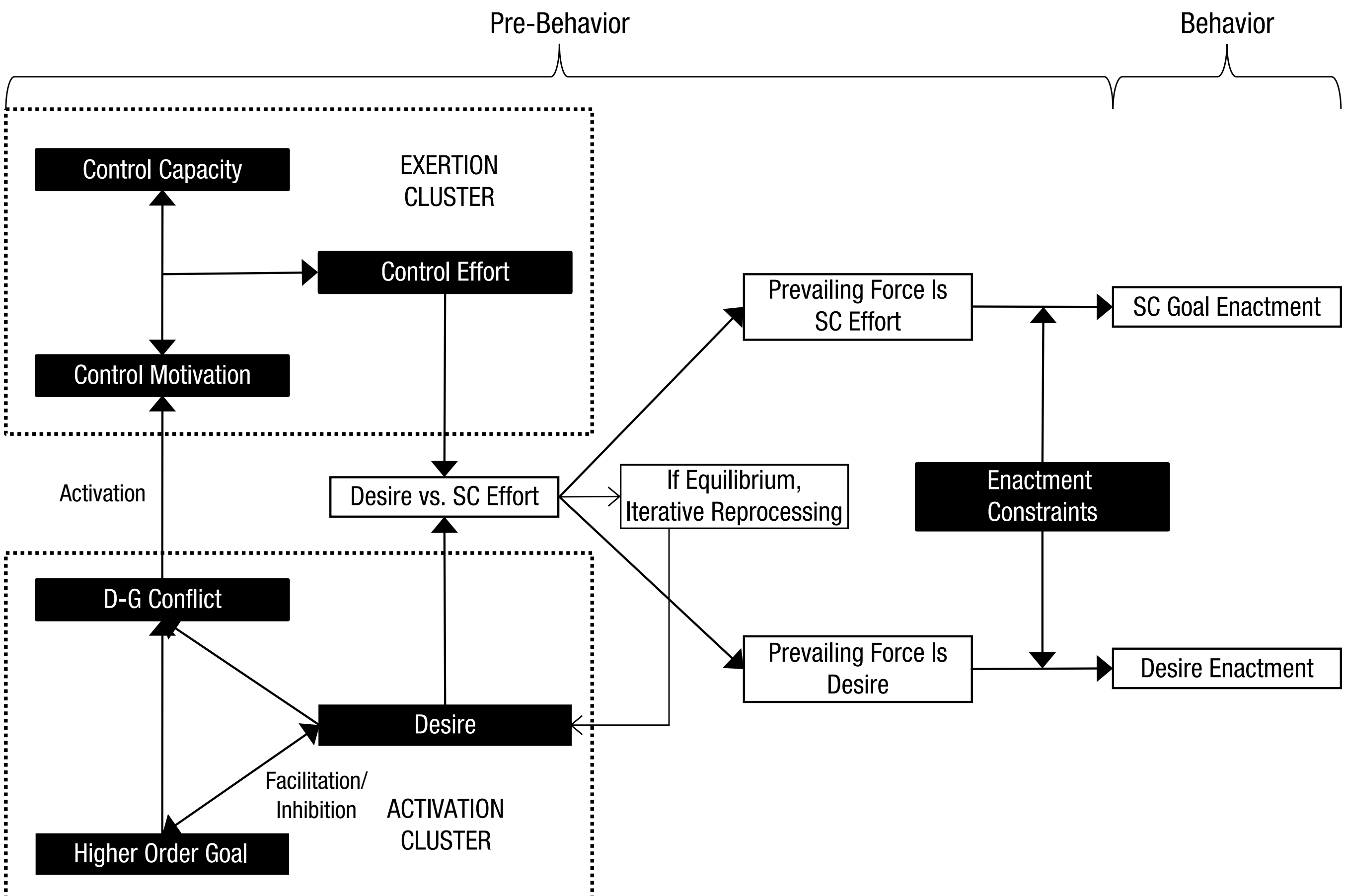

Fig. 1. A diagram of integrative self-control (SC) theory. The coactivation of desire and an at least partly incompatible higher order goal induces desire–goal (D-G) conflict, which triggers SC exertion processes by yielding control motivation. Control motivation and control capacity determine the upper limit of control effort (see Figure 2 for further explanation). If control effort prevails over desire, then SC will succeed provided that enactment constraints do not prevent higher order goal enactment. If desire prevails over control effort, then SC will fail provided that enactment constraints do not prevent desire enactment.

Bryan, Karlan, & Nelson, 2010)—the process of locking oneself into a certain course of action to prevent weakness of will. We also drew from *I*[3] *theory* (Finkel, 2013), a general theory of human behavior that holds that any human behavior can be predicted by examining the main and interactive effects of *Instigators* (i.e., factors that normatively afford a certain behavior), *Impellors* (i.e., factors that increase the likelihood of enacting that behavior), and *Inhibitors* (i.e., factors that increase the likelihood of overriding the effects of instigators and impellors) in a given situation. In SCT, we view desire as capturing the impelling force and distinguish between internal (control motivation, control capacity, control effort) and external (enactment constraints) inhibiting factors. We also discuss how the combination of these various factors can result in a classifiable variety of behavioral outcomes.

An Integrative Theory of Self-Control

Self-control can be understood as an evolutionarily adaptive function that has emerged from the need to coordinate motivations resulting from multiple dedicated subsystems in the brain (Livnat & Pippenger, 2006). These motivations consist not only of bodily needs and reflexive impulses to stimuli in one's context or environment but also social and long-term motivations arising from the sophisticated ability to imagine future outcomes (Morsella, 2005; Tooby & Cosmides, 1992). To effectively deal with such motivational conflicts, an optimal decision-making system may require at least two concerted faculties: a faculty for the detection of conflict (e.g., Botvinick et al., 2001; Livnat & Pippenger, 2006; Yeung et al., 2004) and a faculty for the resolution of internal conflict (Egner, 2008). We adopt this general perspective by distinguishing between an "activation cluster" and an "exertion cluster" in SCT (see Figure 1).

It is important to note that our analysis is at the level of the main components of self-control and their interactions. The degree to which these components are supported by relatively more controlled or automatic processes is currently under debate. In line with influential models of desire and wanting (Berridge et al., 2009;

Kavanagh et al., 2005), we assume that desire typically emerges in a relatively automatic (i.e., associative, resource-independent) manner as reward processing centers in the brain evaluate stimuli properties on the background of internal need states and learning history (for a more detailed explanation, see Hofmann & Van Dillen, 2012). In contrast, we assume that the mechanisms involved in effortful self-control operate in a relatively controlled (i.e., rule-based, resource-dependent) manner. However, a strict one-to-one mapping of desire and control to different levels of processing is implausible for at least three reasons. First, there is considerable evidence suggesting that desire can induce controlled processes (e.g., planning where to get the next cigarette; motivated reasoning) as it enters working memory and becomes more elaborated (De Witt Huberts, Evers, & De Ridder, 2013; Hofmann, Friese, Schmeichel, & Baddeley, 2011; Hofmann & Van Dillen, 2012; Kavanagh et al., 2005; Nordgren & Chou, 2013; Van Dillen, Papies, & Hofmann, 2013). Second, some controlled processes involved in effortful self-control may turn into automatic or habitual processes over time as they are repeatedly practiced (Fishbach, Friedman, & Kruglanski, 2003; Neal, Wood, & Drolet, 2013; Ouellette & Wood, 1998). Third, assuming a hierarchical nature of action control (Carver & Scheier, 1982, 1990; Powers, 1973), controlled efforts to advance a higher order goal may induce an instant adjustment of more automatic subsystems involved in attention allocation, response selection, and response execution (Dreisbach & Haider, 2009; Folk, Remington, & Johnston, 1992; Miller & Cohen, 2001). From such a hierarchical perspective of automaticity and control, effortful self-control must work with an auxiliary of automatic processes. For these reasons, we refrain from subsuming the components of self-control into a strict automatic versus controlled dichotomy. Rather, we assume that each component has automatic and controlled aspects, and their interplay within and across components is an important topic for future research.

The activation cluster

The activation cluster comprises the first three components of SCT: desire, higher order goal, and D-G conflict (see Figure 1).

Desire. Although the term desire is colloquially used to refer to all kinds of wishes and wants (e.g., "he desires to build his own car"; "the student desires straight A's"), we advance a technical definition to help distinguish it as a unique construct: Desire is a psychological driving force that varies in strength and is rooted in innate or learned need states (e.g., for food, alcohol, drugs, sex, rest, social connection, gambling). It directs a person toward immediate, rewarding stimuli. A person can experience desire even when he or she does not know why he or she is experiencing desire (e.g., imagine a gambler wants to take another chance at roulette even though he thinks he is done for the night). Desire originates as a state of wanting (Berridge et al., 2009) when subcortical reward processing regions (e.g., the nucleus accumbens) evaluate external stimuli (instigating factors) against the backdrop of internal need states and one's learning history (impelling factors; Hofmann & Kotabe, 2013). Fast associative processes give rise to apparently spontaneous, intrusive thoughts about the appetitive target. When those intrusive thoughts signal the possibility of pleasure or relief, cognitive elaboration usually ensues (Kavanagh et al., 2005). Through cognitive elaboration, desires can "crowd out" concurrent cognitive activity associated with higher order goals (Hofmann et al., 2011; Hofmann & Van Dillen, 2012; Kavanagh et al., 2005). Such elaborative processes maintain the desired target in working memory over an extended period.

Desire and related concepts (e.g., impulse, craving) are studied from various levels of psychological analysis. Approaches that help bridge the social–cognitive and neural levels of analyses have been particularly fruitful here. From such a perspective, the current consensus is that the wanting aspect of desire is mediated by largely subcortical neural systems that include mesolimbic dopamine projections. Research has shown that specific parts of the nucleus accumbens in the ventral striatum mediates opioid-stimulated increases in wanting (Berridge et al., 2009; Peciña & Berridge, 2005). Reward signals from midbrain regions are then forwarded to regions in the brain involved in reward representation and integration, with the orbitofrontal cortex being among the regions most consistently implicated in the conscious representation of desire (Van der Laan, De Ridder, Viergevera, & Smeetsa, 2011). Broader behavioral neuroscientific models, such as the balance model by Heatherton and Wagner (2011), suggest that humans fail to control desire when lateral prefrontal cortical (PFC) regions do not exert enough top-down control over subcortical reward-processing due to either strong reward signals (desire) or impaired prefrontal function due to contextual factors (e.g., depletion of control capacity).

Desire is necessary but not sufficient for the activation of effortful self-control processes. To activate effortful self-control, one needs to activate both a lower order desire and a conflicting higher order goal. It is important to note at this point that our analysis is at the subjective level throughout. The absence of self-control activation does not imply that a given desire is nonproblematic when judged by an outsider (e.g., parent, spouse, policy maker). Some desires are consensually harmful yet are enacted because the person does not hold a conflicting higher order goal. For example, a heroin addict may overdose after acting on a nonconflicting desire for heroin. For the heroin addict to engage self-control, he or she would need to at least minimally internalize the outsider's perspective.

Higher order goal. A higher order goal is a relatively "cool" cognitive construct, largely mediated by cortical circuitry (Miller & Cohen, 2001; see also Berridge et al., 2009), which is associated with an endorsed end state that motivates instrumental psychological (cognitive, affective, and behavioral) activity (Moskowitz & Grant, 2009). Unlike desires, higher order goals are often pursued intentionally and are associated with declarative expectations of long-term benefits. A higher order goal can motivate action that either purely inhibits (a "do not" higher order goal) or overrides (a "do" higher order goal) that of the focal desire. For example, a dieter may have a "do not" goal to not eat junk food or a "do" goal to eat vegetables instead of junk food. Both types of goals have in common that they associate with a long-term and beneficial state of "healthfulness," but they differ in that the former is aimed at purely inhibiting desire enactment, whereas the latter is aimed at overriding it with behavior compatible with the higher order goal.

Mental representations associated with higher order goals may typically be more abstract than those associated with desires (Fujita, 2011). For example, when faced with a tempting food, a dieter may associate abstract ideas, such as weight loss, with the higher order goal, whereas desire is more associated with concrete features of the tempting food, such as its color, smell, texture, and so forth. Also, higher order goals may be more strongly associated with a person's values and virtues than desire (Hofmann, Baumeister, Forster, & Vohs, 2012). Consequently, goal-consistent and goal-inconsistent behaviors may be more likely to be linked with self-conscious emotions such as pride and guilt, respectively (Eyal & Fishbach, 2010; Hofmann & Fisher, 2012; Hofmann, Kotabe, & Luhmann, 2013; Kotabe, Righetti, & Hofmann, 2013).

Like desires, higher order goals vary in strength. At a cognitive level, higher order goal strength may correspond with the accessibility of the associated target end state and supporting cognitions in memory (Fishbach & Ferguson, 2007). Further, higher order goal strength is determined by at least two (often correlated) factors: *importance* and *commitment*. Whereas importance refers to the degree to which a goal represents a high-priority objective (Fishbach et al., 2003), commitment refers to one's determination to achieve a goal (Klein, Wesson, Hollenbeck, & Alge, 1999).

D-G conflict. At bottom, we posit that D-G conflict is a form of response conflict as defined by cognitive neuroscientific models (e.g., Botvinick et al., 2001). That is, D-G conflict is induced by the "coactivation of mutually incompatible responses" (Yeung et al., 2004, p. 931). It follows that D-G conflict should have the same basic function as other response conflicts: motivating conflict resolution through cognitive and behavioral adjustment (Botvinick et al., 2001; Kerns et al., 2004; Yeung et al., 2004). Recently, models of self-control have included the monitoring for and detection of response conflicts as key processes in the activation of effortful self-control (e.g., Inzlicht & Legault, 2014; Milkman, Rogers, & Bazerman, 2008; Myrseth & Fishbach, 2009). When self-control processes are activated by D-G conflict, the desire becomes a temptation, and the higher order goal becomes a self-control goal.

Neural models of conflict monitoring and detection propose that the anterior cingulate cortex (ACC) responds to occurrences of response conflict (for reviews, see Botvinick et al., 2001, 2004). The conflict-monitoring theory, supported by several experiments and simulations (e.g., Botvinick et al., 2001; van Veen & Carter, 2002; Yeung et al., 2004), assumes that ACC activation, in response to conflict, functions like an internal "alarm bell" that triggers a subsequent adjustment in cognitive control processes occurring in various regions of the PFC. In other words, conflict monitoring and detection involves an evaluative process that helps determine how much control needs to be exerted to resolve conflict to advance the intended goal. We adopt this idea by suggesting that the detection of D-G conflicts is the primary trigger for control motivation, and thus, it bridges the activation and exertion clusters.

D-G conflict differs from other motivational conflicts in its main determinants and some of its consequences. By definition, D-G conflict is induced by the coactivation of lower order and higher order motivational processes. To illustrate this asymmetry, researchers have identified variants of these two determinants as "vices" and "virtues" (Read, Loewenstein, & Kalyanaraman, 1999), "inner demons" and "better angels" (Pinker, 2012), and "want self" and "should self" (Bazerman, Tenbrunsel, & Wade-Benzoni, 1998). Recent research has suggested that trait self-control is associated with how well people deal with D-G conflicts, but not with how well they deal with other motivational conflicts, supporting that D-G conflict differs from other motivational conflicts, and it uniquely defines the temptation case (Hofmann et al., 2014). There seems to be a particular interest in such conflicts, perhaps because of their special consequences: Assuming that violating a higher order goal is relatively more disruptive to the person as a goal-directed system than not enacting desire, D-G conflict should, under normal circumstances, signal the need to control desire, effectively making desire (partially) unwanted, whereas the higher order goal remains endorsed. There is some imaging research supporting the D-G conflict distinction. Unlike in conflict monitoring and cognitive control in response conflict tasks (see Botvinick et al., 2001), self-control struggles involve subcortical reward- and emotion-related brain activity (Heatherton & Wagner, 2011), indicating the presence of desire. This is further supported by various neuroimaging research on dual-systems models (e.g., Li & Sinha, 2008; Somerville, Jones, & Casey, 2010; Volkow et al., 2010; Volkow, Wang, Fowler, & Telang, 2008). Further, neuroimaging research on economic decision making has shown that subcortical activity is associated with more immediate outcomes, whereas PFC activity is associated with more long-term outcomes (Huettel, 2010; McClure, Laibson, Loewenstein, & Cohen, 2004). Relatedly, a recent self-control model centered on affect suggests that D-G conflict is a particularly distressing form of response conflict that signals that there is a potential for things to go wrong (Inzlicht & Legault, 2014). Together, this research suggests that, at least in some respects, D-G conflict is determined and dealt with differently from other response conflicts.

On the components of the activation cluster working together. Our conception of the activation cluster suggests that D-G conflict may be predicted reasonably well as a function of (a) desire strength, (b) higher order goal strength, and (c) the degree of incompatibility between the two. Determining this function is an important goal for future research. Taking a cybernetic approach, we suggest that when incompatibility between the two forces is high, strong—as compared with weak—desires would seriously threaten higher order goal pursuit, thus increasing D-G conflict. Further, as the possibility of violating strong—as compared with weak—higher order goals poses potentially serious disruption to the person, higher order goal strength should also increase D-G conflict. However, incompatibility is not always extreme. The implication is that the presence of a strong desire and a strong higher order goal does not necessarily translate to strong D-G conflict: It depends on how incompatible the higher order goal is with the active desire, or vice versa (see Riediger & Freund, 2004). Imagine that we held constant the strength of a desire (e.g., for junk food) and an incompatible higher order goal in a person while varying the degree of incompatibility between the two (e.g., by substituting a strong dieting goal with an equally strong exercise goal). Then, D-G conflict would be weaker in the case of the exercising goal to the extent that exercising, compared with dieting, is less incompatible with the desire for junk food.

We should mention here that the strengths of desire and the higher order goal are not necessarily independent. There is evidence that desires and higher order goals influence each other dynamically by exerting activating and inhibiting effects on each other. Research by Fishbach et al. (2003) suggests that desires facilitate the activation of higher order goals among people who successfully control desires but inhibit higher order goals among people who are less successful at controlling desires (see also Papies, Stroebe, & Aarts, 2008; Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008). Conversely, strong higher order goals may help to reduce desire-related processing through goal shielding mechanisms (Shah, Friedman, & Kruglanski, 2002).

This discussion highlights two general routes through which desire can be controlled: (a) through the inhibition/down-regulation of desire at the outset of the self-control episode and (b) through effortful self-control that is triggered by D-G conflict. One may note the topographical similarities between these two routes and Gross's (1998) process model of emotion regulation. Insofar as desire is an emotional construct (see Hofmann & Kotabe, 2013), the process model should apply: The inhibition/down-regulation of desire may be aided by situation selection, situation modification, attentional deployment, and cognitive change, whereas response modulation occurs after the emergence of D-G conflict. Magen and Gross (2010) proposed a process-oriented model of self-control that proposes multiple possible stages of self-control in this very way. In real life, self-control may often involve a combination of these two processes: Some of self-control is mediated through the more automatic inhibition/down-regulation of desire, and some is mediated through effortful self-control—with effortful self-control having to deal with the residual effect of desire remaining after such early-stage inhibitory/down-regulative mechanisms have had effect. An important direction for future research is to investigate how individuals and situations differ with regard to the degree to which these two routes are involved.

The exertion cluster

The exertion cluster of SCT comprises control motivation, control capacity, and control effort (see Figure 1). On the basis of the cognitive neuroscientific and motivational literatures on intrapsychic conflict resolution (Botvinick et al., 2001; Carter et al., 1998; Hofmann, Baumeister, et al., 2012; Inzlicht & Legault, 2014; Myrseth & Fishbach, 2009; Yeung et al., 2004), we propose that D-G conflict—the output of the activation cluster—triggers operations of the exertion cluster through control motivation.

Control motivation. We define control motivation as the aspiration to control desire. On the basis of research on conflict detection and subsequent control engagement, we propose that control motivation is activated by and correlated with D-G conflict. Converging evidence from researchers using neuroimaging and electroencephalography supports that the ACC monitors for and detects response conflicts and subsequently engages PFC regions, primarily in the lateral areas, to resolve that conflict (Carter & Van Veen, 2007). The level of control engagement has been shown to correspond with the degree of response conflict (Botvinick et al., 2001).

As implied by this relationship, control motivation may be partly determined by the strength of the higher order goal as mediated via D-G conflict. That is, a strong higher order goal, compared with a weak one, may "signal" through D-G conflict that violating it is a major concern, and therefore, desire should be controlled (see Carver & Scheier, 1982; Kruglanski et al., 2002). Likewise, control motivation may also be partly determined by the strength of desire mediated via D-G conflict. A strong desire, compared with a weak one, may signal through D-G conflict that it is a major threat to higher order goal fulfillment, and therefore, controlling it is important. Beyond these sources of control motivation, there may be several other sources of control motivation.

First, one of the axioms in psychology is that people aspire to be effective and in control. Versions of this axiom have been referred to as striving for self-efficacy (Bandura, 1977), valuing control (Higgins, 2011), the need for competence (Deci & Ryan, 1985), and effectance motivation (White, 1959). The underlying principle is that people are chronically motivated to feel effective (competent, in control, etc.). As a basic motive (Fiske, 2003), this goal to be effective may be superordinate and independent of the strength of the higher order goal in conflict with desire. Further, it may be pursued simultaneously. For example, a dieter may aspire to control food desires to pursue his or her higher order goal to lose weight, but he or she may further aspire to control these desires purely for the sake of feeling in control. Therefore, we argue that this can independently contribute to control motivation. Second, expectations of future higher order, goal-related behaviors and beliefs regarding how D-G conflicts should be balanced over time may also affect how strongly one aspires to control desire in the present through goal-balancing mechanisms (Fishbach & Dhar, 2005; Fishbach, Zhang, & Koo, 2009). If people expect to make progress toward or violate their higher order goals in the future, they may aspire less or more, respectively, to control their desires in the present—not because their desires or higher order goals change in strength but rather to counterbalance future higher order, goal-related behaviors. Further, people may hold certain beliefs about how to strike the "right" balance between desire and higher order goal enactment in their daily lives that specifically affect control motivation (e.g., one may believe that one spur-of-the-moment purchase at the end of the month is okay). Third, people may aspire to control desire to experience positive self-conscious emotions, such as pride, or to not experience negative self-conscious emotions, such as guilt. Recent research suggests that anticipating pride from avoiding desire and anticipating guilt from enacting desire can result in decreased desire enactment (Kotabe, Righetti, & Hofmann, 2013; see also Patrick, Chun, & Macinnis, 2009). Tangney, Stuewig, and Mashek (2007) made a corresponding argument, suggesting that such secondary emotional rewards may substitute for foregone primary pleasures. Again, this may be a source of control motivation largely independent of that transmitted through D-G conflict. This discussion suggests that there may be several additional sources of control motivation beyond what is transmitted via D-G conflict.

Control capacity. Control capacity refers to all the nonmotivational cognitive resources one has in a given moment to override desire with a higher order goal (see Baumeister & Heatherton, 1996; Carver & Scheier, 1996). As aforementioned, on the basis of the neuropsychological evidence, lateral and other PFC regions seem to compose the main neural substrate for effortful control processing, suggesting that these regions of the brain are critical to control capacity (Heatherton & Wagner, 2011). In one study, transcranial magnetic stimulation to the lateral PFC apparently caused people to choose more immediate rewards over larger delayed rewards (Figner et al., 2010). This view corresponds with the contemporary neurodevelopmental theory that children and adolescents are more impulsive than adults because of an immature capacity for self-control associated with the relatively slow development of the PFC (Casey, Getz, & Galvan, 2008; Diamond, 2002; Kotabe, Hardisty, Weber, & Figner, 2013). Beyond the PFC, individual differences in self-control capacity might also relate with prefrontal-subcortical connectivity (Heatherton & Wagner, 2011).

Control capacity is closely linked with a set of cognitive constructs called *executive functions* (Hofmann, Schmeichel, & Baddeley, 2012; Kaplan & Berman, 2010). Executive functions subserve a wide range of cognitive processes, and their operations also rely heavily on the PFC in humans (Alvarez & Emory, 2006; Miyake et al., 2000). Recently, a convincing argument was made that executive functions and what we call control capacity rely on the same depletable and restorable cognitive resource: directed attention (Kaplan & Berman, 2010). The importance of executive functions to self-control is clear. It was shown that executive functions may help reduce the influence of impulsive predispositions toward tempting stimuli on actual behavior (Hofmann, Friese, & Roefs, 2009; Hofmann, Rauch, & Gawronski, 2007). Moreover, a recent review suggests that the three basic executive functions from Miyake et al.'s (2000) framework—updating, inhibiting, and shifting—independently contribute to self-control performance (Hofmann, Schmeichel, & Baddeley, 2012).

More specifically, individual differences in working memory capacity may moderate the degree to which people's behaviors in tempting contexts is guided by desire versus higher order goals—with people low in working memory capacity guided more by desire and people high in working memory capacity guided more by higher order goals (Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008). In addition, people high in working memory capacity may be better at suppressing the expression of emotions and appraising emotional stimuli unemotionally (Schmeichel, Volokhov, & Demaree, 2008).

Evidence is mounting that control capacity can be restored in the short-run and improved in the long-run. According to the strength model, one simple way to restore control capacity in the short-run is to rest (Baumeister, 2002; Tyler & Burns, 2008; cf. Vohs, Glass, Maddox, & Markman, 2011). This view is supported by research showing relationships between rest and mental resources (Spiegel, Tasali, Leproult, & Van Cauter, 2009) and, oppositely, rest disturbance and fatigue (Åkerstedt et al., 2004). Some researchers have argued that control capacity can also be boosted by consuming glucose (Gailliot et al., 2007; Heatherton & Wagner, 2011; Masicampo & Baumeister, 2008), although this hypothesis has been doubted recently. Our take is that what is temporarily impaired are *cognitive abilities* that rely on directed attention (Kaplan & Berman, 2010), and although these cognitive abilities (e.g., working memory) do rely on glucose (as demonstrated by positron emission tomography), their breakdown is not a simple function of glucose consumption.

Other research suggests long-term strategies that do not improve self-control performance by replenishing a temporarily depleted resource but rather by expanding overall control capacity. These include regular self-management exercises such as managing money and sticking to work and exercise regimens (Muraven, Baumeister, & Tice, 1999; Oaten & Cheng, 2006a, 2006b), participating in programs designed to improve executive functions (Houben, Wiers, & Jansen, 2011), and mindfulness and meditation training (Alberts, Mulkens, Smeets, & Thewissen, 2010; Kaplan, 2001; Papies, Barsalou, & Custers, 2012).

Control effort. Generally speaking, *effort* refers to the mobilization of mental energy to carry out instrumental behavior (Gendolla & Wright, 2009). More specifically, effort refers to the actual amount of mental energy a person invests to effectively reach a certain goal, given obstacles and barriers to fulfillment and the principle of energy conservation (Brehm & Self, 1989; C. L. Hull, 1943; Muraven, Shmueli, & Burkley, 2006; Tolman, 1932; Wright & Kirby, 2001). We adapt these general views to the issue of how much of the available stock of control capacity people actually and effectively use to battle desire. The central point is that people often do not use the full amount of their available control capacity, for a variety of reasons—sometimes to the benefit of self-control (in that cognitive resources are conserved, whereas desire is still not enacted) but other times to its detriment (in that insufficient cognitive resources are used toward controlling desire): (a) The desire at hand may be weak so that it does not require the full use of a prepotent control capacity or so overwhelmingly strong that the person disengages from the higher order goal (Atkinson, 1957; Brehm, Wright, Solomon, Silka, & Greenberg, 1983), (b) the person may perceive him- or herself as skillful at controlling a given desire so he or she uses less control effort, or (c) there may be concurrent competing goals to which the person needs to invest some of his or her available control capacity. Whether self-control succeeds depends on whether there is enough control effort. Some of the reasons for reduced control effort described earlier suggest a situation in which not a lot of control effort would be needed to successfully control desire (e.g., desire is weak), whereas others suggest a situation in which not enough control effort is invested leading to self-control failure (e.g., desire is so strong it leads to disengagement; when one conserves too many control resources for competing goals). Thus, sometimes people will fail at self-control not because of insufficient control motivation or control capacity per se but rather because of a reduction in actual control effort due to moderators.

On the components of the exertion cluster working together. On the basis of recent formulations of effort in cognitive energetics theory (Kruglanski et al., 2012), control motivation and control capacity may determine the potential control effort that can be invested in a given moment. As previously indicated, how much control capacity is actually used in battling desire is dynamically moderated by additional factors, including desire strength, perceived skill, and competing goals. A similar distinction between potential and actual effort was made by Brehm and Self (1989); however, in their model, they did not include cognitive resources as a major determinant of potential effort, and actual effort expenditure was solely a function of task demands. Adapting formulations from cognitive energetics theory to the topic of effortful self-control, potential control effort (E_p) may be proportional to the product of control motivation (M) and control capacity (C) at a given point in time:

$$E_p \sim M \times C, \text{ where } 0 < M < 1.$$

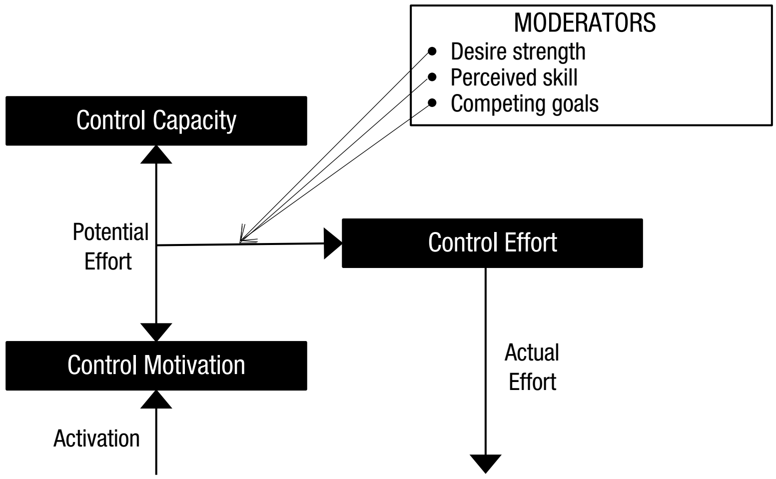

Fig. 2. A close-up of the exertion cluster. Desire–goal conflict activates control motivation that, together with control capacity, determines potential control effort. Potential control effort is moderated by desire strength, perceived skill, and competing goals to yield actual control effort.

The multiplicative relation implies that, in terms of determining the level of potential control effort, control motivation and control capacity are functionally interchangeable (see Kruglanski et al., 2012). Further, the terms imply that how much control effort could be invested in principle is a joint function of the various sources that factor into control motivation and of trait differences (e.g., in executive functions) and state influences (e.g., cognitive load, alcohol intoxication, stereotype threat) that factor into control capacity. The range of *M* implies that potential effort is capped by the control capacity at a given time.

Why do people not always fully exert themselves in a self-control episode? Control motivation and control capacity determine how much control effort can be exerted, but how much control effort is actually exerted may depend on additional moderators (see Figure 2). Formally stated, actual control effort expenditure (E_A) is limited by potential control effort (E_P) and is reduced further by additional moderators of control effort (E_M):

$$E_A = E_P - E_M.$$

First, according to the effort mobilization literature, actual control effort investment should depend on the difficulty of controlling desire. Most centrally, effort allocation is assumed to be guided by a basic concern for energy conservation (Brehm & Self, 1989; Fiske & Taylor, 1991; Kruglanski et al., 2012). Further, recent research suggests that cognitive effort is intrinsically costly (Kool, McGuire, Wang, & Botvinick, 2013). These views support that, like the use of money or time, the use of effort should be economical and contingent on one's available "budget." In fact, Kool and Botvinick (2014) showed that labor/leisure decisions in humans (i.e., choosing between using cognitive effort or "taking it easy") resemble labor/leisure decisions predicted by economic models of labor supply. The point is that multiple streams of research converge on the idea that people try to efficiently allocate control effort to effectively deal with the desire at hand. Thus, it follows that people usually allocate less effort to control weak desires than strong desires (Hofmann & Van Dillen, 2012; Kavanagh et al., 2005). However, this linear relationship holds up only to the point where the desire strength is too high in relation to one's potential control effort—resulting in (temporary) disengagement (see Brehm & Self, 1989; Gendolla & Richter, 2010). For example, take the relationship between desire strength and actual control effort at different levels of potential control effort because of depletion reducing control motivation and control capacity (Baumeister & Vohs, 2007; Muraven & Slessareva, 2003). Whereas depleted and nondepleted people would invest similar amounts of control effort in controlling weak desires, depleted people would disengage much sooner as desire strength exceeds potential control effort (E_P), leading to higher rates of control failure.

A second moderator is perceived skill. Some people may see themselves as more tacitly able to use their available control capacity in the service of self-control than others (Reber, 1989; Wagner & Sternberg, 1985). Additionally, some people may believe that they have more or better self-control strategies at their disposal in a given situation than others (see Sheppes & Meiran, 2008). In both cases, the degree of perceived skill would inversely vary with control effort engagement because of energy conservation concerns. The emphasis on perceived skill suggests that people may downplay the difficulty of combating a given desire or make overly confident judgments about their skill in controlling it, perhaps because of unrealistic perceptions of self-efficacy. Such "control illusions" may lead them to actually allocate less control effort than required (leading to a mismatch between desire strength and actual control effort) and might thus lead to self-control failure (Nordgren, Van Harreveld, & Van Der Pligt, 2009).

Third, as self-control does not occur in a vacuum, one may (have to) allocate control resources, even unintentionally, to competing goals (Hassin, Bargh, & Zimerman, 2009; Kruglanski et al., 2012; Shah & Kruglanski, 2002). For example, imagine a person making a decision to eat or not eat a tempting cookie at a work meeting despite his or her diet. If another goal was activated (e.g., planning what to say next), then he or she may reserve some cognitive resources to use toward that goal that otherwise was going to be used for self-control against the cookie. Thus, even though potential control effort would be high in this example, a consequence of the competing goal is that not enough available resources may get allocated to effectively support the dieting goal.

In sum, whereas control capacity and control motivation factor into determining the potential amount of control effort that can be used at a given time, how much control effort is invested may depend on the additive effects of at least three moderators: desire strength, perceived skill, and competing goals. Accordingly, actual control effort expenditure would be highest when desire strength is high, perceived skill is low, and competing goals are absent. Conversely, actual control effort expenditure would be lowest when desire strength is low, perceived skill is high, and competing goals are present. This formulation of control effort shares many features with the formulation of goal-directed effort in cognitive energetics theory (Kruglanski et al., 2012), though there are some key differences. Like in cognitive energetics theory, control motivation and control capacity may determine the potential effort that can be invested at a given moment. Additionally, however, we propose that how much control capacity is actually used in battling desire is dynamically moderated by desire strength, perceived skill, and competing goals (in cognitive energetics theory, task demands are factored into the restraining force, and actual skill increases the likelihood of goal attainment).[3] In self-control, perceived skill at controlling desire seems to strongly influence the extent to which control effort is mobilized (Nordgren et al., 2009). In what follows, we deal with the question of whether the actual effort mobilized is going to be enough to prevent the enactment of a given desire.

Enactment constraints

Enactment constraints are neither part of the activation nor exertion cluster. They are environmental factors often not under the person's immediate control that constrain the range of available behavioral options in a given situation. Thus, they are a subset of a broad class of inhibiting factors (Finkel, 2013), and their external nature sets them apart from the internal capacity for inhibition. Such factors include finite resources, such as time and money, as well as physical and social barriers that can keep a person from enacting desire even when there are no "inner constraints" operating. Thus, enactment constraints represent the often overlooked but important fact that even when desires are strong and internally unfettered, additional things need to fall into place to enact them. Furthermore, in the very same way, whether a "do" higher order goal can be enacted also depends on the presence or absence of enactment constraints. From a choice architecture perspective (Thaler & Sunstein, 2009), introducing desire-enactment constraints and reducing higher order, goal-enactment constraints into a choice environment is therefore an effective recipe for facilitating self-control. From a self-regulatory perspective, one can proactively manipulate enactment constraints on potential future behaviors to prevent desire enactment or to facilitate enactment of behaviors compatible with the higher order goal (Hofmann & Kotabe, 2012). Such self-regulatory strategies can be very effective, and thus people are attracted to them—as evidenced by the popularity of self-commitment devices, such as long-term gym memberships (Brocas et al., 2004; Bryan et al., 2010).

Behavioral enactment

The final big question is, which psychological force—desire or control effort—"wins" and why? Because of enactment constraints, it is not simply a matter of which force is greater. First, to predict the outcome of a self-control episode, it is important to determine whether the person pursues a "do" or "do not" higher order goal. In the case of a "do not" higher order goal, if the prevailing force is desire, then desire enactment will occur if that force overcomes all enactment constraints working against it. If the prevailing force is control effort, however, desire will not be enacted, and enactment constraints would be irrelevant because fulfillment of a "do not" higher order goal is not contingent on enactment constraints. Formally stated, the resulting behavior (B) is a function of desire strength (DS), actual control effort (E_A), and desire enactment constraints (EC_D):

$$B = DS - E_A - EC_D, \text{ where } DS \neq E_A.$$

Note that for the formula to apply, desire strength cannot match actual control effort, as this results in equilibrium (Lewin, 1951) and iterative reprocessing (see left side of Figure 1), which does not constitute a "true" behavioral outcome but rather is an interim process. If $DS - E_A$ is a positive value greater than EC_D, then B represents *inhibitory failure*. That is, if desire strength exceeds actual control effort and prevails over enactment constraints, then desire enactment will occur because of inhibitory failure. For example, imagine a man trying to quit cigarettes is offered a cigarette at a party. He is intoxicated so he uses little resistance effort, and because the cigarette is being directly handed to him, there are virtually no enactment constraints. Thus, desire is enacted because of pure inhibitory failure. If $DS - E_A$ is a positive value less than or equal to EC_D, then B represents *fortuitous control*. That is, if desire strength exceeds actual control effort but does not exceed desire enactment constraints, then desire enactment will not occur because of the fortunate presence of these constraints. Now imagine the intoxicated man is offered a cigarette, but this time his sober friend intervenes and destroys the cigarette. Now the man cannot smoke the cigarette, not because of the success of his inner restraint but because of the enactment constraint posed by his friend. If $DS - E_A$ is a negative value, then B always represents *inhibitory success*, and the value of EC_D is irrelevant in terms of B. That is, if control effort exceeds desire strength, then desire enactment will not occur because of the effective internal inhibition of desire. Now imagine the man is not intoxicated when he is offered the cigarette. Soberly, he considers the long-term ramifications, and then he puts his foot down and successfully resists the tempting offer. To summarize, when a "do not" higher order goal competes against actual control effort, there are three classes of behavioral outcomes: inhibitory failure, fortuitous control, and inhibitory success.

In the case of a "do" higher order goal, the behavioral function is slightly different. Because any difference between DS and E_A represents a behavioral tendency that depends on enactment constraints, we take the absolute value of that difference. Related to that, because enactment constraints can prevent either desire-driven behavior or higher order, goal-driven behavior, EC can represent either desire enactment constraints (EC_D) or higher order goal enactment constraints (EC_G), depending on whichever behavioral tendency is more potent:

$$B = | DS - E_A | - EC_{D/G}, \text{ where } DS \neq E_A.$$

If $DS - E_A$ is positive and greater than EC_D, then B represents inhibitory failure. That is, like in the case of a "do not" higher order goal, if desire strength exceeds control effort and also overcomes all respective enactment constraints, then desire enactment will occur because of inhibitory failure, just like in the earlier example, except for that the smoker has a "do goal," such as reaching for nicotine gum whenever he is offered a cigarette. If the absolute difference between DS and E_A is less than or equal to $EC_{D/G}$, then B represents *no enactment*. That is, regardless of the outcome of the competition between desire strength and control effort, enactment constraints will prevent any behavioral enactment. Like in the earlier example, the smoker will not enact the desire if his friend destroys the cigarette. He also will not enact the higher order goal of chewing nicotine gum instead if he left his nicotine gum at home. If $DS - E_A$ is negative and greater than EC_G in absolute terms, then B represents self-control success because of sufficient control effort mobilization and successful enactment of the "do" higher order goal (*higher order goal enactment*). In this case, the smoker inhibits the desire for a cigarette and overrides it by doing something else—chewing nicotine gum instead. To summarize, when a "do" higher order goal competes against control effort, there are also three classes of outcomes: inhibitory failure, no enactment, and higher order goal enactment.

One insight we derive from this analysis is that in the case of "do not" higher order goals, one may achieve success because of purely external reasons, whereas internal and external reasons are prerequisites for the successful enactment of "do" higher order goals. That is, in the case of "do not" higher order goals, one may achieve inhibitory success completely because enactment constraints prevent desire enactment. In contrast, to enact a "do" higher order goal, one has to mobilize enough control effort to overcome any enactment constraints to achieve success. Thus, one may successfully achieve a "do not" goal by lucky circumstance, but achieving a "do" goal requires sufficient control effort.

Some issues should be discussed. First, this model posits that self-control success or failure emerges from a competition of the relative forces behind desire and control effort. This implies that self-control failure can happen because of quite different reasons. As Sir T. S. Clouston once said, "the driver may be so weak that he cannot control well-broken horses, or the horses may be so hard-mouthed that no driver can pull them up" (James, 1890, p. 540). Whether control effort prevails hinges on the strength of the desire against which it competes. Therefore, any approach that neglects either side of the desire–control effort interplay would be incomplete.

Second, a diversity of contextual factors may have moderating effects on the components that determine desire and control effort strength. For example, contextual factors such as acute alcohol intoxication may increase desire strength or decrease control capacity (Hofmann, Friese, & Strack, 2009). This implies that whether a person can resist a desire at one time or another would vary depending on the contextual boundary conditions at each time and their (downstream) effects on desire strength and actual control effort.

Third, we are purposefully mute about how long self-control episodes last. Struggles with desire can take place in just an instant, or they may even continue for prolonged periods without a clear "winning" motivation emerging. Such equilibrial "ties" between desire strength and control effort may be unstable and accompanied by aversive feelings and the experience of conflict (Inzlicht & Legault, 2014; Lewin, 1935). Eventually one should exit

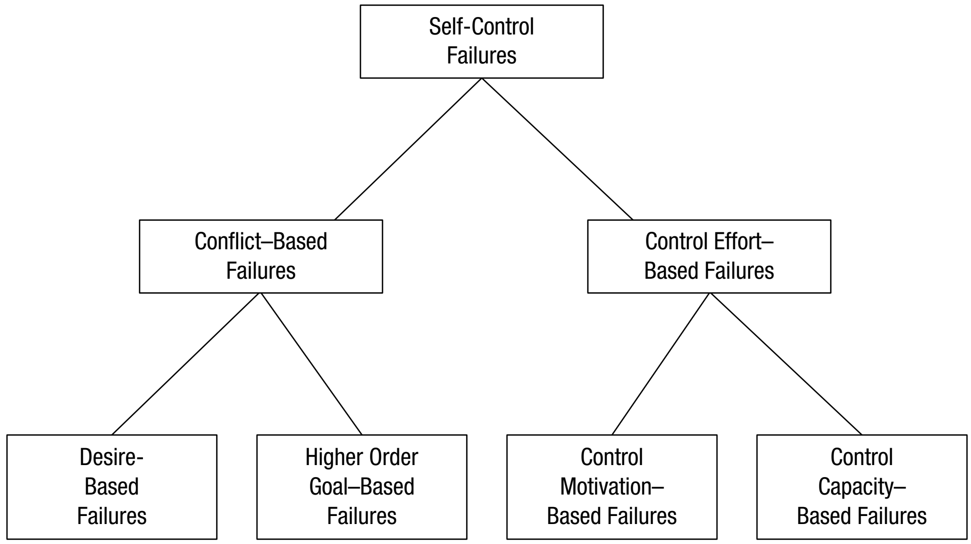

Fig. 3. A taxonomy of self-control failures derived from integrative self-control theory.

this equilibrial state and gravitate toward one attractor state or the other (Carver & Scheier, 2002; Lewin, 1935). Until that happens, we propose that such struggles occur over time through iterative processing.

Summary of the model and framework

SCT provides a global, seven-component analysis of self-control. It shows that self-control involves the interplay of two clusters of psychological components—the *activation cluster* and the *exertion cluster*. The output of the activation cluster—D-G conflict—emerges from the coactivation of a lower order desire and an at least partly incompatible higher order goal. D-G conflict, by triggering control motivation, provides the conceptual bridge to the exertion cluster. The output of the exertion cluster—control effort—emerges from the interplay of control motivation, control capacity, and several moderators of control effort. The resulting control effort is the net force that opposes the net force of the focal desire. The behavioral outcome of this competition between forces depends on whether the person is pursuing a "do" or "do not" higher order goal and whether he or she faces enactment constraints.

Applications

Classifying self-control failures

One way SCT can be usefully applied is in distinguishing forms of self-control failure (see Figure 3). SCT suggests that several psychological components need to collaborate to achieve self-control success, which implies that there are several ways through which self-control can fail. The activation and exertion clusters suggest two broad forms of self-control failure: conflict-based and control-effort-based. Each of these can be further decomposed into two nested categories (desire-based and higher order, goal-based; and control-motivation-based and control-capacity-based, respectively). Distinguishing among different types of self-control failures has both theoretical and applied advantages. Theoretically, the proposed taxonomy allows situating one's specialized research on self-control and its failure in the context of self-control phenomena more generally. In application, identifying the primary reason for why certain problem groups or individuals fail at self-control can facilitate the selection of the most appropriate treatment.

Conflict-based failures. These failures comprise desire-based and higher order, goal-based failures. Basically, both types of failure result when there is insufficient effect of D-G conflict. We suggest that this happens when people temporarily fail to detect a D-G conflict that they would normally detect.[4] There are two reasons one may overlook D-G conflict: (a) desire may be so strong as to "blind" someone of his or her higher order goals (*desire-based control failure*), or (b) at the outset of a self-control episode, one may be preoccupied with low-level details of the situation to the extent that the higher order goal is neglected, which allows desire to operate "freely" (*higher order, goal-based failure*). The main difference is thus that in the former, potent desire causes higher order goals to temporarily be neglected (because of desire consuming attentional resources), whereas in the latter, temporarily neglected higher order goals (because of excessive low-level processing at the outset) allow desire to operate with less (or without) interference.

Desire-based failures. These failures resonate with the folk concept of overpowering passion. According to the elaboration-intrusion theory of desire (Kavanagh et al., 2005) and a recent review of the role of desire in self-control (Hofmann & Van Dillen, 2012), the dynamical reprocessing of desire stimuli uses up space in working memory that otherwise could be engaged in other competing and concurrent cognitive tasks. In this way, a potent desire may temporarily consume mental faculties that otherwise could be used to represent higher order goals. In such cases, potent desire may cause the higher order goal to be temporarily "forgotten" (Hofmann et al., 2011; Hofmann et al., 2008).

Higher order, goal-based failures. This type of failure results when attention to higher order goals is temporarily lacking at the outset of the self-control episode. People may enter a self-control episode neglecting higher order goals because they are processing at a low-level of construal (Fujita, 2011) or because they are intoxicated and affected by alcohol myopia (J. G. Hull, 1981; MacDonald, Fong, Zanna, & Martineau, 2000). In these cases, people fail to experience D-G conflict not because desire consumes them but because higher order goals are not represented when they need to be.

Control-effort-based failures. These failures comprise control-motivation-based and control-capacity-based failures. Their commonality is that desire enactment occurs because of a lack of control effort. Their difference is in whether this lack of control effort is due to insufficient control motivation or insufficient control capacity. Either way, potential control effort (E_P), as it is determined by control motivation and control capacity, may be critically reduced. Because E_P limits E_A, this critical reduction increases the likelihood of self-control failure.

Control-motivation-based failures. Self-control failure because of lack of motivation has been a topic of debate in the philosophical literature on weakness of will (Davidson, 1980). It is gaining traction among psychological researchers interested in this topic, as evidenced by the apparent shift from strictly capacity-based accounts of self-control failure to broader models that capture the interplay between motivation and capacity (Inzlicht & Schmeichel, 2012; Vohs, Baumeister, & Schmeichel, 2012). One recent stream of research that serves as an example of this development shows that one's expectations and implicit beliefs of the concept of "willpower" can shape self-control outcomes (Job, Dweck, & Walton, 2010; see also Bandura, 1977). Related research has shown that the mere perception of being resource-depleted may sometimes be more impactful than actual depletion in reducing effective self-control (Clarkson, Hirt, Jia, & Alexander, 2010). Moreover, recent work suggests that merely expecting glucose consumption, compared with actually ingesting it, is sufficient to buffer against typical depletion effects (Molden et al., 2012; Sanders, Shirk, Burghin, & Martin, 2012).

Self-control research has also lately been linked closely with motivated reasoning (De Witt Huberts et al., 2013; Kunda, 1990). The core idea in this research suggests that control motivation may be susceptible to reasoning that promotes desire or demotes higher order goals. Motivated reasoning is thought to bias people toward particular preferred conclusions by making cognitions that support the preferred conclusions more accessible. In our discussion on different sources of control motivation, we noted that people may hold specific beliefs about how to balance between desire and higher order goal enactment in their daily lives. When these beliefs offer too much leeway for motivationally driven interpretations, motivated reasoning may result in self-control failure. For example, a dieter who lapses once at self-control by drinking a milkshake with dinner may think, "oh what the hell, dieting is done for today," and then subsequently indulge again by eating ice cream for dessert (Herman & Mack, 1975). Or, a person may rationalize indulgence in the here and now by instilling a sense of deservingness or justify why controlling oneself is unwarranted by augmenting the costs of self-control or downplaying possible risks of desire enactment. For example, Kivetz and Zheng (2006) showed that people are more likely to purchase tempting goods when they can point to hard work as justification. More recently, such self-licensing effects have been shown with regard to tempting food (De Witt Huberts, Evers, & De Ridder, 2012). A sense of deservingness may also stem from the perception that one has already committed to a virtuous act in the past (Khan & Dhar, 2006; Mukhopadhyay & Johar, 2009) or has made substantial progress advancing a higher order goal (Fishbach & Dhar, 2005). Motivated reasoning can lead to behaviors that are arguably insensible. For instance, a dieter may find no reason to control the desire for a ridiculously unhealthy entree because he or she got it with a diet soda (Chernev, 2011; Chernev & Gal, 2010).

Control-capacity-based failures. Regarding control-capacity-based failures, we assume that limitations in control capacity can be attributed to both trait-level and state-level effects. A wealth of evidence suggests that people vary in their trait ability to use the executive functions that subserve self-control (Hofmann, Friese, & Roefs, 2009; Hofmann et al., 2011, 2008; Hofmann, Schmeichel, & Baddeley, 2012). Additionally, executive functions seem to generally follow a developmental trajectory such that they tend to mature late (Figner, Mackinlay, Wilkening, & Weber, 2009; Levin, Weller, Pederson, & Harshman, 2007) and degenerate in old age (Buckner, 2004). As for its state component, control capacity may temporarily suffer because of prior heavy usage (Baumeister et al., 2007), concurrent load/stress (Hofmann, Schmeichel, & Baddeley, 2012), alcohol intoxication (Hofmann & Friese, 2008), or sleep deprivation (Spiegel et al., 2009).

Classifying self-control interventions

Our theoretical framework can also be applied to create a taxonomy of self-control interventions. For example, interventions in which desire is targeted include (a) those that prevent desire from occurring (e.g., Houben, Havermans, & Wiers, 2010) and (b) those that reduce desire strength after desire starts operating (e.g., Florsheim, Heavin, Tiffany, Colvin, & Hiraoka, 2008). As for interventions targeting higher order goals, examples come from traditional health psychology. These approaches aim to get people to set goal intentions and to boost commitment to goals, for example, via educational campaigns that inform about health-behavior links and potential risks and long-term consequences of impulsive behavior (Ajzen & Albarracin, 2007; Godin & Kok, 1996; Janz & Becker, 1984; Strecher et al., 1995). Regarding conflict, there is a long history of cognitive behavioral therapeutic interventions aimed at increasing self-monitoring (Cohen, Edmunds, Brodman, Benjamin, & Kendall, 2012). Additionally, interventions aimed at increasing mindfulness (for a review, see Baer, 2003) of inner states may be useful in that they may help people identify D-G conflict and respond to it effectively. As for control motivation, in one prominent approach, researchers target control motivation by using motivational interviewing to elicit self-motivational statements (e.g., Senay, Albarracín, & Noguchi, 2010; Tullett & Inzlicht, 2010). Recently, capacity has become a promising intervention focus. This trend has been inspired by experimental research in cognitive psychology suggesting that executive functions can be trained (e.g., Jaeggi, Buschkuehl, Jonides, & Perrig, 2008; Olesen, Westerberg, & Klingberg, 2003). Finally, one only needs to look to behavioral economics for interventions targeting enactment constraints—the popular though controversial concept of "nudging" involves authority figures proactively altering choice environments in ways that get people to make healthier decisions (Thaler & Sunstein, 2009).

Concluding Remarks

The ways humans resolve their internal conflicts between passion and reason have major implications at the personal, social, and societal levels. In this article, we argued that such conflicts may serve as a basis for a clear definition of self-control. From this perspective and within this scope, we developed SCT, a model and theoretical framework that integrates seven different emphases in self-control research. We drew on concepts and findings from a wide range of areas. For example, we integrated key elements from basic psychological research on reward processing, conflict monitoring and detection, executive functions, and effort allocation, as well as from applied psychological research on self-control interventions. Through this integration, we believe SCT makes several useful contributions. First, it moves researchers beyond dual-component (e.g., dual-systems, dual-motives) approaches to a more widely compatible approach that may serve as a foundation for a more rigorous analysis of self-control episodes. Second, it provides a general framework of self-control that self-control researchers can use as a context in which to embed their research to understand its broader theoretical implications and to identify future directions. Third, it puts forward an explanation of self-control exertion that emphasizes the difference between what people are willing to do, what they are able to do, and what they actually do. Fourth, with SCT we discuss self-control and related motivational phenomena using clearly defined language. Specifying the language will surely help reduce ambiguities moving forward.

Our main goals in this article were to promote integration, organization, and definition in the science of self-control: integration of the hitherto disconnected components involved in self-control, organization of the large and growing bodies of research on self-control, and definition of the nuanced constructs involved in self-control. We hope we have ably conveyed that SCT can advance each of these goals and, by doing so, can help people understand—and improve—the way that they deal with the age-old problem of unwanted wants.

Acknowledgments

We thank Ayelet Fishbach, Chin Ming Hui, Anirudh Tiwathia, and Timothy Lewis for their useful comments and suggestions.

Funding

We are grateful to William R. Waters and Phyllis Jean Waters for establishing the Sidney Davidson Doctoral Fellowship that funded this research.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Notes

1. A case pertinent to the one described here could be called "dread control." Whereas self-control concerns controlling appetitive behaviors driven by desire, dread control concerns controlling fearful behaviors driven by dread. Biopsychological studies of rat behavior suggest that the intensely felt motivational states

of desire and dread are related in that they are both generated by the same subcortical circuits involving the nucleus accumbens, but they differ in valence and in the way they are experienced (Faure, Reynolds, Richard, & Berridge, 2008; Reynolds & Berridge, 2008; Richard & Berridge, 2011). Although self-control and dread control may involve the same control processes, we do not make this assumption and suggest that answering this is an important direction for future research. For now, we focus on the typical self-control case involving desires and higher order goals.

2. Not to be confused with *desire for control* (Burger & Cooper, 1979), which is defined as the motivation to control the events in one's life.

3. Note that actual skills such as inhibitory capacity and attentional control are subsumed under the control capacity component of SCT. Thus, actual skills increase the likelihood of higher order goal attainment by increasing potential effort.

4. This is different from when a person does not hold the higher order goal at all. In both cases, the person would likely not inhibit acting on desire, but only when this is due to a temporary self-monitoring lapse can the person be said to fail at self-control in that the desire is incompatible with a higher order goal to which the person otherwise is committed.

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