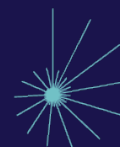


The Science of Self-Control

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I. INTRODUCTION

Self-control can be defined as the ability to align one’s behavior with personally valued goals and standards in the light of certain kinds of motivational conflicts. For the last half-century, researchers interested in understanding the structure and dynamics of human motivation have focused on self-control as a window for thinking about self-regulation and sustained goal pursuit. Because of this, we now have a richer understanding of what is involved in self-control, what is required to display it, and why it matters.

Researchers have come to the topic from different traditions. These include philosophers working in action theory and practical rationality, social psychologists interested in motivation and decision-making, personality experts studying positively and negatively associated character traits (e.g., conscientiousness, impulsivity), social and life scientists developing interventions to promote life-satisfaction, as well as neuroscientists interested in executive functioning and frontal lobes.

This multiplicity of voices has produced a rich and diverse field. Consequently, there are deep disagreements among self-control theorists, from how to define it to how to measure it. This has not prevented, however, some larger consensuses from emerging. Whereas there are many questions that remain open, as we shall see, there is a well-charted territory for theoretical and experimental discussions to take place.

Understanding our capacity for self-control requires, at the very least, (1) knowing how to define it and how to conceptualize its core manifestations; (2) finding suitable ways of studying it empirically; (3) constructing models that tell us how it is exercised or how we fail at it; (4) identifying strategies for developing self-control; and (5) grasping its connection with similar psychological constructs. This review examines each of these topics in the light of the recent literature.

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II. DEFINING SELF-CONTROL

The term “self-regulation” has been used to refer to the processes by which people adopt goals and standards for how they think, feel, and behave, and by which they monitor and implement behaviors that allow them to meet them (Carver & Scheier, 1982, 1990; Debus, 2016; Higgins, 1996; Muraven, Tice, & Baumeister, 1998). Thus understood, self-regulation requires a variety of different capacities and skills, including the ability to select one’s goals, to find suitable ways of implementing them in the light of environmental constraints, to monitor their implementation, and to evaluate how costly or effective their adoption and implementation is. Self-control belongs to this set of capacities (Fujita, 2011; Fujita, Carnevale, & Trope, 2018).

To a first approximation, self-control is the ability to adequately resolve (maybe, in some cases, circumvent) certain kinds of *motivational conflicts* that are part of everyday life. Below, we discuss more precisely what kind of conflicts these are, and what counts as an adequate solution to them. But, in general, unlike the conflicts that arise when one faces alternatives that seem equally good or bad (e.g., in situations of ambivalence), the options here usually display a marked valuational difference. Typically, self-control comes in whenever one feels tempted by something, despite some available alternative evidently being more valuable or better, even by one's own lights.

Some of these conflicts, for example, are of moral or ethical relevance. For instance, you might be committed to being an honest person but sometimes feel tempted to lie to get ahead. Others, however, have no clear moral import. Although there is a tendency to moralize self-control or the lack of it (Mooijman, Meindl, & Graham, 2020; Mooijman et al., 2018; Rozin, 1999), sometimes the alternatives that structure the conflict lack any moral valence. Thus, it might be wise to get out of bed to brush one's teeth after realizing that one forgot to do it earlier. Yet there is nothing immoral about failing to do it and staying instead in bed.

Self-control is an interesting topic for a variety of reasons. First, understanding what promotes or hinders it is of great *practical importance*. Individuals who might be labeled as self-controlled, for instance, have been found to score high on a number of significant life outcomes, including financial prosperity, career success, physical and mental health (Duckworth & Seligman, 2005; Mischel, Shoda, & Rodriguez, 1989; Moffitt et al., 2011; but see Hofmann et al. 2012, for some complications of this view). Yet, not all ways of promoting and enhancing self-control are created equal. Some strategies, as we discuss (see Section 4), are more effective than others; different strategies work in different circumstances (Duckworth, Gendler, & Gross, 2016).

Self-control also raises deep *theoretical questions*. Even though it promotes significant life outcomes, people often struggle to exercise it (Hagger, Wood, Stiff, & Chatzisarantis, 2010; Kurzban, Duckworth, Kable, & Myers, 2013). In some cases, in fact, exercising self-control requires a big effort, a considerable amount of what is normally referred to as "willpower" (Baumeister, 2002; Holton, 2003). Yet, although everyday life provides multiple examples of this, there still seems to be something paradoxical about it. Why do people struggle exercising self-control, if doing it has clear benefits for their overall life and well-being? How come exercises that promote valued but otherwise easily attainable goals require a big effort on our part and why do people find that effort aversive? (For discussion about how to understand effort and why it is felt under these circumstances, see Kurzban, 2016.)

Finally, the ability to exercise self-control is a central piece of the image that many of us have of ourselves, even at an early stage of our lives (Wente, Zhao, Gopnik, Kang, & Kushnir, 2020). We might not be optimistic about our ability to exercise it, but we certainly wish we could be better at it (Park, Peterson, & Seligman, 2006). So, getting clear on what self-control is and what promotes it is part of the project of *understanding what some of our ideals demand from us*.

To illustrate this last point, consider the following loose observations. Acquiring the ability to control one's impulses has long been considered a developmental landmark (Freud, 1996; Singer, 1955). Having self-control is typically regarded as a virtue, or (more controversially) as something of which one cannot have too much (Kalis, 2018; Peterson & Seligman, 2004, although see Section 7 for discussion). Failures of self-control, on the other hand, are often seen as signs of irrationality (see Bermúdez, 2018b, intro and the essays in it). Thus, in so far as we care about ourselves, as mature, virtuous, and rational individuals, the ability to exercise self-control becomes central to the persons we aspire to be.

1. Failures of self-control

Self-control is the ability to adequately solve certain kinds of motivational conflicts in the light of enduring or otherwise highly valued goals and standards (Baumeister, Vohs, & Tice, 2007; Duckworth et al., 2016). What kind of conflicts are these? What counts as an adequate resolution of them?

We can begin answering these questions by identifying the kind of episodes where our ability to exercise self-control fails. This is, in fact, a useful rule of thumb. The rationale behind the various approaches to self-control becomes more transparent, once one focuses on the cases that originally motivated them. Often, these cases involve failures of self-control, rather than successful exercises of it.

Weakness of will

Philosophers have been interested in self-control going back to Ancient Greece (for a brief discussion, see Bermúdez, 2018b, intro; for more in depth discussion, see the essays in Bobonich & Destrée, 2007). But in the late 1970s a renewed interest in the topic came about, as philosophers in the analytic tradition began developing theories of intentional agency and its rational underpinnings. Donald Davidson's (1969) paper, "How is weakness of will possible?" defined much of the agenda for discussion, even up to this day.

Following him, many contemporary philosophers have focused on the kind of failures of self-control that go under the guise of *weakness of will*. In short, a weak-willed agent is one who decides to do something against her better judgment (Mele, 1987). That is, it is a person who thinks that some course of action is in overall terms preferable (say, to refrain from eating the cake). Nevertheless, she is more motivated to behave otherwise and, in fact, ends up acting according to that motivation (she eats the cake).

As Davidson (1969) did, many philosophers have found the mere possibility of weakness of will puzzling (see Watson, 1977 for a classical skeptical position). Whereas the experience of acting in ways that are not preferable seems part of everyday life, it raises a host of interesting questions, in particular, how can someone be more motivated to do something, while still thinking that there is a preferable

alternative available to her? Does the person find it genuinely preferable or is this something that she says but doesn't really mean?

At the same time, the idea that one can overcome weakness of will is conceptually troubling. If one is more motivated to do one thing (e.g., eat the cake), as opposed to an available alternative (e.g., eat a healthy snack), then it seems that one's motivations speak against attempting to do that latter thing (Kennett & Smith, 1996; Mele, 1997; Sripada, 2014). But, if this is true, then it does not seem that people can really be motivated to overcome their weaknesses (e.g., to stick to the healthy diet despite the tempting cake). Put less controversially, if they can be sufficiently motivated to do so, it is only because they were *not* as weak as one would have thought in the first place or the temptation was *not* as strong as one thought it was.

These questions can be and have been answered in a variety of ways (for a review, see Stroud & Svirsky, 2019). But a common strategy has been to recognize that understanding weakness of will requires distinguishing different kinds of attitudes or stances within the human mind. In particular, philosophers have distinguished attitudes corresponding to the *motivational force of a goal* and the *subjective assessment of its value* (for discussion, see Andreou, 2018). Examples of how the distinction has been drawn include, respectively, desires vs. practical judgments (Mele, 1987), emotional vs. practical desires (Sripada, 2014), motivational vs. rational preferences (M. Peterson & Vallentyne, 2018), etc.

It is easy to see why this strategy has proved so attractive. To begin, this kind of distinction helps remove the puzzling aspect behind weakness of will. That is, because different circumstances and factors internal to the person shape these attitudes, it is possible that some of them end up pulling in different directions. Consequently, on any given occasion, what one finds in overall terms preferable might dissociate from the things that one is more motivated to do.

Further, the distinction between evaluative and motivational attitudes also helps explain why there is something *irrational or problematic* about being weak-willed. Evaluative attitudes are typically held to respond to rational considerations (the diet is in overall terms good, preferable, etc.), while merely motivating ones are seen as more susceptible to distracting factors or to reflect only a partial evaluation of what's good about a certain outcome (eating too much dessert is pleasant but not good, all things considered). Arguably, acting in line with the latter, when it dissociates from our evaluative attitudes, is criticizable.

Finally, but more importantly perhaps, this strategy also gives us a general way of *defining self-control*. Exercising self-control, according to this line, is a matter of intervening so that our behavior aligns with our evaluative stance, in cases in which our motivations are not in line with it (Mele, 2018; Sripada, 2014). Adequately resolving the motivational conflicts that define self-control, in other words, is a matter of counter-balancing the force of some of our motivational attitudes.

Delay of gratification

Whereas philosophical approaches to self-control have widely focused on weakness of will, psychological approaches often begin with the notion of *delayed gratification*. The idea here is that resisting the impulse to receive an immediate reward to receive, later in time, a larger reward is sometimes difficult to achieve. The difficulty explains common and pervasive failures of self-control.

In a series of studies beginning in the 1960s, Walter Mischel and his colleagues shaped this idea into a full research program (Mischel & Ayduk, 2011; Mischel et al., 1989). And, although they primarily studied delayed gratification in children, their findings impacted the way subsequent scientists have been thinking about self-control in general. In fact, their “marshmallow test” is nowadays a staple of scientific and popular culture.

Among some of their most interesting results, Mischel and his colleagues found meaningful individual variation in children’s capacity for delayed gratification (Mischel et al., 1989). Interestingly, the variation was not just associated with age, as had been widely believed for a long time (Freud, 1996; Singer, 1955). It was also associated with a number of independent and developmentally significant characteristics, which seemed to suggest that the ability to delay gratification was not merely one among other abilities for self-regulation but one with a “long reach” (Baumeister, Alquist, Vonasch, & Sjastad, 2020; but see Watts, Duncan, & Quan, 2018 for a recent replication problematizing this result). These characteristics included intelligence (Mischel & Metzner, 1962), social responsibility, and how ambitious children’s life plans would be (Mischel, 1961).

Many contemporary psychologists use delay of gratification paradigms (see Section 3.1) to study self-control in healthy adults and clinical populations. In fact, self-control is often defined in the literature in these terms: as the ability to forgo sooner-and-smaller rewards for the sake of obtaining later-and-larger rewards (Gottfredson & Hirschi, 1990; Kotabe & Hofmann, 2015; Rachlin, 2010). Conversely, although people generally tend to be less moved by rewards in the distant future than in the immediate future (and some level of discounting might even be considered rational), theorists see an extreme tendency in this direction as diagnostic of self-control deficits.

There are several advantages in this way of thinking about self-control. First, the idea of delay of gratification provides a *clear behavioral description* of what counts as exercising self-control. This is key for testing hypotheses regarding which factors shape its development in children and its possession in adults, as well as finding out which interventions promote it and to what degree they are effective. As an example, working with the notion of delay of gratification, researchers have been able to gather evidence of a strong association between the affective environments in which children grow (e.g., having or not having emotionally responsive caregivers) and the development of abilities for self-control (see Luerssen & Ayduk, 2014 for a review of the evidence).

The notion of delay of gratification has also allowed researchers to study how self-control, thus understood, relates to other important psychological constructs (Section 5). It is common, for example, to study *impulsive decision-making* using delay gratification paradigms: in fact, some researchers have taken measurement of delay gratification as indexes of impulsivity (Madden & Bickel, 2010; Reynolds,

2006). Likewise, the ability to delay gratification has been found to be somewhat associated with *conscientiousness*, as measured by the Big Five inventory (Duckworth, Tsukayama, & Kirby, 2013).

Finally, the construct of delay gratification has been useful to conceptualize *addictive disorders* in ways that make clear its connection with everyday failures of self-control. It has been found, for example, that individuals with substance use disorders display greater preference for smaller, immediate rewards over larger, delayed alternatives than controls (Bickel et al., 2010; Mackillop et al., 2011). Similarly, reduced abilities for delay gratification has been shown to be a good predictor of relapse during periods of attempted abstinence (for a review of these results, see Ballard et al., 2015).

Preference reversals

The phenomenon of delayed gratification shows that motivation has an inherent temporal dimension. Briefly, how much one is motivated to do something is a function of how sooner or later the outcomes resulting from doing that thing will obtain. This is something economists and rational choice theorists have discussed since the 1930s under the concept of *temporal discounting* (Samuelson, 1937).

In the mid-1970s, however, rational choice theorists began worrying about the precise way in which motivation and time were related. Up until that point it had been assumed that an *exponential curve* would best describe this relationship (see Figure 1). Less formally, the assumption was that the subjective value of an outcome (how valuable or motivating one would find it) decreased at a constant rate as a function of how long it took one to obtain it.

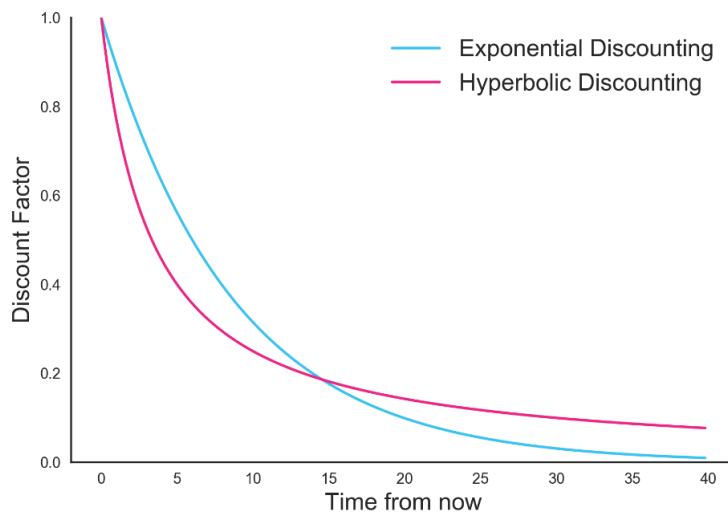


Figure 1. (From Said, 2018). *Exponential and hyperbolic discounting curves.* In an exponential curve the discount rate is constant. Thus, at five time intervals from now, an outcome has roughly half the value it has now; at 10 time intervals it has roughly one-quarter of the present value. In a hyperbolic curve, it is not constant. So, waiting for one time interval in the near future has a greater effect on the value of the outcome than when the wait time lies far ahead in the future. In the example

used in the text, the difference in cost between waking up or snoozing for a bit longer is larger in the morning than it was at night when you were setting up the alarm.

In a seminal paper, however, George Ainslie (1975) pointed out that this assumption was at odds with some frequently observed failures of self-control. (See also, Rachlin & Green, 1972 for another seminal paper. For discussion, see Loewenstein, 1996 and Bermúdez, 2018a.) These failures involve what is commonly known as *preference reversals*: at some point the person seems to prefer one alternative over another and commits to it, only to override her commitment at a later time. As Ainslie (1975) and other theorists argued then, the reversals were indicative of the fact that people were not discounting the future at a constant rate.

The point is easy to illustrate with an everyday example (see also Thoma, 2018; Wolff, Krönke, & Goschke, 2016). At night one might find it preferable to wake up earlier in the morning to study for an exam and decide to do so. At that point, a few extra minutes in bed in the morning might not seem much. Under the assumption that the future is discounted exponentially, the same should hold in the morning. For most of us, however, this is not true. When the alarm goes off and the reward of staying in bed becomes imminent, many of us give into temptation, motivated by the prospect of staying those extra minutes in bed.

Examples like this suggest that people tend to weight differently a delay in obtaining an outcome depending on whether the delay takes place sooner or later in time. The few minutes in bed, which didn't matter much at night, at least when compared to the prospects of doing well on the exam, seem to matter much more in the morning, when the possibility of enjoying them is imminent. That is why, in the morning, one overrides the earlier decision of getting up to prepare the exam.

Preference reversals have drawn the attention of rational choice theorists for a variety of reasons. Among others, these cases help sharpen the question about the temporal profile of human motivation, suggesting that the temporal proximity of an outcome majorly affect the *rates of discounting*. Following Ainslie (1975), for instance, some theorists have proposed that the relationship between motivation and time is better described, at least in these cases, in terms of *hyperbolic curves*—roughly, discount rates increase precipitously at relatively short delays as compared to longer ones (see Figure 1) (Kirby, 1997; Laibson, 1997; Rachlin, 2000). Other theorists have argued that other non-exponential forms of discounting account better for observed patterns of human behavior. (For discussion, see Green & Myerson, 2018.) It is possible, however, that this is an area of high individual variability: even among heavy smokers, for instance, it is not clear that their preferences have a unique shape (Hofmeyr et al., 2017).

Most important, perhaps, preference reversals seem to challenge one tenet central to classical rational choice theories: the so-called (historical) *separability* of preferences (see Bermúdez, 2018b; McClennen, 1990). This is the idea that what is rational for an individual to choose at a given time depends upon the preferences the person has then and there. Rational choice, as it is often put, is *myopic*: it does not

depend on the preferences the person had at an earlier time or the choices she made before. It depends solely upon her motivational structure at the time the choice is presented.

To see why this assumption is challenged, compare preference reversal to cases of weakness of will mentioned earlier. Unlike these cases, preference reversals involve what is normally characterized as a *diachronic* (as opposed to a synchronic) *conflict*. The person does not have conflicting attitudes at the time she breaks down (synchronic). The conflict, instead, is defined over attitudes the person initially had and the attitudes she ends up having later in time (diachronic). What is problematic about her, in other words, is not so much her motivational state at the time but her *irresoluteness*: the fact that the person changed her mind (e.g., by revising or dropping prior commitments) without a good reason.

This way of looking at self-control raises a distinctive set of concerns (see Bermúdez, 2018b and Thoma, 2018 for discussion). However, for rational choice theorists the rationality of resolute choice has been particularly interesting, and it becomes of paramount importance once the separability assumption is dropped. Why, in short, would it be rational to stick to some previously made choice if one's preferences have changed over time? What personal value is there in sticking to that commitment?

Different accounts have been put forward to answer this question. Some theorists, for example, have argued that rational choice should not just be a matter of one's preferences at the time but also how those preferences fit with larger plans and deliberative strategies. Being resolute, on this view, is an instance of efficient planning and good reasoning about what to prefer (Bratman, 2012; Gauthier, 1997). Other theorists have argued instead that in choosing rationally, agents should not only consider the present self but also their future selves. Resoluteness, that is, adhering to resolutions, commitments, or intentions is under this injunction recommended as a form of present and future-self collaboration (Cummings & Roskies, 2020; Easwaran & Stern, 2018; Gold, 2018; Holton, 2003).

We can, however, set aside these disagreements to bring to light an important consensus that lies behind them. Most rational choice theorists working on the topic agree that preference reversals illustrate the paradigmatic conflicts that self-control is supposed to help us solve (see, for instance, A. Ahmed, 2018; Bermúdez, 2018a). Accordingly, they define self-control as resolute choice: the capacity to adhere to resolutions, commitments, intentions, etc. For them, understanding what make self-control possible is a matter of understanding the mechanisms that allow us to stick to a decision in the light of changes in our preferences.

2. Effortful Inhibition

The motivational conflicts that compel self-control vary in several ways (Veilleux et al., 2018). There are thematic differences, such as moral vs. non-moral conflicts. But there are also differences in the shape of these conflicts. Whereas some are conflicts between different attitudes held by the person at a given time (synchronic conflicts), others are between the different time slices of the person (diachronic conflicts).

It is possible that these forms of self-control dissociate from each other. A *resolute* person, for instance, might be good at sticking to whatever commitments she has already made, say, to put away every month some savings for the education of her children. Yet, in the absence of an explicit commitment to it, she might end up spending her savings in ways that ultimately evince a short-term mindset, say, upgrading to a new car when her old is still perfectly fine. Likewise, a *weak-willed* person might succumb to temptation and decide to eat a sweet snack, despite being on a diet. But she might be able to delay gratification and wait to eat the snack when nobody is around and she does not have to share it.

One influential attempt to unify this diversity comes from the idea that we typically manage to resolve these conflicts by inhibiting certain tendencies in us: our capricious desires, the allure of short-term rewards, the temptation to forgo some past commitments, or certain automatic emotional reactions. Because inhibiting these tendencies often comes with certain feelings of effort, many theorists have reduced self-control to *effortful inhibition* (see Hofmann, Friese, & Strack, 2009; Sel, Shepherd, & Rushworth, 2020). One specific but highly influential incarnation of this view is the claim that exercising self-control ultimately boils down to a display of *willpower* (Baumeister, 2002; Holton, 2003).

There are two ideas implicit here. The first is that self-control has a distinctive phenomenology: exercising self-control is often described as unpleasant, aversive, and uncertain. In short, it is something that *feels effortful*. The second is that self-control involves a general cognitive operation, the top-down inhibition of preponderant responses. The operation is general in the sense that it underwrites a diverse set of common cognitive tasks, not restricted to the resolution of motivational conflicts: maintaining focus on a difficult task in the presence of a salient extraneous stimuli, sustaining attention on a target in the presence of similarly looking distractors, and so forth.

Below we discuss various important models of self-control centered around these two ideas (see Sections 4.1 to 4.3). In fact, many current models consist of variations along the lines set by these claims. Before doing so, however, we should note that some theorists have begun to call for a *more ecumenical* approach to defining the phenomenon. According to their view, theories seeking to define self-control as effortful inhibition are unduly reductionistic. For even though effortful inhibition might be a means of exercising self-control, there are plenty of exercises of it that are neither inhibitory or actually effortful (Carnevale & Fujita, 2016a; Duckworth et al., 2016).

Various kinds of studies can be brought to bear in support of this last point. There is, for instance, evidence indicating that goal pursuit in the face of temptation is more related to a decrease in exposure to adverse stimuli and situations, rather than to effortful exercises (Hofmann, Baumeister, Förster, & Vohs, 2012; Imhoff, Schmidt, & Gerstenberg, 2014; Milyavskaya & Inzlicht, 2017). In other words, people who are better at achieving long-term significant goals report feeling fewer temptations and having to engage less in effortful restraint than those who are worse at it, however, their scores on experimental tasks requiring effortful inhibition seem not to be significantly different.

Likewise, there is evidence that people commonly fail to behave in line with valued standards because they do not conceptualize at the time their behaviors as contrary to them (Coelho do Vale, Pieters, & Zeelenberg, 2008; Myrseth & Fishbach, 2009). Actually, heightening people’s awareness of what their values are often leads them to be more sensitive about those potential conflicts, which tends to result in greater standard-behavior consistency (for discussion, see Sklar & Fujita, 2017).

Maybe more telling, there are now a variety of well-documented interventions that seem to promote the pursuit of long-term goals that do not fit the model of effortful inhibition: for instance, developing appropriate habits (see Section 5.2) or forming certain kinds of if-then plans or “implementation intentions” (for discussion, see Sheeran & Webb, 2016). These are interventions that work mostly by pre-empting the relevant motivational conflicts either by extinguishing the problematic responses that otherwise would need to be inhibited or by helping people avoid the situations where such responses get triggered.

To illustrate, dieters often times attempt to maintain their desired weight by means of effortful limited food consumption (Johnson, Pratt, & Wardle, 2012). Their efforts are sometimes effective, although they are hard to maintain over long periods of time and in the long run can have potentially negative consequences, such as binge eating (Van Strien, Herman, & Verheijden, 2014). In contrast, developing healthy habits (e.g., buying certain kinds of groceries) or coming to form mental associations that promote healthy choices (e.g., associating having a snack craving with eating fruit) leads to better results in meeting food consumption goals. (For a discussion, see Wood, Labrecque, Lin, & Runger, 2014, and Lin, Wood, & Monterosso, 2015.)

Obviously, advocates of viewing self-control as effortful inhibition do not (need to) deny that these kinds of interventions are possible and useful. They might, alternatively, insist that these are not really forms of self-control; rather, they are forms of self-regulation, or less central aspects of self-control. But, lest this becomes a mere terminological dispute, it is worth stating one significant conclusion that follows from this kind of evidence. To wit, becoming better in the pursuit of long-term valuable goals in the face of potentially distracting options (i.e., the thing that is supposed to make self-control something valuable) does not always or necessarily involve becoming better at inhibiting problematic responses.

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III. METHODS

During the last half-century, self-control has been studied by psychologists and neuroscientists by means of more-or-less controlled experiments and tasks. Hence, understanding the scientific findings in the self-control literature requires knowing a bit about the methodologies by which those findings have been obtained. The following is not meant to be exhaustive, although many of the paradigms for studying self-control in an experimental way fall into one of these categories.

1. Delay of gratification paradigms

Delayed gratification tasks were initially developed to study age-related changes in self-control among children. Although prior to the 1960s there were some attempts to build projective measures of delayed gratification (for example, Singer, 1955), the tasks devised by Mischel and his colleagues are now considered as providing a reliable measure of it (Mischel et al., 1989).

In general, delayed gratification tasks tend to come in two flavors, *hypothetical* and *real choice*. In hypothetical tasks, subjects are presented with a series of choices between smaller immediate rewards and larger delayed rewards without the expectation to receive either of them. Subjects are asked a variety of questions regarding their preferences, say, “which would you prefer: \$10 in 100 days or \$3 now?” with questions varying the size of the rewards and the length of the delays (see, Kirby, Petry, & Bickel, 1999, for a standard questionnaire). Typically, answers to these questions are taken to measure self-control and are used to construct temporal discounting curves (Carter, McCullough, & Carver, 2012; Green & Myerson, 2018; Rachlin, Raineri, & Cross, 1991).

In real choice tasks, by contrast, subjects make actual choices and receive the rewards then or at some point after the choice is made. In the simpler version of this kind of task, decisions are made at a single point in time, after which they cannot be revoked. In the more complicated *sustained* versions of it, subjects receive the chosen delayed reward after a period of time during which they are allowed to change their minds (Mischel et al., 1989). This opens the possibility of determining how much subjects, who initially prefer that reward, can resist opting out for the smaller, immediate reward. That is, the amount of time they can wait can be used as a more finely grained measure of their ability to delay gratification.

To the extent that these tasks make delayed gratification easy to observe and measure, researchers have often used them to assess to what degree different factors impact individual attempts at self-control. One example is positive and negative mood. By differentially inducing negative and positive affect on subjects, say by giving them positive vs. harsh feedback on a prior task, and asking them to subsequently perform a delay gratification task, we now have good evidence that negative affect hinders self-control, while positive affect has a more nuanced effect: it does not hurt it and sometimes facilitates it (for review, see Luerssen & Ayduk, 2014). At a different level, delay of gratification tasks have been instrumental to identify neural correlates of self-control impairments among populations with drug disorders (Ballard et al., 2015).

Perhaps because hypothetical tasks tend to be inexpensive and easy to run, they are commonly used to study how time, valuation, effort, and self-control are related. Also, there is evidence that the results tend to coincide with those obtained in comparable real choice tasks (Johnson & Bickel, 2002; Madden, Begotka, Raiff, & Kastern, 2003). At the same time, to some researchers, sustained versions of the task raise the possibility that factors other than time actually influence choice, which would mean, if true, that these tasks might not be isolating delay discounting as such (Green & Myerson, 2004; Reynolds & Schiffbauer, 2004). In brief, waiting for a period of time to obtain a delayed reward might raise

anxieties and doubts about the certainty of obtaining it. In the face of those anxieties, it might even be rational to go for the short-term reward.

2. Executive functioning tasks

As mentioned earlier, many theorists define self-control in terms of effortful inhibition. Among them, the use of executive function tasks has taken relative precedence. In general, these are tasks that require high-level, goal-directed control over processes that would otherwise result in prepotent or overlearned responses. These tasks have been used for a range of purposes: for example, to assess individual differences in self-control, to evaluate the prospects of different interventions, and to see what kinds of factors tax exercises of self-control.

The Stroop task and various kinds of go/no-go tasks are examples of common paradigms used here (Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956; Stroop, 1935). In the former, subjects are presented with incongruent stimuli (e.g., the word “red” written in green) and are asked to respond in a way that requires inhibiting an overlearned response (e.g., not reading the word but reporting its color; see Figure 2). In go/no-go tasks participants develop a prepotent response (e.g., hitting the spacebar) to a frequently appearing target, which they subsequently must inhibit when a less frequent non-target appears.



Figure 2. (From Henik & Salo, 2004) *Stimuli for color-based version of the Stroop task.* The two leftmost columns contain incongruent stimuli and the two rightmost columns contain neutral stimuli (originally, Stroop used cards with patches of color for the neutral condition). In both conditions, participants are asked to name the color of the ink of each stimulus without stopping, and the two conditions are presented separately.

At first glance, these tasks might seem unrelated to self-control. There is, after all, no motivational conflict involved in them: there is no reward and nothing preferable about the response to be avoided. Yet under the assumption that self-control consists in, or is largely a matter of, effortful inhibition, these tasks do seem to be closely related to common exercises of this ability. Not only is the phenomenology of overriding the inappropriate response similar to the effortful and aversive character of resisting temptation, the inhibitory mechanisms behind them seem, at least, of a similar kind (Hofmann, Schmeichel, & Baddeley, 2012; Sripada, 2020).

Following this line of reasoning, many theorists have used these tasks to investigate some of the reasons self-control fails. As noted, overcoming temptation often requires effort; but effort can normally only be exercised for limited periods of time. By extension, it seems plausible to suppose that continued exertion might lead to self-control failures. That, as we discuss in detail in Section 4.2, is a hypothesis that has been tested with the use of these tasks (Hagger et al., 2010). If a person exercises restraint, say, by performing a Stroop task, would that affect her ability to delay gratification?

Similarly, the converse question, the question about improving one's capacity to forgo tempting rewards, can be addressed with the use of executive functioning tasks. Suppose that, as hypothesized, self-control requires inhibitory control. Then, it would seem reasonable to conjecture that training inhibitory control by means of executive function tasks would lead to better self-control. There is some evidence that repeated practice of go/no-go tasks improves one's future chances of avoiding temptation (Houben & Jansen, 2011; Veling, Aarts, & Papiés, 2011). But this evidence has recently been challenged in a study that found no self-control improvement in participants that underwent a six-week training program (Miles et al., 2016).

Now, to the extent that the use of these tasks to study self-control is closely tied to a specific way of conceptualizing the phenomenon, researchers have become interested in assessing whether the results obtained in them generally correlate with other self-control measures. And whereas there is much to be done on this score, things are not as simple as one might otherwise suppose. More recently, results in standard executive function tasks, including Stroop tests, for instance, have been found to have limited predictive value with respect to performance in delayed gratification tasks and self-control questionnaires (see below) (Duckworth & Kern, 2011; Necka, Gruszka, Orzechowski, Nowak, & Wójcik, 2018).

Obviously, this need not impugn the hypothesized relation between self-control and inhibitory top-down control. As various researchers have argued, it is possible that the lack of ecological validity of these tasks, say, the fact that they do not really seem to incorporate a genuine motivational conflict, not the falsity of the underlying assumption, explains why performance in them does not converge with performance in other reliable self-control tasks and measures (Baumeister & Vohs, 2016). Accordingly, it is possible that variations of these task that manage to incorporate an element of reward, say, by rewarding differentially appropriate and inappropriate responses, might increase correlation with other self-control measures (see Wolff et al., 2016 for an example of how this can be done). At present, however, this is a possibility that deserves further investigation and with respect to which the debate is just beginning (although see Dang, King, & Inzlicht, 2020, who argue on general methodological grounds for skepticism about finding strong correlations between self-report and behavioral measures of self-control).

3. Questionnaires

So far, we have been talking loosely about people being better or worse at exercising self-control. It is possible, however, to make our discussion more precise here by drawing a distinction between two ways of conceptualizing this ability. We can talk about *state* self-control: the ability, as it varies across time and situation, modulated by factors such as previous attempts, motivation, and so forth. On the other hand, we can talk about *dispositional* or *trait* self-control: the ability, as relatively immune to situational variation.

Pen-and-paper questionnaires have been widely used for measuring trait self-control. In fact, most evidence we have regarding the centrality of self-control for successful life outcomes is from measurements obtained by these questionnaires, as completed by participants or close informants. Scores obtained in them have been shown to predict, among others, physical health and wealth (Moffitt et al., 2011), interpersonal success (Tangney, Baumeister, & Boone, 2004), and academic achievement (Duckworth, Tsukayama, & May, 2010).

Currently, more than 100 existing questionnaires can be found in the self-control literature (Duckworth & Kern, 2011). The Self-Control scale is one the most general and most commonly used (Tangney et al., 2004), although there are other common instruments. In its long version, it asks subjects to rate their agreement with items intended to assess their ability to override inner responses (e.g., I get carried away by my feelings, I lose my temper too easily) or to interrupt some behavioral tendencies or patterns (e.g., I do not keep secrets very well, I spend too much money).

In addition to being predictors of positive life outcomes, scores from the Self-Control scale and similar questionnaires have been used to test hypotheses regarding the specific processes and abilities that underlie self-control. A good illustration comes from the study of valence-weighting: how individuals integrate positive and negative information about a situation when making an initial assessment of it (for an overview, see Fazio, Pietri, Rocklage, & Shook, 2015). There is evidence that people with low trait self-control, as measured by the Self-Control scale, tend to have a positive valence weighing bias (i.e., they tend to give more weight to positive information), which would explain why they tend to favor alluring options despite their obvious negative consequences (Zunick, Granados Samayoa, & Fazio, 2017).

These scores also help explain to what extent self-control relates to other personality traits. There is, for instance, ample evidence that religious attitudes and beliefs modulate self-control, as measured by a number of these questionnaires (McCullough & Carter, 2013; McCullough & Willoughby, 2009, but see Section 5.2 for further discussion). More significantly, self-control, as measured by the Self-Control scale, seems to mediate some well-known associations, for example, between religiosity and lower rates of substance abuse (DeWall et al., 2014) and between religiosity and lower levels of aggression (Shepperd, Miller, & Tucker Smith, 2015).

With so many questionnaires available, it is worth asking what determines researchers' choice of one of them over the other. To the extent that the variations in the instruments are often due to the kinds of behaviors targeted and the population for which these were originally construed, specific research questions are usually what determine the choice. Also, to the extent that questionnaires are also underwritten by different models or ways of conceptualizing self-control, the choice of questionnaires is sometimes also driven by the theoretical commitments of the researchers (see de Ridder, Lensvelt-mulders, Finkenauer, Stok, & Baumeister, 2012, for some discussion of these points).

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IV. MODELS

We have reviewed some of the ways in which the phenomenon of self-control has been defined and some of the paradigms that have been used to study it empirically. We now turn to some widely discussed models of the psychological mechanisms at the heart of successful exercises of self-control.

1. Strength model

As mentioned earlier, many theorists have argued that exercising self-control, at least in paradigmatic cases, is a matter of inhibiting preponderant and otherwise overlearned responses. By appealing to the notion of willpower, Roy Baumeister has proposed an influential account of self-control along these lines. The essence of the account is that self-control involves an exercise of *strength*, dependent upon the availability of *certain limited resources* (Baumeister, 2002; Baumeister et al., 2007).

To explain this, return to the idea that self-control is a form of self-regulation. Following Carver & Scheier's (1982) influential cybernetic model, it is common to break down self-regulation into three distinct components: setting certain goals and standards, monitoring whether one is achieving them, and changing one's current behavior whenever it is not in line with those goals and standards. Self-control is supposed to belong to this third element.

According to Baumeister and his colleagues, changing one's behavior in this way is a matter of overriding certain motivational impulses. It is not actually a matter of preventing them from occurring—that would be a function of the first aspect of self-regulation. Instead, it is about preventing them from running to completion (Baumeister & Heatherton, 1996). Further, because these impulses have a certain strength, successfully overriding them requires the display of a *greater* strength. This is intuitively what self-control, understood as willpower, is: the deployment of one's personal strength to override certain kinds of responses or behaviors.

Various pieces of evidence have persuaded many self-control theorists of the plausibility of the model. First, the model seems to provide a straightforward explanation of the alleged phenomenology of willpower. By analogy with physical effort, it treats the feeling of exerting effort as the visible sign that some kind of resources are being spent in resisting a tempting option (Muraven et al., 1998). More

important, perhaps, the strength model also captures a phenomenon somewhat familiar from everyday experience (see Section 3.2): the fact that one's capacity or willingness to exert self-control diminishes following a previous act of self-control (Carnevale & Fujita, 2016b). In the literature, the phenomenon has come to be known by the name of "ego depletion."

Since the early 1990s, numerous attempted laboratory demonstrations of ego depletion have been carried out using a sequential-task paradigm. Depending on how one counts them, the studies add up to anywhere in the range of 200 to 600 (Baumeister et al., 2020; Hagger et al., 2010). In the typical version of it, participants are randomly assigned to either of two tasks: a control task or one that requires overriding certain impulses (the depletion task). Immediately after, they are asked to perform a second task (the outcome task) that also requires impulse inhibition. The observation reported by many experimenters is that participants in the control group perform better in the output task than those that previously performed the depletion task.

Because effortful inhibition has typically been considered a general kind of operation, these studies have used a diverse set of depleting and performance tasks: from an executive functioning task, such as the Stroop, to tasks involving the suppression of emotional reactions, to the infamous cold pressor task (keeping one's arm in ice water for a long period of time) (see Hagger et al., 2010). For reasons that we will discuss below, some theorists have worried about this. In general, however, the differences in the tasks have not made a significant difference in the outcomes reported.

Proponents of the strength model have taken these results as confirmation that effortful self-control requires using general but limited resources (for some ways of interpreting ego depletion, which do not appeal to resource limitations, see Inzlicht & Schmeichel, 2012 and Carnevale & Fujita 2016). In the stronger interpretation, the depleting task is seen as exhausting these resources; in a less radical interpretation, it does not exhaust them but reduces them to the point where the person is no longer willing to expend any more of them (Baumeister, 2002; Muraven et al., 1998). Regardless, the idea is that in the absence of *available* resources, the person does not have the strength to counteract some undesirable impulses; for that reason, her performance in the output task goes down.

2. Interlude: Is ego depletion real?

In recent years, skepticism surrounding the phenomenon of ego depletion has been on the rise. Given that the phenomenon plays a major role as evidence for the strength model, it is worth discussing some of the reasons behind this skepticism. Also, looking at how the story of this discussion has unfolded (at least, some significant moments of it) will serve to illustrate one of the liveliest discussions happening today in the field.

Although appeals to mental resources and their limitations have been common in cognitive and social psychology for the last few decades, many theorists have worried about their explanatory import (Cohen, 2017; Navon, 1984). Sometimes talk of resources has been metaphorical; other times it has

referred to some postulated quantity yet to be discovered. But a theory that relies on limited resources as heavily as the strength model does certainly need to say something more concrete about it.

In a paper published in 2007, Baumeister and his collaborators attempted to move forward in this direction using a modification of the ego depletion paradigm (Gailliot et al., 2007). They presented a series of studies purportedly showing that depleting tasks reduced glucose levels, that the reduction was predictive of performance in subsequent tasks, and that performance decrements in the latter could be alleviated by ingesting a glucose drink. From this they concluded the self-control depleted glucose and that the limited resources at the heart of the model were, literally, energy resources. In other words, our limitations in the exercise of self-control were metabolic.

No doubt this would have been an interesting conclusion, except that we now have solid reasons to doubt that these results were ever valid (for an overview, see Vadillo, Gold, & Osman, 2016). First, given plausible assumptions about brain metabolism, it does not seem that standard self-control tasks can consume the amount of glucose reported in the studies (Kurzban, 2010). Also, statistically speaking, the effects reported do not seem plausible, given the size of the sample used in the studies (Schimmack, 2012). Last, but perhaps more telling, other studies that asked people to swish a glucose drink in their mouth without swallowing it didn't find a performance decrement following the depleting task (Carter & McCullough, 2013; Molden et al., 2012).

These criticisms, clearly, were not sufficient to impugn the strength model: the metabolic claim was, after all, an ancillary hypothesis, not essential to the theory. But, as theorists' attention was drawn to this debate, many started wondering about the reality of ego depletion. Why did swishing glucose in one's mouth prevent the worsening of performance? Was it a motivational effect? Or was it perhaps that the glucose had no effect and there was no depletion of resources happening in the first place?

Several studies and analysis have suggested that the latter is likely the case, sparking a generalized skepticism regarding ego depletion and the strength model of self-control (Frieze, Loschelder, Gieseler, Frankenbach, & Inzlicht, 2019; Inzlicht, Gervais, & Berkman, 2015). In a way, this reflects our current *zeitgeist*. The skepticism has come at a time where social psychology (among other disciplines) has been undergoing a replication crisis (Pashler & Harris, 2012). At the same time, the reasons for doubting the reality of the effect cannot easily be dismissed as mere "brouhaha" (Baumeister et al., 2020).

As an illustration, consider two of these "skeptical" studies. The first is a meta-analysis where Carter and colleagues sought to test the depletion hypothesis and to estimate the size of the depletion effects, by including unpublished results where no depletion effect was found (Carter, Kofler, Forster, & McCullough, 2015). After analyzing 116 studies, they concluded that there was scant evidence to suggest that the depletion effect was real. The second is an attempted pre-registered replication of the depletion effect involving 23 different labs and following a standard sequential task-paradigm (Hagger et al., 2010; Sripada, Kessler, & Jonides, 2014). It was concluded, after running more than over 2,000 subjects, there was likely no such thing as an ego depletion effect of the sort that had been reported previously; if there was one, its size was close to zero.

Obviously, theorists who believe in ego depletion have responded to this. A common response is that skeptics have excluded from their analyses huge swaths of successful ego depletion studies that would paint a different picture or have used in their replications tasks that are not justified by the underlying theory (see Baumeister et al., 2020 for an extended presentation of these criticisms). Accordingly, new meta-analysis and replications efforts have been proposed, using narrower or alternative dependent measures (see, for instance, Dang, Björklund, & Bäckström, 2017). Whereas the discussion continues, it seems clear that the situation has changed dramatically from what it was in the early 2000s. The strength model of self-control is nowadays far from having the preeminence that it enjoyed for over a decade.

3. Dual Process Models

Among psychologists, dual process models have been widely used to account for almost any aspect of higher-cognition since they first appeared in the late 1970s and early 1980s (Evans & Stanovich, 2013; Frankish & Evans, 2019). In general, these models posit a distinction between two kinds of thinking processes, one fast and intuitive, the other slow and deliberative, which is thought to be central to the architecture of the human mind. The distinction is usually meant to explain commonly observed discrepancies between people's explicit attitudes and their manifest behavior.

Various theorists have appealed to dual models to account for the psychological mechanisms behind self-control (Hofmann et al., 2009; Sripada, 2014; Wiers & Stacy, 2006). Part of what makes these models appealing is that they provide a useful way of conceptualizing some of the motivational conflicts discussed above. In short, according to them, conflicting motivations within a person, say, between those that merely motivate her to act and those that also reflect her values, are the deliverances of different kinds of thinking processes.

Consider the classical model proposed by Mischel and his colleagues (Metcalfe & Mischel, 1999). According to them, human motivation is the product of two distinguishable systems, a hot one and a cool one. The former mostly involves a reactive form of processing: motivations are triggered by the presence of stimuli with certain appealing characteristics and their activation directly issues in approach and avoidance responses. The cool system, by contrast, involves a more holistic way of operating: motivations are mediated by abstract knowledge, strategies, and general goals, making behavior less directly dependent on available stimuli.

Mischel and his colleagues originally proposed this architecture to explain the results observed by them in delayed gratification paradigms. For example, the fact that hot motivations are stimulus driven explained, in their view, why self-control failures are more likely in the physical presence of the short-term rewards. It is clear, however, that the hot/cool distinction (or a version of it) can play a more general role explaining other results obtained in the laboratory. There is good evidence, for instance, that working memory load, which is said to interfere with "cool" processing, increases temporal discounting (Hinson, Jameson, & Whitney, 2003).

Obviously, not all dual model theorists have adopted the “hot/cool” terminology. But many of them have argued that drawing some distinctions along these lines is not only important to explain experimentally observed failures of self-control but also key for assessing “real-life” interventions to promote it. The distinction cannot only help explain why certain kinds of interventions might not work. It can also guide the design of strategies that do work.

To illustrate, many interventions have been shown to change people’s health-related intentions and their assessment of risk. Unfortunately, they only have a modest effect changing their health-related behaviors (see the articles in Sheeran et al., 2016). A plausible explanation is that these interventions tend to target participants’ general knowledge or reflective goals, leaving intact their dispositions to respond impulsively to certain stimuli. By contrast, interventions that target these impulsive responses (say, making healthy choices easily available) or that teach people how to keep them under control (training oneself not to attend to unhealthy alternatives) would seem to have better chances of success (Avishai-Yitshak & Sheeran, 2016; Sheeran et al., 2016).

Despite their popularity, dual models have faced some significant criticisms as depictions of the cognitive architecture behind decision-making (see, for example, Keren & Schul, 2009; Krajbich, Bartling, Hare, & Fehr, 2015). We cannot review all these criticisms—doing it would get us into larger methodological and epistemological discussions. We can, however, focus on some of the criticisms that have been issued against dual models as applied to the specific phenomenon of self-control. Looking at these criticisms helps illustrate some of the complexities involved in accounting for the psychology behind it.

First, it is standard among dual-model theorists to characterize failures of self-control in terms of one mode of processing taking precedence over another, say, hot motivations taking precedence over cool ones. But, as some critics have argued, there are telling exceptions to these sorts of generalizations, which are robust enough to cast doubt over the exhaustiveness of dual accounts. Briefly put, in certain situations, thinking slowly or thinking more can be detrimental for self-control; acting impulsively or following one’s intuitive reactions might be better (for discussion, see Duckworth et al., 2016; Fujita, 2011).

The examples are easy to find once one begins looking for them. Whereas *emotional* reactions tend to favor impulsive gratification, developing some emotions (e.g., pride and guilt) can actually aid self-control (Giner-Sorolla, 2001; Scarantino, 2020). Similarly, even though *impulsive* reactions often divert one from achieving long-term goals, deliberating about one’s choices sometimes makes it easier to rationalize poor decisions (De Witt Huberts, Evers, & De Ridder, 2012). Importantly, as we discuss in Section 5, developing that right *automatisms* and *habitual* responses can be effective ways to resist the temptation of short-term rewards when long-term but larger rewards are available.

Another significant and often raised challenge for dual models has to do with the architectural distinction they posit. According to some of their critics, it is unclear to what extent the evidence

adduced on behalf of these models actually supports this distinction, as opposed to a much weaker claim. This was a point raised above in relation to the phenomenon of weakness of will. Disparities between what people explicitly say or judge and what they do can be interpreted in several different ways.

Consider, as an example, a recent proposal by Kentaro Fujita and his colleagues (Fujita et al., 2018; Sklar & Fujita, 2020). According to them, the motivational conflicts behind self-control are best understood in terms of a whole vs. part dynamic. The person, in this picture, is motivated to do a certain thing. But that motivation fails to be integrated with her overall motivational makeup. It fails to cohere, in other words, with the hierarchical structure of super- and subordinated goals that otherwise describe what motivates the person.

Clearly, this whole-part model of self-control is also committed to a certain mental architecture—more precisely, it is committed to the idea that the conflicts behind self-control are signs of a psychological structure of sorts. But the conflicts, according to it, are not evidence of the person being torn or of “two minds,” as advocates of dual systems would have it. They are instead evidence of a lack of self-governance: the absence of a structure exerting top-down influence to organize one’s motivations into a coherent whole. (For a similar proposal along these lines, see Cummings & Roskies, 2020.)

4. Minimalists and Maximalists

Over the last few decades, most general accounts of self-control have been built around the main ideas behind the strength and dual process models. But because each account faces significant challenges (empirical and conceptual), some theorists have more recently been motivated to pursue alternative ways of explaining self-control. We can briefly look at some of these proposals to get a sense of some current discussions in the literature.

Some theorists, for instance, have preferred adopting more *minimalist* models. These models are minimalist in the sense that they do not postulate a specific cognitive mechanism or architecture for self-control, whether these are depletable resources or partitions within one’s motivational system. For them, instead, exercises of self-control (successful or failed) are simply an indication of how much weight different goals and considerations have in us, or how we aggregate those considerations when making a decision.

A good example of this kind of approach is Berkman and colleagues’ account of self-control as a *value-based choice* (Berkman, Hutcherson, Livingston, Kahn, & Inzlicht, 2017). According to them, choices are the product of integration processes, by which different considerations are weighted, trade-offs are calculated, and prospects of success are brought to bear. This is true as well of those choices by which self-control is exercised. Thus, subjectively, it might seem as though one is attempting to resist a force within oneself. Objectively, it is like any other decision: a matter of choosing in accordance to what one prefers, all things considered.

This kind of view is meant to be deflationary (the authors describe it as “parsimonious”). Self-control, according to it, is not a distinctive skill, the manifestation of some special power, or a capacity of sorts. It is just the exercise of a capacity to decide what one thinks is best. For the same reason, failures of self-control are not much different from other well-known forms of poor reasoning. They are, in short, the results of biases in the aggregations of value upon which decisions are made.

Obviously, this strong minimalist approach comes at a cost. Whereas strength and dual models place a high premium on the phenomenology of self-control, minimalists instead seek to downplay it. For Berkman and colleagues, for example, the feelings of conflict that precede self-control decisions are evidence of value fluctuations: the person cannot settle on how valuable the alternatives she faces are. Similarly, the feelings of effort that normally accompany displays of self-control are simply the manifestation of one’s realization that some attractive opportunity is being left on the table (for effort understood as opportunity cost, see Kurzban et al., 2013).

Other theorists, by contrast, have proposed more *maximalist* approaches. If minimalists argue that self-control is not a unique or distinctive psychological ability, maximalists doubt that exercises of self-control can be fully understood in terms of individual abilities or the architecture of our minds. For them, the psychological makeup of a person at a given time is part of the explanation of whether she succeeds at exercising self-control. But attention to personal history and context is also key (for a classic formulation of this maximalist understanding of self-control, see Elster, 2000).

Duckworth and colleagues have developed an account of this sort, which they dub the *process model* of self-control (Duckworth et al., 2016). The idea of the model comes from some observations already mentioned. Particularly important for them is the variety of available means that people have of reining in conflicting motivations, other than by sheer effort or by the direct inhibition of responses. These include the development of habits and automatisms, and interventions in their environments.

According to Duckworth and colleagues, motivations generally influence behavior in a series of iterative cycles, each consisting of various stages. Initially, the person finds herself in a situation. Being in the situation, her attention is directed toward certain aspects of it. Then, depending on how she appraises the situation, a behavioral response is produced. The response, in turn, affects the probability that the person will encounter a similar situation in the future.

The idea of viewing self-control as a process is to accommodate the variety of ways in which it can be exercised. In fact, exercises of self-control can happen at any of these stages. One can modify the situations faced to preempt or minimize motivational conflicts. Attention can be turned away from the tempting stimuli or directed toward features of the situation that make it easier to resist. Changes in one’s appraisal of the situation can be made. Finally, as a last resource, one can try to inhibit the problematic response.

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V. INTERVENTIONS

As we have seen, traditional approaches to self-control have emphasized the idea that self-control is best achieved by inhibiting problematic responses. But, in recent years, as philosophers and psychologists have turned to other ways of conceptualizing the phenomenon, there has been an increasing interest in alternative “effortless” interventions to promote goal pursuit in the face of temptations. We have already mentioned above some of these interventions. We now discuss two of them in detail (see Duckworth, Milkman, & Laibson, 2018, for a complete review of a variety of tested interventions).

1. Cognitive re-appraisals

Failures of self-control seem indicative of some sort of short sightedness. The person faces a situation where one of the options is, in the long run or all things considered, better. Yet, despite knowing this, she ends up favoring a less optimal option, tempted by its short-term rewards or by some attractive aspect of it. It would seem, therefore, that self-control could be improved by getting people to broaden their perspective on the situations where this kind of choices are faced.

Mischel and colleagues first tested this suggestion on delayed gratification tasks (for a review, see Mischel & Rodríguez, 1993). As they observed, children were able to postpone gratification when they were able to physically shift their attention away from tempting stimuli or to entertain distracting thoughts. More significantly, they found that their abilities were also enhanced when children were instructed to construe those stimuli in a different light: for instance, when they pretended the stimuli were not real (“imagine you are looking at a picture of the marshmallow, not at a real marshmallow”) or when they focused on abstract features of them (think of the marshmallow as puffy and round, like a cloud”).

In a series of studies, Fujita and colleagues provided further confirmation of the role that subjective *construals* play with respect to self-control (Fujita & Han, 2009; Fujita, Trope, Liberman, & Levin-Sagi, 2006; but see also Freitas, Gollwitzer, & Trope, 2004). In their studies, participants were induced to think abstractly or concretely about available choices in monetary delayed gratification tasks. To induce these modes of thinking, a procedural priming paradigm was used, which required that subjects perform prior unrelated tasks known to vary along these dimensions—explaining why certain actions that are normally performed primes abstract thinking, and that how they are performed primes concrete thinking. As Fujita and colleagues observed, participants primed to think more abstractly expressed significantly stronger preferences for delayed outcomes, as compared to those primed to think more concretely.

Now, it is somewhat puzzling that manipulating the degree of abstractness of one’s thought might make a difference in one’s preferences. It is even more puzzling that this might lead one to behave in more rational ways. After all, thinking more abstractly or concretely about one’s choices involves a difference in focus, but it does not seem to necessarily provide information that one did not have before

(see Bermúdez, 2018a for a discussion of this problem in the context of framing effects). To illustrate, picturing a marshmallow as puffy and round does not change the fact that the marshmallow is (and one knows it to be) sweet and delicious. Abstractly thinking about an outcome does not necessarily provide new information about its monetary value.

Many psychologists, however, believe that construals make a difference because altering them can potentially change the subjective meaning of the choices faced by individuals (Carnevale, Fujita, Han, & Amit, 2015; Fujita et al., 2018). Inducing different construals, in other words, promotes what is often referred to as “cognitive re-appraisal” (Gross & John, 2003). In short, by altering the way one thinks about them, the meaning of the options changes and that change, in turn, leads to a reconsideration of the impulsive or emotional response normally attached to them.

Cognitive re-appraisals can happen in several different ways. As we have seen, it is possible to artificially induce them by means of priming techniques. More interestingly, at least from the point of view of designing interventions applicable in everyday life, they are known to result from processes that involve some form or another of *psychological distancing*. This is, in fact, a well-documented hypothesis that has recently sparked a wave of interesting research. People can change the meaning of a problematic situation and, hence, their immediate responses to them, by mentally detaching from it along a variety of dimensions.

Temporal distancing is one familiar dimension of detachment (Bruehlman-Senecal & Ayduk, 2015). As the label implies, it involves an individual mentally separating herself from the here and now. The person, for example, ceases to focus on the immediate consequences of a problematic recent event. Instead, she directs her attention to how the event would be perceived by her in a distant future. Another familiar dimension consists in self-distancing (Grossmann & Kross, 2014; Kross & Ayduk, 2017). Instead of being immersed in her own perspective, the person imagines what the event would look like from the perspective of a third-person observer witnessing it.

There is a wealth of evidence showing that temporal and self-distancing can aid emotional regulation. It has been found, for instance, that distancing helps down regulate stress and has positive consequences in how individuals with depressive disorders think about negative experiences (Bruehlman-Senecal & Ayduk, 2015; Kross, Gard, Deldin, Clifton, & Ayduk, 2012; J. Park et al., 2014). It also facilitates navigating personal conflicts (Grossmann & Kross, 2014; Leitner et al., 2017) and boosts valuable reasoning attitudes (Kross & Grossmann, 2012). Finally, and perhaps, more central for present purposes, this kind of distancing can aid self-control (Mischel & Ayduk, 2004).

Rachel White and her colleagues provided a promising demonstration of the power of self-distancing in this regard (White et al., 2016). They asked a group of 4- and 6-year old children to perform a boring task for 10 minutes, while having the option to take breaks in which they could play a fun video game on an iPad. They found that children who were asked to take a third-person perspective on the task worked longer on it, as compared to those who took a first-person perspective. Interestingly, children who impersonated an exemplar character and were asked to view their situation from that

perspective (in their case, Batman) outperformed those who took the perspective of an indistinctive third person. (For discussion and validation of the methodology of self-distancing among children, see Grenell et al., 2019.)

These results are promising for a variety of reasons. But one noteworthy aspect of them is how relatively easy it is to engage in some form of self-distancing. In everyday life people often refer to themselves in the third person (say, by using “you” or their own name during episodes of self-talk), invite others to look at things from a distant perspective, and keep diaries where they register their experiences. And these simple interventions have been shown to promote self-distancing (Bruehlman-Senecal, Ayduk, & John, 2016; Moser et al., 2017; Orvell, Kross, & Gelman, 2017; J. Park, Ayduk, & Kross, 2016). Thus, to the extent that people do this without much effort, even spontaneously, self-distancing promises to be an easily available way of promoting self-control.

2. Habits

Habits often create trouble for self-control. The picture here is a familiar one. You make a resolution to change some recurrent behavior to achieve some long-term benefit: not to smoke, to exercise daily, to eat better, etc. Yet when the time comes, you slip into an old habit and fail to live in accordance with those resolutions (Itzhakov, Uziel, & Wood, 2018; Labrecque, Wood, Neal, & Harrington, 2017). You light up, trade a morning jog for a few extra minutes in bed, or eat junk food after a day of hard work.

Various considerations reinforce this contrasting picture. To mention one of them, habitual behaviors tend to be driven by context in ways that would seem at odds with personal control. This, in fact, is reflected in a common way of defining habits as context-response associations learned through repeated performance (Gardner, 2015; Labrecque et al., 2017). Also, habits tend to trigger behavior automatically. Their associated responses, in other words, tend to be relatively resistant to change from persuasion and often in tension with explicitly held attitudes (Amodio & Ratner, 2011; Wood & Runger, 2016).

Standard ways of experimentally studying self-control reflect this tension between acting habitually and exercising self-control. Discussed in Section 3.2 is that many theorists have favored executive functioning tests (e.g., versions of the Stroop task) as a means of measuring trait self-control. These tests characteristically pit novel or less rehearsed behaviors with responses that have been overlearned and that often are part of the habitual repertoire of participants (say, reading a word presented to you). Under the assumption that habitual inhibition is paradigmatic of self-control, responding contrary to these responses has been taken as a proxy of trait self-control.

Many psychologists have accordingly developed interventions for boosting self-control aimed at breaking existing habits. The interventions typically follow one of the following routes (for discussion of some of these techniques, see Wood & Neal, 2016). Some of them work by making contextual cues less salient: hiding away your cellphone to avoid distractions while studying for an exam or keeping

snacks out of sight in order to stick to a healthier diet. Interestingly, major life changes, such as moving to a new place or becoming a parent, can have this disruptive effect too (Carden & Wood, 2018).

Other interventions work by adding costs to habitual responses or reducing the indirect costs of making appropriate choices. Pre-commitment strategies are a good example here (Elster, 2015; Strotz, 1956). For instance, making a public commitment to pursue a long-term goal adds an extra layer of social pressure not to diverge from it (Hawley, 2020; O'Brien, 2020). At an institutional level, these kinds of interventions are also possible. Smoking bans on campus add a disincentive to light up: one has to walk a long way to get a smoke. Adding a fast checkout line only for healthy meals in cafeterias, by contrast, creates an extra incentive to have a better diet.

Finally, strategies of vigilant monitoring (i.e., telling yourself, “don’t do it!”) are also helpful in this regard (Quinn, Pascoe, Wood, & Neal, 2010). Whereas they do not sustain self-control by changing the strength of the habit, they do heighten top-down cognitive processes that aid restraining a habitual response. Relatedly, nudges or “reminders” presented in the contexts where habituation has occurred, say, the packages of an unhealthy snack, seem also to have this effect (Geier, Wansink, & Rozin, 2012).

Still, given the pervasive role that habits have in our lives, the contrast between acting habitually and exercising self-control would seem to leave us in a precarious position. Fortunately, there is a more positive role for habits to play with respect to self-control, a role that recent work on the topic has begun to understand much better (Galla & Duckworth, 2015; Wood, 2017). In brief, whereas habits can get in the way of one’s long-term commitments, this might be a function of some of our specific habits, rather than principled opposition between acting habitually and exercising self-control.

There are various possible ways of looking at this. First, habits of the right kind can pre-empt situations where temptations abound or where willpower is required to stick to a long-term goal. If you get in the habit of shopping locally in your neighborhood, you might end up walking more than you would otherwise do. And that, in turn, might contribute to having a lower body mass index (BMI) (Verplanken & Roy, 2016). Additionally, developing appropriate habits can protect one from making wrong decisions in situations where deliberation is hard (Lin et al., 2015; Wood, 2017). If you are tired, you might not have the stamina to stick to a resolution. But if you have the right kinds of habits, you might automatically follow suit.

Several results speak on behalf of these possibilities. It has been found, for instance, that people who score high on a variety of self-control measures tend to have weak habits for unhealthy activities, such as eating junk food (Adriaanse, Kroese, Gillebaart, & De Ridder, 2014). By contrast, they tend to have strong habits for activities that promote achievement of long-term goals, for instance, regularly doing some physical exercise (Gillebaart & Adriaanse, 2017). More surprising perhaps, people with appropriate work/study habits report being less conflicted by opportunities to engage in leisurely or distracting activities (Galla & Duckworth, 2015).

Obviously, diverging accounts of self-control conceptualize in different ways the positive role that habits can play here. Theorists who understand self-control mainly in terms of restraint or willpower will tend to see habits merely as ancillary to it: that is, as pre-empting the need to exercise self-control by obviating the conflicts that make it necessary (see, for instance Sripada, 2014; 2020). On the other hand, those who have a more ecumenical conception of self-control will tend to view habits as further constitutive elements of it (see, for instance, the process theory discussed in Section 3.4). In the latter view, developing good habits is essentially one efficient way of becoming good at self-control.

Regardless how one conceptualizes it, having the right kind of habits seems to be majorly implicated in the overall ability to shape conduct in line with valued goals and standards. And this, everyone can agree, is a desirable goal, independent of how one’s theory ends up framing it. It would seem, therefore, that designing policies that promote the development of healthy habits can have a positive effect on people’s life, from a personal to a national scale (Rothman et al., 2015; Wood & Neal, 2016).

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VI. RELATED PHENOMENA

As mentioned at the outset, self-control is part of the capacities and traits that make self-regulation possible. It is also strongly associated with a variety of positive life outcomes. For these reasons, many theorists have been interested in understanding the relation between self-control and other neighboring psychological constructs. Understanding these relations is key to placing self-control among the constellation of abilities and traits involved in successful conduct management. It also helps establish more precisely what specific aspects of self-control explain its contribution to those positive outcomes. We now turn to illustrate these points.

1. Grit

Over the last decade, as interest on self-control has grown, research on grit has also caught the attention of theorists working in the field. Grit, at least some aspects of it, had previously been studied under the labels of “persistence” (Lufi & Cohen, 1987) and “conscientiousness” (Hough, 1992). But its recent prominence, among academic and non-academic audiences as well, is due to the pioneering work of Angela Duckworth.

Grit can be defined as perseverance for long-term goals in the face of obstacles and adversity (Duckworth, 2016; Duckworth et al., 2007). Gritty individuals tend to have *consistent* interests and to *persevere* in their pursuit—these are, in fact, the two factors that constitute it. This is why they stick to the pursuit of a goal for long periods of time and why they typically continue to do it in spite of the difficulty of attaining the goal.

Examples of grit are easy to find among successful individuals in highly competitive fields, such as professional athletes. Yet what is perhaps most interesting about grit is that it is not a trait only relevant in specialized competitions. Grit, in fact, has been found to correlate with various positive life outcomes within the reach of the more general population. Gritty individuals, for instance, are more likely to graduate from high school (Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014) and attain more levels of education, as compared to less gritty individuals of the same age (Duckworth et al., 2007). They seem to be more proficient in learning a second language as compared to their peers (Wei, Gao, & Wang, 2019). And they tend to exhibit a greater degree of career engagement (Lechner, Danner, & Rammstedt, 2019).

Duckworth and colleagues originally introduced grit to explain individual differences in success that are not traceable to differences in IQ or to social and cultural factors (Duckworth et al., 2007). As they observed at the time, other well-known personality traits would seem to explain only a small fraction of the variance found, for instance, in individual job performance or educational achievement. Grit, by contrast, has been observed to be a good predictor of success, in some respects even a better predictor than cognitive ability (for critical discussion of how good a predictor of success grit is, see Credé, Tynan, & Harms, 2017 and Jachimowicz, Wihler, Bailey, & Galinsky, 2018).

Consider, as an illustration, the longitudinal study conducted by Duckworth and colleagues, where more than 11,000 cadets at West Point Military Academy were tested for cognitive ability, physical ability, and grit before they began training (Duckworth et al., 2019). Unsurprisingly, cognitive ability was found to be the best predictor of military and non-military GPA. Physical ability was the best predictor of physical performance. Grit, in contrast, was the only reliable predictor of success in the infamous initial summer training (where the peak attrition rates are observed) and, together with physical ability, it was a reliable indicator of four-year graduation (for a similar illustration among novice teachers, see Robertson-Kraft & Duckworth, 2014).

In so far as grit tends to be a determinant of success, it bears interesting relations to other psychological constructs. Gritty individuals, for instance, tend to be optimistic, in the sense that they interpret adverse events as being specific and changeable, as opposed to global and permanent (Duckworth, Quinn, & Seligman, 2009). In addition, they tend to be better at tolerating frustration (Meindl et al., 2019).

Now, as mentioned before, grit is closely related to conscientiousness. Some theorists, in fact, believe that grit is just a facet of conscientiousness and have, on those grounds, criticized research on grit as an instance of the *jangle fallacy*: believing that something new is being measured because it has been labeled differently (Schmidt, Lechner, & Danner, 2020). In an interesting study, Schmidt and colleagues asked participants to complete standard grit and conscientiousness scales and measure how redundant items in either scale were with respect to items in the other scale (i.e., how much of the variance in participants' answers in one scale overlapped with answers in the other scale). According to their results, the perseverance dimension of grit was very strongly related to the facet of conscientiousness known as industriousness (95% of shared variance), suggesting that both were

actually tapping into the same underlying personality trait (Schmidt, Nagy, Fleckenstein, Möller, & Retelsdorf, 2018).

Whether it is an independent trait or a lower-level realization of conscientiousness, it is evident that grit and self-control are related to each other. Conceptually, both involve planning and managing one's conduct in the light of valued goals, typically in situations where doing it requires some effort. Empirically, a high correlation between the two has been detected: individuals who score high on the Self-Control scale of Tagney and colleagues (see Section 2.3) typically also score high on grit (Duckworth et al., 2007). Nevertheless, there are significant differences (for discussion, see Duckworth & Gross, 2014; Morton & Paul, 2019).

To begin, grit and self-control operate on different time scales. Whereas self-control is usually displayed at specific moments, say, not going to the party tonight to stay home studying, grit is displayed over long periods of time. Also, there is a difference in scope. Gritty individuals tend to pursue a handful of overarching life goals: for instance, having a successful career or making sure that one's marriage lasts over time. Self-control, by contrast, is typically exercised with respect to a variety of lower-level goals: having only a glass of wine with dinner, not having an extra serving of dessert, etc.

More important, perhaps, self-control and grit are exercised to overcome different kinds of conflicts. Noting this is key to understanding how self-control and grit can complement each other, as personal-level traits that help secure long-term goal satisfaction. In brief, whereas self-control protects one from temptations, grit prevents one from being easily put off by the obstacles involved in the sustained pursuit of the goal.

2. Religiosity

In Section 5 we reviewed various sorts of interventions that enhance the ability to exercise self-control. One question that we did not ask, however, is whether and to what extent certain personality traits are associated with better capacities of self-control. This is a question that has occupied experts working on the topic (Hoyle & Davison, 2016; Jensen-Campbell et al., 2002; O'Gorman & Baxter, 2002). Intuitively, although some people have to work hard to gain self-control, for others it would seem to come more easily.

In this context, many psychologists have been interested in charting the connections between religiosity and self-control. In general, religiosity can be defined as a set of beliefs and behaviors associated with the existence and perceived interactions with supernatural agents, as these play important roles shaping human affairs. Interest about these connections is, in part, derived from numbers. In the United States alone, more than 80 percent of respondents in a 2014 nationwide survey said they believe in God (Pew Research Center, 2014). Worldwide, the numbers are even higher.

Perhaps the most recurrent finding in this context is that religiosity positively correlates with self-control (Desmond, Ulmer, & Bader, 2013; McCullough & Willoughby, 2009). Religious individuals,

for example, reliably score high on the Self-Control scale of Tagney and colleagues (Carter, McCullough, & Carver, 2012). They also show better capacities for delayed gratification, say, as measured by standard hypothetical monetary delayed gratification tasks (Carter, McCullough, Kim-spoon, Corrales, & Blake, 2012). Interestingly, these findings are not restricted to any one faith tradition. Although more cross-cultural work needs to be done here, similar correlations have been observed among Muslim populations (Ahmed, 2009; French, Eisenberg, Vaughan, Purwono, & Suryanti, 2008).

These connections seem to run deep. Religious individuals have been observed to engage less in aggressive behavior (Shepperd et al., 2015), be less prone to substance abuse (Kendler, Gardner, & Prescott, 1997), and to have lower divorce rates (Mahoney, Pargament, Tarakeshwar, & Swank, 2001). As psychologist James McCullough has proposed, it is likely that self-control plays a major role in this and similar correlations (McCullough & Carter, 2013; McCullough & Willoughby, 2009). It is not just that religious individuals happen to achieve these outcomes and to score high on self-control. It is rather that they achieve these outcomes precisely *because* they are generally better at engaging in self-control.

To illustrate, Jungmeen Kim-Spoon and colleagues studied over a period of 2.4 years the consumption patterns of alcohol, cigarettes, or marijuana of a group of 100 early adolescents (Kim-Spoon, Farley, Holmes, Longo, & McCullough, 2014). At the beginning of the study, most participants reported not having consumed any of the three substances, and this allowed researchers to focus on initiation patterns. As they discovered, religious adolescents were more likely to delay gratification, which seemed to explain why they refrained from substance abuse to a greater extent than their less-religious peers. Religiosity, in other words, seems to have had protective effects against substance abuse and those effects seemed mediated by low temporal discounting.

Various explanations for the observed connections between religiosity and self-control have been proposed. One possibility is that religions promote self-control by encouraging certain forms of self-monitoring (Carter, McCullough, & Carver, 2012). The idea here is that the belief that a God is watching might increase one's focus on how one's behavior matches or not with one's goals and standards. Another interesting possibility, which dovetails with results of the Kim-Spoon et al. (2014) study, is that religiosity changes the perception of time in ways that make it easier for religious individuals to delay gratification (Carter, McCullough, Kim-spoon, et al., 2012). After all, core religious themes, such as re-incarnation or after-death divine justice, show a preoccupation with the distant future.

It is possible, however, that something more general is going on here. As mentioned at the outset, although self-control is not necessarily an issue of right and wrong, exercises of it are often moralized. One plausible hypothesis in this regard is that religious individuals tend to moralize self-control, which would explain why self-control is more prevalent among them. There is, in fact, some intriguing evidence that this might be the case (McCullough & Willoughby, 2009; Mooijman, Van Dijk, Van Dijk, & Ellemers, 2017). In brief, the sanctification of self-control goals among religious individuals

(e.g., in the form of prohibitions against certain impulsive behaviors) seems to explain some of the observed associations between religiosity and self-control.

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VII. A CAUTIONARY NOTE

Interest in self-control has been propelled by the strong relations it bears with widely acknowledged measures of success in personal and professional affairs. Some theorists, perhaps carried away by these associations, have expressed an overtly optimistic view of self-control, some of them even claiming, “there is no true disadvantage of having too much” of it (Petersen & Seligman, 2004: 515). Various considerations, however, speak in favor of a *more cautious* approach, and we should bear them in mind to get a fuller picture of self-control and what we can do to promote it.

The first thing to note, perhaps, is that self-control can sometimes lead to undesirable outcomes, depending on the standards and values that guide their exercise. Overcoming *weakness of will*, for instance, is normally a good thing: you resist temptation and stick to what you think you ought to do. However, if your perception of what you ought to do is the result of undue social pressure (e.g., your friends told you ought to do certain things), being strong willed can favor behaviors that negatively impact your well-being. Thus, by resisting impulses to the contrary and doing what you think you should do, you might actually wind up engaging in risky activities in order to secure social acceptance (Brownstein, 2018; Rawn & Vohs, 2011).

Although there are reasons for assigning self-control a central role in the abilities behind self-regulation, overestimating its importance can also have undesirable consequences. Self-control, as we mentioned at the outset, is often moralized. So, failures of self-control might lead to shame or guilt (Kivetz & Keinan, 2006; Patrick, Helen, & Macinnis, 2009). Relatedly, anticipating that one might fail to exercise self-control can also favor self-harming behaviors. Fear of losing control, for instance, has been associated with eating disorders, such as anorexia, especially among individuals with perfectionist tendencies (Froreich, Vartanian, Grisham, & Touyz, 2016; Sassaroli, Gallucci, & Maria, 2008).

This point applies not just to how people perceive themselves, but also to the ways in which they judge and regard others. It has, in other words, consequences for our social evaluations. Let me explain. Failures of self-control are typically considered grounds for criticism; people are held to standards that reflect our positive attitudes toward self-control. Without doubt, there are good reasons behind this kind of stance. To mention the obvious, the allure of short-term rewards often gets in the way of obtaining larger rewards in the long run. Hence, going for the short-term rewards over the long-term ones seems like a self-defeating strategy.

Yet, as some theorists have pointed out, under certain circumstances, seeming failures of self-control might prove to be incarnations of *ecologically valid* policies. In circumstances of extreme deprivation and

uncertainty, for instance, it might *not* be unreasonable to choose short-term rewards over long-term larger ones. Larger-later rewards might be uncertain, whereas smaller-sooner rewards might be required for sheer survival. In general, in such extreme conditions, behaviors that would otherwise seem irrational, upon inspection, actually turn out to be instances of rationality (for extended discussion, see Duflo, 2006; Morton, 2017; Shah, Mullainathan, & Shafir, 2012).

Another respect in which caution ought to be exercised is this. As discussed throughout this review, self-control bears intimate relations to a variety of constructs. Although we have reason to consider it to be a distinct ability or trait, as we come to know more about these relations, its specific contribution to the positive outcomes mentioned earlier might still be hard to tease out from the contribution of related traits and constructs.

A telling example comes from a recent study by Watts and colleagues that sought to replicate the results of Michel and colleagues' original marshmallow studies, but using a larger and more representative sample (Michel's sample was mostly comprised of preschoolers from the Stanford University community) (Watts et al., 2018). Their results suggest that the association between early delay of gratification and adolescent outcomes was not as strong as Michel and colleagues had observed. Also, it was significantly mediated by demographic characteristics, including the education of the children's primary caregiver.

Finally, but equally important, in evaluating interventions to promote self-control, it is key to ask whether alternative measures could have more profound effects on the outcomes that we ultimately seek to accomplish. In other words, in order to promote satisfaction of a valuable goal, re-appraising the situation might be a good thing; it might also be good to develop habits or set up one's environment to keep the stimulus out of reach. But, perhaps, a better strategy would be to intervene on one's motivation, to decrease the desirability of the tempting stimulus or increase the desirability of the more valuable goal.

We have evidence that goals with which people self-identify ("I diet because I consider myself a healthy person") tend to be, motivationally speaking, stronger than goals pursued for external reasons ("I diet because I am anxious about how I look") (Converse, Juarez, & Hennecke, 2019; Milyavskaya, Inzlicht, Hope, & Koestner, 2015). The difference does not have to do with the content of those goals (what the goals are about), but with the grounds or reasons for adopting them. Thus, designing interventions that lead to transformations in one's reasons for adopting certain goals, where have-to goals become more like want-to goals, might be an effective way of obtaining the outcomes otherwise sought by self-control interventions.

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VIII. CONCLUSION

In the last fifty years, researchers from a variety of disciplines and fields have come together in the study of self-control. Consequently, current work on the topic is taking place against a rich conceptual tradition and a solid methodological background. A sign of the fecundity of the field is the various debates documented here. As we have seen, the debates range over a multiplicity of topics: how to define the boundaries of self-control, what are the best mechanistic models of it, and which are the most promising interventions to boost it.

At the same time, the discussion extends beyond the strict limits of the phenomenon of self-control to touch on foundational issues in current psychological science, such as those raised in the recent “replication crisis” debates. Also, because of the centrality that self-control has in successful self-management, interesting work is currently being done on the relation between self-control and other associated psychological skills and personal traits. Some of these issues and further explorations have been discussed here.

There are, of course, some important topics not covered in this review (for instance, the status of the literature on addiction). Throughout, however, the goal has not been to cover all themes in the universe of self-control but to show some of the central work that has given structure, depth, and continued fresh life to work on this important topic.

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