6 Taking stock of self-control

A meta-analysis of how trait self-control relates to a wide range of behaviors

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Self-control is related to a wide range of behaviors. Empirical research shows that people with high self-control are better able to control their thoughts, regulate their emotions, and inhibit their impulses than people with low self-control (Baumeister, Bratslavsky, Muraven, & Tice, 1998). They enjoy greater psychological well-being, more academic success, and better interpersonal relations (W. Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990; Tangney, Baumeister, & Boone, 2004). High self-control is relevant to nearly all forms of behavior conducive to a successful and healthy life. Conversely, low self-control is assumed to be at the heart of many societal problems, including obesity, substance abuse, criminality, impulsive buying, and procrastination (Baumeister & Heatherton, 1996; Gottfredson & Hirschi, 1990; Patton, Stanford, & Barratt, 1995; Vohs & Faber, 2007). In view of its beneficial effects for human functioning, self-control is considered a hallmark of adaptation (W. Mischel, Cantor, & Feldman, 1996; Rothbaum, Weisz, & Snyder, 1982; Vohs & Baumeister, 2004) and has become a prominent concept in different areas of research in psychology and other disciplines, including social psychology, clinical psychology, developmental psychology, health psychology, criminology, sociology, and medical sciences.

Given the frequent assertions of the theoretical, empirical, and practical importance of self-control, the present investigation undertook to review the evidence concerning the behavioral concomitants of trait self-control. We sought to learn whether trait self-control has been shown to be reliably related to behavior and, if so, how large these effects are. We tested a series of hypotheses about possible moderators of the relationship between self-control and behavior, such as whether it is more strongly related to inhibiting unwanted behaviors or promoting desired ones, and whether it is more relevant for habitual, automatic behaviors or for controlled actions.

The present article is organized as follows. First, it defines self-control and provides a brief overview of the most prominent theories on self-control, identifying implicit assumptions surrounding the effects of self-control that warrant empirical testing. Second, it reports the results of a meta-analysis on studies investigating the

behavioral correlates of trait self-control as measured by the Self-Control Scale (Tangney et al., 2004), the Barratt Impulsiveness Scale (Patton et al., 1995), and the Low Self-Control Scale (Grasmick, Tittle, Bursik, & Arneklev, 1993). It includes all published and unpublished studies since 2004. Third, based on the results of the meta-analysis, it evaluates the three scales and what the meta-analytic results have to say about trait self-control and self-control theory.

What is self-control? Although there is considerable dissent in the literature over how to name, define, and measure the construct of self-control (Duckworth & Kern, 2011), existing theories generally agree that self-control can be defined as the capacity to alter or override dominant response tendencies and to regulate behavior, thoughts, and emotions (Bandura, 1989; Carver & Scheier, 1981, 1982; Metcalfe & Mischel, 1999; Rothbaum et al., 1982; Vohs & Baumeister, 2004). Because self-control includes the successful regulation of impulses, researchers often equate low trait self-control with trait impulsiveness, though in principle impulse strength and self-control or restraint contribute independently to whether a behavior is enacted (Duckworth & Kern, 2011; Duckworth & Seligman, 2005; Tangney et al., 2004). In addition, researchers agree that self-control focuses on the efforts people exert to stimulate desirable responses and inhibit undesirable responses and that self-control thereby constitutes an important prerequisite for self-regulation (Baumeister, Heatherton, & Tice, 1994; Carver & Scheier, 1998; Muraven & Baumeister, 2000; Tangney et al., 2004).

Research distinguishes between state self-control and dispositional self-control (Tangney et al., 2004). State self-control varies across situations and time. Ample empirical evidence confirms that people's capacity to exert self-control is susceptible to situational influences, including previous attempts at self-control (Baumeister et al., 1998; Muraven & Baumeister, 2000), mood (Fishbach & Labroo, 2007; Tice, Baumeister, Shmueli, & Muraven, 2007), working memory capacity (Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008; Schmeichel, 2007), and motivation (Muraven, 2007).

Dispositional self-control is assumed to be relatively stable across situations and over time; people with high self-control are better than others at controlling their impulses (Gottfredson & Hirschi, 1990; W. Mischel et al., 1996; Rothbart, Ellis, Rueda, & Posner, 2003). Similarly, as compared to people with low self-control, people with high self-control report less substance abuse, psychopathology, eating disorders, physical and verbal aggression (Tangney et al., 2004), show greater inhibition of a negative emotional response (Kieras, Tobin, Graziano, & Rothbart, 2005), and make greater accommodations in close relationships (Finkel & Campbell, 2001). Conversely, children with low self-control, as indicated by poor performance on a delay of gratification measure, had poorer academic performance 10 years later than those with high self-control (W. Mischel et al., 1988). Adolescents with low self-control engage in more health risk behaviors, such as increased use of alcohol, tobacco, and marijuana as well as increased saturated fat intake than adolescents with high self-control (Wills et al., 2001; Wills, Isasi, Mendoza, & Ainette, 2007; Wills, Walker, Mendoza, & Ainette, 2006). Adults

low in self-control engage more often in deviant behavior, including risky driving, not wearing seatbelts, using force, and committing fraud (Pratt & Cullen, 2000; Vazsonyi, Pickering, Junger, & Hessing, 2001). The present article is focused on the behavioral implications of dispositional self-control.

Theories of self-control. In this section we briefly describe the most prominent theories on self-control and identify implicit assumptions regarding the effects of self-control that have remained untested. Moreover, we highlight how the different theories converge to suggest that self-control is a quintessential feature of self-regulatory behavior.

The *discounting model of impulsiveness* (Ainslie, 1975) considers self-control as the choice of a delayed but more valuable outcome over a more immediate outcome that is ultimately of less value. This perspective on self-control is similar to the delay of gratification concept (W. Mischel, 1974) and equally emphasizes the importance of controlling immediate impulses and responses. Similarly, other approaches in this tradition highlight that self-control requires one to make decisions and to act in accordance with long-term rather than short-term outcomes (Gottfredson & Hirschi, 1990; Logue, 1988; Rachlin, 2000). Specifically, Gottfredson and Hirschi's (1990) self-control theory contends that the ability to exercise self-control in the face of temptation accounts for individual differences in criminal and deviant behavior. Individuals with low self-control are likely to give in to temptations for misbehavior because they have trouble anticipating the long-term costs of their behavior. Individuals with high self-control, on the contrary, can resist temptation because they recognize that in the long run misbehavior comes with costs. Self-control in these models thus concerns decisions in which people sacrifice short-term outcomes in favor of long-term interests, decisions in which immediate (and thus more certain) options are preferred over delayed (and thus more uncertain) outcomes (i.e., delay discounting; cf. Frederick, Loewenstein, & O'Donoghue, 2003).

In *hot/cool system approaches* to self-regulation (Loewenstein, 1996; Metcalfe & Mischel, 1999; W. Mischel, Shoda, & Rodriguez, 1989), self-control is typically conceptualized as part of the cool-cognitive or reflective system that guides goal-directed behavior and requires a person's volitional control or willpower to be effective. The cool system is seen as having evolved to serve long-term self-regulatory purposes that, by means of executive functions (e.g., reasoned judgments, strategic action plans), are able to override prepotent impulses and habits. The cool system operates by a pragmatic principle ("do it if it makes sense") and is associated with high self-control, rational self-interest, and lack of impulsive decision making. In contrast, the hot system operates by a feeling principle ("do it if it feels good") and is associated with low self-control and the potential for impulsive action.

The *self-regulatory strength model of self-control* (Baumeister et al., 1994; Baumeister & Heatherton, 1996) theorizes that exerting self-control to change or alter behavior or emotions requires effort and some form of energy or willpower. Self-control is considered a strength (rather than a skill or a cognitive schema). By exerting self-control to resist temptations or engage in desirable behavior, for example, people

deplete a reservoir of limited resources. When self-regulatory resources have been expended, a state of ego depletion results and failure on a subsequent, unrelated task requiring self-control is more likely (Baumeister et al., 1998; Muraven, Tice, & Baumeister, 1998). Importantly, the model and empirical evidence suggest that different types of self-control (e.g., temptation resistance, impulse overcoming, task persistence, emotion regulation, choice making) tap into a common, limited resource. The important implication is that exerting self-control temporarily depletes resources necessary for a large variety of self-regulatory behavior across a variety of behavioral domains, making subsequent self-control failure more likely.

As becomes evident, all models share our definition of self-control as the capacity of the self to alter dominant responses and to regulate behavior, thoughts, and emotions. They generally assume (a) that self-control helps to promote desirable behavior and inhibit undesirable behavior, (b) that it is beneficial for a large range of behaviors, (c) that it is a conscious and effortful form of regulating behavior, and (d) that it affects actual behavior (rather than imagined behavior). In light of the abundant research on self-control, these assumptions seem robust. Nevertheless, as we show in the following, many of them have not yet been put to an empirical test.

Self-control promotes desirable behavior and Inhibits undesirable behavior. Most theories and definitions agree that self-control facilitates both the inhibition of undesirable behavior and the promotion of desirable behavior to the same extent (although some theories deny the existence of a behavioral promotion system and argue that desired behavior comes naturally once an individual has successfully inhibited an undesired response; cf. Norman & Shallice, 1986). Nevertheless, sound empirical evidence for the assumption that self-control has similar effects on both is lacking. Most research focuses on the influence of self-control on either undesirable behavior (e.g., impaired reasoning; Schmeichel, Vohs, & Baumeister, 2003) or desirable behavior (e.g., academic performance; Duckworth & Seligman, 2005). Even studies that included both types of behavior assessed many more measures of undesirable behavior than desirable behavior (Tangney et al., 2004). Moreover, researchers often seem to assume that when self-control affects undesirable behavior (less binge eating; Tangney et al., 2004), this also implies that it affects desirable behaviors (e.g., healthy eating), and vice versa. Although this assumption may be valid, it has not yet been empirically tested. Importantly, the literature suggests reasons to argue that self-control may have differential effects on desirable and undesirable behavior.

Research on the positive–negative asymmetry consistently shows that negative events have stronger effects than positive events for virtually all dimensions of people's lives, including their thoughts, their feelings, their behavior, and their relationships (for a review, see Baumeister, Bratlavsky, Finkenauer, & Vohs, 2001). For example, people are more distressed by the loss of a certain amount of money than they are made happy by finding the same amount of money (Kahneman & Tversky, 1984). Some researchers suggest that for positive events to be stronger than negative events, they need to outnumber them. For example, Gottman (1994)

proposed that positive and good interactions between partners must outnumber the negative and bad ones by at least 5 to 1 for close relationships to succeed. Thus, many good interactions can override the negative effects of one bad interaction. Given equal numbers of positive and negative interactions, however, the effects of negative ones are generally stronger than those of the positive ones.

What are the implications of the positive–negative asymmetry for the effect of self-control on desirable versus undesirable behavior? Theoretically, the hypothesis can go both ways. On one hand, one could argue that self-control is less effective for the inhibition of undesirable behavior than for the promotion of desirable behavior. If undesirable behavior weighs stronger than desirable behavior, then people should need much more self-control to inhibit undesirable behavior (e.g., yelling back at one's partner) than to engage in desirable behavior (e.g., engage in accommodation; Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991). Conversely, one could argue that self-control is less effective for the promotion of desirable behavior than it is for the inhibition of undesirable behavior. Indeed, if self-control is needed to replace undesirable behavior (e.g., yelling back at one's partner) with desirable behavior (engage in accommodation; Finkel & Campbell, 2001), then people should need much more self-control to approach the desirable behavior because they need to overcome the pull of the undesirable behavior, which is much stronger.

These predictions become even more complex when one considers the great variety of behavior that is affected by self-control. For example, self-control is assumed to help people to inhibit an impulse toward a desired outcome (foregoing an enjoyable evening with friends) in the service of attaining another desired outcome (a high grade for an exam). In this example, the undesired behavior is actually a desired outcome, yet this outcome is in conflict with a delayed, even more desirable outcome. Taking one more step, some undesirable behaviors that at first glance appear to be self-control failures (e.g., smoking or alcohol consumption) may in fact be acts of self-control because they are performed in the service of a valued long-term goal (e.g., acceptance by significant others; Rawn & Vohs, 2011). Whether behavior is regarded as desirable or undesirable is thus highly influenced by contextual factors and may even be idiosyncratic as it relates to the personal goals an individual holds. To avoid confusion with respect to the ambiguity of desirability in the long versus short term, we conceptualize desirable behavior as all behaviors that are associated with people's goal to meet their obligations, duties, and responsibilities and adjust to social norms to live happy, successful, and healthy lives, including psychosocial adjustment, adequate and appropriate expression of emotions, physical exercise, and academic success. Undesirable behaviors, on the contrary, are behaviors that interfere with this goal, including antisocial and destructive impulses, absenteeism, overeating, and interpersonal conflict.

In short, although theories on self-control generally agree that self-control is necessary to inhibit undesirable behavior and stimulate desirable behavior, studies have not directly compared the influence of self-control on desirable and undesirable behaviors. So the first aim of this meta-analysis is to examine whether self-control relates differently to desirable and undesirable behaviors.

Self-control is beneficial for a large range of behaviors. We conceptualize self-control as people's capacity to override or change their inner responses, to inhibit undesired behavioral tendencies, and to facilitate desired behavior tendencies. This conceptualization suggests that self-control should be relevant to various behavioral domains. In line with this suggestion, Tangney and her colleagues (2004) identified five behavioral domains for which dispositional self-control should be particularly relevant: achievement and task performance (e.g., grades, SAT scores), impulse control, psychosocial adjustment (e.g., depression, anxiety), interpersonal functioning (e.g., accommodation, relationship satisfaction), and moral emotions (e.g., shame, guilt). Consistent with their predictions, people with high self-control had more positive outcomes in all five domains than people with low self-control. Given that self-control has been proposed to play a crucial role in the control and inhibition of impulses, research has increasingly investigated the role of self-control for academic performance (Duckworth & Seligman, 2005), health-related behaviors (e.g., physical exercise, condom use, dieting; cf. Kuijer, De Ridder, Ouwehand, Houx, & Van den Bos, 2008; Wills et al., 2007), and affect regulation (e.g., anger control). To capture the broad variety of behavioral domains covered in the existing literature on self-control more effectively, we integrated the different behavioral domains into nine categories, namely (a) school and work achievement, (b) eating and weight-related behavior, (c) sexual behavior, (d) addictive behavior, (e) interpersonal functioning, (f) affect regulation, (g) well-being and adjustment, (h) deviant behavior, and (i) planning and decision making. The second aim of the present meta-analysis is to examine whether self-control relates similarly to behavior across the nine domains.

Self-control Is effortful and conscious: does it equally affect controlled and automatic behavior? As discussed previously, virtually all theoretical approaches to self-control highlight the role of willpower and an active self in the exertion of self-control (Baumeister et al., 1998; W. Mischel et al., 1996). The prevailing assumption, and the favored hypothesis in this investigation also, is that self-control is relevant mainly to behaviors that are under conscious control, whereas behaviors that are performed without conscious effort (such as habitual behaviors) are resistant if not immune to self-control. Still, alternative predictions could be put forward.

It has been suggested that the exertion of self-control may not necessarily be related only to conscious or effortful behavioral processes (Alberts, Martijn, Greb, Merkelbach, & De Vries, 2007; Ferguson, 2008; Fishbach, Friedman, & Kruglanski, 2003; Fitzsimons & Bargh, 2004). Whether self-control is exerted in an automatic or controlled fashion is not an issue we want to debate in this article. Nevertheless, it is possible that many automatic behavior patterns are potentially subject to being overridden or altered by self-control and that self-control might therefore exert its impact mainly by its influence on such automatic responses. Research on the regulatory strength model generally assumes that behaviors that are more effortful also consume more self-regulatory resources (self-control) than automatic behaviors, such as habits (Baumeister et al., 1994). For that reason, as

Baumeister and Alquist (2009) point out, people who are high on self-control are probably good at automatizing behavior.

To illustrate, when first starting to exercise, Mary may need to exert a great deal of self-control to do her five miles of running after a long day at work and taking care of the children and the household chores. After a couple of weeks and continued exertion of self-control, the exercise becomes part of her daily routine, and Mary may need to exert less self-control to do her running at the end of the day. In this case, Mary's exercise routine becomes so engrained in her daily schedule that she does it almost automatically. Thus over time, Mary needs to exert less self-control to maintain her exercising behavior, although self-control may still be active to monitor her efforts and ensure that Mary continues to behave in ways that help her to attain her goals (Carver & Scheier, 1998). In a sense, the main value of self-control may lie more in creating the healthy habit than in regulating behavior each day anew.

When self-control operates in such a way that it eventually does not consume resources, such as when the behavior becomes habitual (Baumeister & Alquist, 2009), it may similarly affect responses that are automatic as it affects behaviors that are regulated by conscious control. Evidence examining whether dispositional self-control affects controlled and automatic behavior in the same fashion is lacking, however. The third aim of this meta-analysis therefore is to examine whether the effects of self-control differ for effortful and automatic behaviors.

Is self-control related to actual behavior, or do people with high self-control merely imagine that they are doing better? An impressive number of studies have provided convincing evidence that intended behavior does not necessarily translate into actual behavior (Gollwitzer, 1990; Gollwitzer & Sheeran, 2006; Heckhausen & Gollwitzer, 1987). In a similar vein, people's reports about what think they can do (e.g., expectations of behavior or behavior-specific self-efficacy) and what they should do (e.g., subjective norms or attitudes) do not necessarily reflect what they actually do (Nordgren, Van der Pligt, & Harreveld, 2010). Therefore, the distinction between actual behavior and imagined behavior (i.e., behavior that one intends to do, thinks one can do, or thinks one should do) is relevant for examining the link between self-control and behavior. As a fourth aim of this meta-analysis we investigated whether self-control equally affects actual behavior and imagined behavior. Imagined behaviors may be more vulnerable to wishful thinking and may therefore reflect biased beliefs about one's capacity for self-control, resulting in stronger associations between self-control and behavior.

Assessing dispositional self-control. Self-control is at the heart of many desirable behavioral responses, whereas its lack is associated with many undesirable behavioral responses. Given the important implications of self-control for psychosocial adjustment and well-being, it is crucial to assess dispositional self-control with a reliable and valid scale. Moreover, researchers, practitioners, and laypeople need to know whether the scale is able to detect self-control on a sound and solid basis

that is not vulnerable to variations in the particular sample that is investigated (e.g., age, gender distribution) or methodological variables (e.g., lab study vs. field study).

A variety of scales have been developed to assess self-control, including the Self-Control Behavior Inventory (Fagen, Long, & Stevens, 1975), the Self-Control Schedule (Rosenbaum, 1980), the Self-Control subscale of the California Personality Inventory (Gough, 1987), the Self-Control Questionnaire (Brandon, Oescher, & Loftin, 1990), the adapted Kendall-Wilcox Inventory for self-management (Kendall & Williams, 1982; Wills, Vaccaro, & McNamara, 1994), and the Ego-Undercontrol Scale (Letzring, Block, & Funder, 2005). In fact, a recent meta-analysis of self-control measures identified more than 100 self-report questionnaires on self-control, most of which have been used only sporadically (Duckworth & Kern, 2011). Rather than assessing individual differences in self-control across broad behavioral domains in general populations (Baumeister et al., 1994), most scales target specific behaviors (e.g., health behavior; Brandon et al., 1990) in specific populations (e.g., adolescents—Kendall & Williams, 1982; clinical samples—Rosenbaum, 1980). Other scales are outdated and have not been used recently (Fagen et al., 1975; Gough, 1987) or focus on a specific aspect of self-control such as ego undercontrol (Letzring et al., 2005). In sum, none of these scales have been used frequently in general populations. Neither were they developed to examine the impact of self-control on a wide range of behaviors, including thoughts and emotions, across different life domains.

The present analysis examined three self-control scales that have been used relatively frequently in a variety of populations and with different types of behavioral outcomes: the Self-Control Scale (Tangney et al., 2004), the Barratt Impulsiveness Scale (Patton et al., 1995), and the Low Self-Control Scale (Grasmick et al., 1993).[1] In line with the defining features of self-control, the Self-Control Scale (Tangney et al., 2004) assesses people's ability to override or change inner responses (e.g., "I get carried away by my feelings"; reversed) and to interrupt undesired behavioral tendencies and refrain from acting on them (e.g., "I am good at resisting temptations"). In two large studies, Tangney et al. (2004) demonstrated that the scale has good reliability (Cronbach's $\alpha = .89$) and good test–retest reliability ($r = .89$ over 3 weeks). In addition to the 36-item full scale, Tangney and her colleagues developed a 13-item brief scale, which showed a strong correlation ($r = .93$) with the full scale and good psychometric properties. Since its publication in 2004, the scale has been used among different populations (young adolescents—Finkenauer, Engels, & Baumeister, 2005; adult romantic partners—Finkel & Campbell, 2001; student samples—Gailliot, 2007b).

The Barratt Impulsiveness Scale (Patton et al., 1995) assesses lack of planning, spontaneous decision making, and acting without thinking (sample items are "I am more interested in the present than in the future" and "I do things without thinking"). Although trait self-control focuses on overriding an impulse, trait impulsiveness highlights low self-control. This scale thus seemingly assumes that impulsiveness and (low) self-control are equivalent constructs because they represent the two end points of the same dimension (Duckworth & Kern, 2011; Tangney et al., 2004). Although there is some debate about the separate dimensions that

constitute impulsiveness (Patton et al., 1995), the Barratt Impulsiveness Scale is often used as a generic measure of impulsiveness and is among the most widely used measures of self-control (Duckworth & Kern, 2011). The 30-item scale has good reliability (Cronbach's $\alpha > .80$) and discriminates between populations known to be high or low in impulsiveness (e.g., substance-abuse patients vs. undergraduates; Patton et al., 1995).

Another widely used measure is the Low Self-Control Scale (Grasmick et al., 1993), derived from Gottfredson and Hirschi's (1990) self-control theory. As mentioned above, this theory contends that variation among individuals in their ability to exercise self-control in the face of temptation accounts for individual differences in deviant behavior. The 24-item Low Self-Control Scale intends to capture six components of low self-control: impulsivity, preference for simple rather than complex tasks, risk seeking, preference for physical rather than cerebral activities, self-centered orientation, and low tolerance for frustration (sample items are "I often act on the spur of the moment without stopping to think" and "I lose my temper pretty easily"). The scale has shown good reliability (Cronbach's $\alpha > .80$) and is often used in studies on deviant behavior in both student samples and community samples (Pratt & Cullen, 2000).

The present analysis focused on these three scales as measures of dispositional self-control. There are two reasons for doing so. First, compared to other measures, they better match the most widely accepted conceptualization of the self-control construct in the literature. Second, because they have been used relatively frequently in a variety of populations and with different types of behavioral outcomes, they allowed us to investigate whether self-control is equally beneficial in different behavioral domains.

In addition to the aims of this meta-analysis already described, another aim was to explore two types of moderators, study moderators (e.g., study design) and sample characteristics (e.g., gender distribution).

Study characteristics. The first characteristic that warrants consideration is the *study design*. As compared to survey studies, experimental studies may detect stronger associations between self-control and behavior because they control for confounding contextual influences (e.g., distractors, noise). The second characteristic is the *publication status* of studies. As compared to published studies, unpublished studies are likely to have smaller or nonsignificant effects. As a third characteristic, our analysis considered whether the impact of self-control on behavior depends on whether that behavior is *self-reported* or *objectively measured*. Self-reported behaviors may overestimate the association between self-control and behavior because of social desirability or memory biases. Fourth, we considered the *time interval* between the assessment of self-control and the assessment of the behavioral outcome. Because this meta-analysis is concerned with self-control as a dispositional variable, we consider relations between self-control and behavior to be more robust if such associations are maintained when a longer time frame is employed. Finally, and applicable only to the Self-Control Scale (Tangney et al., 2004), we considered the *scale version* (full or brief) as a potential moderator of the self-control-behavior link.

Sample characteristics. To establish the link between dispositional self-control and behavior and minimize the influence of potential confounds, our analysis considered *sample types, age, gender*, and *country*. For all four characteristics mean-level differences have been found. To illustrate, self-control may be higher among older than younger people (H. N. Mischel & Mischel, 1983; Steinberg et al., 2009; Wills et al., 2006; cf. Roberts, Walton, & Bogg, 2005), and women have been found to have higher levels of self-control than men (Gibson, Ward, Wright, Beaver, & Delisi, 2010; McCabe, Cunnington, & Brooks-Gunn, 2004; Silverman, 2003). Although these mean differences do not necessarily affect the relation between self-control and behavior, they may have implications for the general use and validity of various self-control scales.

The present research

The present research aimed to take stock of the relationship between dispositional self-control and behavior. It investigated a number of assumptions regarding self-control that have largely remained untested by empirical studies. To put the effect of self-control on behavior to a test, we adopted a broad view of the kinds of behaviors that may be related to self-control. Specifically, we considered any cognition, emotion, or overt behavior potentially susceptible to the influence of self-control, regardless of whether the behavior was assessed in the lab or in survey studies and of whether it was observed or self-reported. This choice reflects the enormous variety of behaviors that have been linked to self-control, ranging from the self-rated likelihood of engaging in sexual infidelity (Gailliot & Baumeister, 2007) to refraining from eye blinking (Schmeichel & Zell, 2007) and from consuming potato chips (Friese & Hofmann, 2009) to the expression of affect (Zabelina, Robinson, & Anicha, 2007) and music piracy (Wolfe, Higgins, & Marcum, 2008). Our analysis excluded only dependent variables that are dispositional or trait-like characteristics that are by definition invariant (e.g., personality traits) and some very specific outcomes (e.g., MRI scans).

To examine the association between self-control and behavior, we report on the three self-control scales separately. Our initial aim was to directly compare the three scales, but, unfortunately, the types of moderator variables that were included in studies with each of the three scales differed dramatically (with most of the conceptual moderators that guide the present meta-analysis lacking from studies with the Barratt Impulsivity Scale and the Low Self-Control Scale), making it impossible to undertake such a direct comparison. For each scale, we first quantify the overall impact of self-control on behavior. Second, we use meta-analysis to examine the four implicit assumptions we identified in the existing literature, that is (a) whether self-control promotes desirable behavior and inhibits undesirable behavior to the same extent, (b) whether self-control is equally beneficial across behavioral domains, (c) whether self-control equally affects controlled and automatic behavior, and (d) whether self-control equally affects actual and imagined behavior. Because the distinction between desired and undesired behavior is considered to be a central element in theoretical models of self-control, we report all

analyses for both types of behavior separately to search for differential effects of self-control on both types of behavior (De Boer, Van Hooft, & Bakker, in press; De Ridder, De Boer, Lugtig, Bakker, & Van Hooft, 2011). Third, we examine the influence of study and sample characteristics.

Method

Selection of studies. The following methods were used to generate the sample of studies (cf. Lipsey & Wilson, 2001): (a) computerized searches of social scientific databases were performed (Web of Science, PsycINFO, and Dissertation Abstracts International) for the years 2004–2009 on the search term *self-control* (studies had to include the term in either the title or the abstract), (b) reference lists in each article were evaluated for inclusion of relevant studies, and (c) researchers in the field of self-control were contacted (via networks) and asked for copies of studies that were unpublished or in press. Two authors performed independent searches to increase the odds that all relevant articles would be retrieved.

Studies were considered eligible for this meta-analysis when they met the following criteria. First, they had to employ a version of the Tangney et al. (2004) Self-Control Scale, either the full 36-item scale or the brief 13-item scale, and adapted versions were also considered (e.g., Duckworth & Seligman, 2005); the Low Self-Control Scale (Grasmick et al., 1993); or the Barratt Impulsiveness Scale (Patton et al., 1995). Second, they had to include a measure of behavior to examine associations with self-control. We employed a broad definition of behavior, including overt behaviors, cognitions, and emotions. Our focus on types of behavior was strongly associated with the behavioral categories employed in previous studies on the three scales, such as adjustment, interpersonal functioning, and performance (Tangney et al., 2004), deviant and addictive behavior (Pratt & Cullen, 2000), and planning and decision making. Third, to be included in the database, studies had to report sufficient statistical information to enable the computation of a standardized effect size ρ from correlations, *t* values, or *F* values, accompanied by their standard deviations or variances as well as the number of participants (Cooper & Hedges, 1994; Lipsey & Wilson, 2001). We contacted authors for additional information if insufficient details were reported.

Self-Control Scale. The literature search identified 53 studies that could be potentially included in the review. Of these, 3 were rejected because they did not include a measure of behavior. The majority of the remaining 50 studies reported several outcomes. The final database contained 312 tests of the association between self-control and behavior and a combined sample of 15,455 respondents (an average sample size of 309 participants per study with a range of 20 to 1,828).

Barratt Impulsiveness Scale. The literature search identified 58 published studies that could be potentially included in the review. A total of 27 studies were rejected because they reported insufficient statistical details ($n = 17$),[2] employed a dependent measure that was not relevant for the present meta-analysis ($n = 7$), or had a

within-subjects design ($n = 3$), resulting in a sample of 31 studies that met the inclusion criteria. Most studies reported several outcomes. The final database included 97 tests of the association between impulsiveness and behavior and a combined sample of 4,791 respondents (an average sample size of 154 participants per study ranging from 14 to 617).

Low Self-Control Scale. We found 26 published studies that could be potentially included in the review of which 21 met the inclusion criteria. Five studies were rejected because they reported insufficient statistical details. Most studies reported several outcomes, resulting in a database that included 40 tests of the relation between low self-control and behavior. The combined sample consisted of 14,402 participants (an average sample size of 591 respondents per study, ranging from 64 to 2,437).

Data coding. A detailed coding format was developed (cf. Lensvelt-Mulders, Hox, Van der Heijden, & Maas, 2005), comprising information about (a) statistical details required to compute standardized effect sizes, (b) information about the study, the sample, and measurement of relevant variables that was used either to determine study quality or to provide information about potential moderator effects, and (c) conceptual variables that are of theoretical interest to explain the relation between self-control and behavior. More specifically, the following characteristics were coded:

Statistical details included (a) sample size at baseline and, if applicable, at follow-up and (b) statistical information to enable the computation of a standardized effect size (e.g., *F* value, correlation).

Study characteristics included (c) study design (experimental vs. survey), (d) publication status (peer-reviewed published or in-press article, unpublished manuscript, report, or book chapter), (e) in case of the Self-Control Scale only, the version of the self-control scale (full, brief, or adapted version), (f) measurement of dependent variable, self-reported behavior versus objectively assessed (e.g., food consumption, grades, performance at lab tasks such as time spent on puzzle solving), and (g) the time interval between assessment of self-control and the behavior under study.

Sample characteristics included (h) sample type (student, community, or clinical), (i) the mean age of the sample, the gender distribution of the sample (male vs. female), and (k) the country where the study was conducted.

Conceptual characteristics of the behavioral measure included (l) whether the behavior involved the inhibition of an undesired response or the performance of a desired response. As explained in the introduction, desirable behavior is conceptualized as any behavior that contributes to people's goals to meet their obligations, duties, and responsibilities and adjust to social norms of living happy, successful, and healthy lives. Typical examples of such behaviors are homework hours, physical exercise, eating healthy foods, condom use, marital satisfaction, health motivation, loyalty, and self-disclosure. Undesirable behaviors, in contrast, are behaviors that interfere with this goal, including, for example, delinquency,

aggressive behavior, health risk taking, worrying, sexual infidelity, lying, drug use, absenteeism, overeating, and marital conflict. To illustrate, if a behavior involves eating fatty foods (an undesired behavior), people could score either low (they don't eat fatty foods) or high (they do) on this dimension. Alternatively, if the behavior involves eating fruits (a desired behavior) it would be coded low if people do not eat fruits and high if they do.

(m) Whether the behavior was controlled or automatic was coded. Controlled behaviors are defined as any behavior requiring conscious attention or deliberation, for example, making coping plans, expressing intentions, quitting smoking, and the number of anagrams solved. Automatic behaviors are defined as behaviors that are performed efficiently, unintentionally, without awareness and without conscious control (Bargh, 1994). Examples derived from the studies included in this meta-analysis involve addictive behaviors (smoking and alcohol) and habitual behaviors (e.g., habitual condom use, habitual snacking). To illustrate, whereas smoking is a habitual or addictive behavior that is performed without conscious attention that would therefore qualify as an "automatic behavior," quitting smoking qualifies as a controlled behavior because breaking a bad habit typically requires conscious effort.

(n) Behavioral domain was coded. Because our aim was not to design an exhaustive categorization of behavioral domains, we categorized the measures of behavior that were available from the studies into nine comprehensive clusters: (1) school and work performance (e.g., GPA, homework hours, persistence at solving task), (2) eating and weight-related behavior (e.g., emotional eating, dieting), (3) sexual behavior (e.g., attitudes and subjective norms about condom use, sexual restraint), (4) addictive behavior (smoking, alcohol use), (5) interpersonal functioning (e.g., commitment to relationship, loyalty tendencies, perceived parental supportiveness), (6) affect regulation (e.g., difficulty describing emotions, positive emotion words used), (7) well-being and adjustment (e.g., self-esteem, happiness, depressed mood), (8) deviant behavior (e.g., cheating, stealing), and (9) planning and decision making (e.g., Iowa Gambling Task, Stroop Task, Tower of Hanoi).

(o) Whether the behavior was imagined and involved thoughts and feelings about a behavior or actual behavior was coded. Typical examples of imagined behavior are perceived social norms about behavior, behavioral expectancies, imagining how one would act in fictitious scenarios, and action plans. Of course, imagined behaviors do not necessarily translate into actual behavior that may be assessed independently from what is going on in a person's mind. Typical examples of actual, observable behavior are absence of work, number of hours in the gym, calories consumed from snacks, errors made in a Stroop Task, and persistence at solving a task.

The first 15 studies were coded by four independent coders. The independent codings showed marginal differences that were resolved by considering the original study. Interrater agreement was very good, with Cohen's kappas (categorical

variables) or correlations (continuous variables) ranging from 80% (life domain) to 100% (all other variables). The remainder of the studies were coded by one of the authors (F.M.S.); when the information in the research was unclear, the study was discussed by the four original coders, and disagreements were jointly resolved.

Analytic Strategy. Most studies reported the correlation between self-control and behavior as an outcome measure. We therefore recomputed all other outcome measures into correlation coefficients, using the transformation procedures provided by Cooper and Hedges (1994) and Lipsey and Wilson (2001). Effect sizes were computed in standardized, sample weighted correlation coefficients ρ.[3] For convenience of interpretation, we report effect sizes in simple *r*s. Cohen's (1992) guidelines for interpreting average effect size values were used. According to Cohen's power primer, $r = .10$ should be considered a small effect size, $r = .30$ is a medium effect size, and $r = .50$ is a large effect size.

Computations were undertaken using standard meta-analysis procedures. First, a total absolute effect size $|\rho|$ was computed for each of the three self-control scales, using SPSS macros originally developed by Wilson (2000). The overall effect sizes were significant but showed a significant variability, which could not be explained by mere sample variance. Thus, a random effects model was chosen because not all variance could be explained by the predetermined moderating factors (Cooper, 1986).

Because the distinction between desired and undesired behavior is central in most models of self-control, we report results from moderator analyses for both types of behavior separately.[4] When possible, each potential moderator was treated as a dichotomous variable and the effect sizes from each study were coded into one of two levels of the moderator. For example, studies that examined effects of self-control on controlled behavior were compared with studies that investigated effects of self-control on automatic behavior. Next, the effect size (*r*) and homogeneity statistic (*Q*) were calculated separately for the two groups of studies. As the number of tests (*k*) varies across studies, the *Q* statistic cannot be compared across analyses, so we also calculated the I^2 statistic as a measure of true heterogeneity expressed as a percentage (J. P. Higgins, Thompson, Deeks, & Altman, 2003), with levels of 25%, 50%, and 75% representing low, medium, and high levels of heterogeneity, respectively (J. P. Higgins & Thompson, 2002). The *d* statistic ($\rho - \rho / SE$) was used to compare the pooled coefficients. When dichotomization was impossible (i.e., in case of multiple behavioral domains), separate *r*s were calculated for each relevant category to compare effects.

We report results for each self-control scale separately because the information about moderator variables that could be derived from the studies differed dramatically from scale to scale, making a direct comparison of the three scales impossible. For each scale, we first present descriptive data of the studies included in the analysis. Second, we report the overall effect size of self-control on all behaviors and effect sizes for desired and undesired behaviors separately. In the third section, we report results from the analyses of sample and study moderators to rule out any systematic biases relating to these characteristics. Finally, we discuss results relating to the conceptual qualifiers of the self-control–behavior association.

Results

Self-Control Scale

Descriptive Data. Of the studies using the Self-Control Scale, 34 were descriptive and 12 had an experimental design; 4 studies combined descriptive and experimental designs. In all, 43 studies were cross-sectional, and a minority of 7 had a prospective design (ranging from 3 to 365 days). Also, 20 studies were published or in-press reports in peer-reviewed journals; the others were unpublished papers or reports. We therefore dichotomized this category into published (including papers that were in press) versus unpublished papers. In all, 22 studies were conducted in the United States, 27 were conducted in Europe, and 1 study reported data on samples from different countries but included predominantly European participants. We therefore dichotomized this variable into European (including the mixed sample) vs. American samples. The majority of studies focused on student samples (n = 32), 16 focused on community samples, and 2 focused on clinical samples. We decided to compare student to nonstudent samples. Of the studies, 13% comprised samples that were predominantly male (i.e., including > 67% males) and 19% comprised samples that were predominantly female (i.e., including > 67% females); the remainder of studies examined samples that were about equal in gender distribution. The mean age of the total sample was 21.8 years, and 67% of the studies comprised samples that included adults only, whereas 33% pertained to predominantly adolescent samples. Fewer than a quarter (20%) of the studies employed the full version of the scale, 61% used the brief version, and the remainder (19%) used adapted versions. We dichotomized this variable into full version versus other versions of the scale. To control for potential dependencies between moderators, we examined correlations between moderator variables.[5] Because of the large sample size, only correlations greater than .35 (thus accounting for more than 10% shared variance) were considered, showing that sample type (student samples vs. other samples) was associated with study design (87% of students participated in experimental designs whereas 70% of nonstudents participated in surveys), country of origin (70% of U.S. samples were students, whereas 27% of other samples were students), sample age (100% of student samples were adults, whereas other samples included both adolescents and adults), and Self-Control Scale version (77% of studies with student samples employed the full version of the scale, whereas 23% of studies with other samples used the full-scale version). This pattern of correlations shows that all associations are inherent to study characteristics (e.g., experimental designs are most of the time conducted in student samples). There were no correlations greater than .35 for the conceptual moderator variables. The mean level of self-control was 3.26 (SD = 0.58), varying from 2.87 to 4.26 (on a scale ranging from 1 to 5), with higher scores reflecting more self-control. Brief descriptions of the samples and selected study characteristics are provided in the appendix (available at http://pspr.sagepub.com/supplemental).

Overall effect size of self-control. We began by computing the overall effect size for the association between the Self-Control Scale and behavior. The average absolute

(with recoded effects for undesired behavior) effect size |ρ| derived from these studies was .26 ($p < .001$), with a 95% confidence interval from .23 to .28, based on 50 studies and a total sample size of 15,455. This means that self-control measured by the Self-Control Scale had, on average, a beneficial small to medium effect on behavior, regardless the type of behavior involved. The forest plot for all studies, including the mean standardized effect size per study and its confidence interval, showed that there were no outliers. Neither was there a difference relating to sample size of the study.

The homogeneity test of the overall effect size was significant ($Q = 375.95$, $df = 311$, $p = .009$), indicating that the data set was heterogeneous and that the observed variation in the effect sizes derived from the primary studies was much larger than could be expected from mere sampling error, although the percentage of between-study variance (in terms of the I^2 index) was quite low (17%). The observed between-study variance encouraged a search for moderators of the relation between self-control and behavior.

Study and sample moderators of the association between self-control and behavior. We first computed effect sizes of the association between self-control and desired and undesired behavior, respectively, but did not find a significant difference ($ES_{desired} = .21$, $ES_{undesired} = -.23$, $Q_{between} = .212$, $df = 1$, $p = .65$). Because effect sizes of self-control may be differently affected by the potential moderating variables, we report on moderator analyses for the performance of desired behavior and the inhibition of undesired behavior separately (see Tables 1 and 2, respectively).

Study Moderators. We began by examining moderation by study characteristics. Five factors were considered: study design, publication status, version of the Self-Control Scale, type of behavioral measure, and time interval. With regard to study design, more rigorous experimental studies showed a smaller (but still significant) effect size than survey studies, but only for desired behavior; a similar nonsignificant trend was observed for undesired behavior. There was also a difference with regard to publication status: Associations between self-control and desired (Table 1) and undesired behavior (Table 2) were stronger in published than in unpublished studies. This finding confirms the presence of a publication bias with smaller effects having a lower chance of being published.[6] We also examined whether the scale version had an effect on the association between self-control and behavior. The full scale resulted in significantly stronger effects in the case of undesired behaviors, suggesting that the full scale assesses inhibition of undesired behavior better than other versions of the scale.[7] Observed behaviors (either desired or undesired) and self-reported behaviors were equally related to self-control, thus indicating absence of flawed or overestimated effects in case of self-report.

Finally, with regard to time interval between the assessment of self-control and the behavior under study, cross-sectional designs measuring self-control and the inhibition of undesired behavior at the same moment resulted in significantly stronger effect sizes than prospective designs with a longer time interval

Table 1 Moderators of the self-control behavior relation for desired behaviors (as assessed by the self-control scale)

Moderator	*Level 1*	*N*	*k*	*r*	*Q*	I^2	*Level 2*	*N*	*k*	*r*	*Q*	I^2	δ
Study characteristics													
Design[#]	Survey	7,110	23	.26***	123.25		Experimental	4,637	15	.11**	33.22[†]	39.7%	.19
Publication status[###]	Published	3,091	10	.32***	58.8		Unpublished	8,655	28	.19***	80.89		.43
Scale version	Full scale	2,781	9	.24***	13.05		Other versions	8,964	29	.22***	126.12		
Self-report vs. observed	Self-report	8,346	27	.21***	119.43		Observed	3,400	11	.21**	42.73		
Time interval	Cross-sect	10,819	35	.21***	117.94		Prospective	2,473	8	.21	41.63		
Sample characteristics													
Sample[##]	Student	7,110	23	.12***	46.96		Nonstudent	4,637	15	.24***	103.0		.21
Age[###]	Adolescent	3,709	12	.31**	50.38		Adult	8,036	26	.10***	52.90		.58
Gender	Male	4,018	13	.25***	64.23		Female	8,964	29	.18***	86.66		
Country Conceptual factors	United States	6,800	22	.22***	64.35[††]	37.8%	Europe	4,946	16	.21***	97.75		
Controlled vs. automatic[###]	Controlled	10,818	35	.15***	93.88		Automatic	6,800	22	.36***	28.64		.22
Imagined vs. actual[###]	Imagined	9,270	30	.26***	140.53		Actual	6,180	20	.14***	46.64		.48

N = average N per study (309) × k; k = tests; r = correlation coefficient; Q = heterogeneity; I^2 = proportion unexplained variance (Q – df/Q).
*Significant ES: **$p < .01$. ***$p < .001$.
[#]Significant difference between groups: [#]$p < .05$. [##]$p < .01$. [###]$p < .001$.
[†]Significant Q = heterogeneity (per group, after meta ANOVA random model): [†]$p < .05$. [††]$p < .01$.

Table 2 Moderators of the self-control behavior relation for undesired behaviors (as assessed by the self-control scale)

Moderator	*Level 1*	*N*	*k*	*r*	*Q*	I^2	*Level 2*	*N*	*k*	*r*	*Q*	I^2	δ
Study characteristics													
Design	Survey	9,891	32	–.22***	321.22†††	65%	Experimental	6,800	22	–.14***	13.63		
Publication status###	Published	4,018	13	–.27***	187.35†††	80%	Unpublished	6,800	22	–.12***	118.29†	82%	.27
Scale version	Full scale	2,473	8	–.37***	18.50		Other versions	7,110	23	–.20***	304.36†††	70%	
Self-report vs. observed	Self-report	8,964	29	–.21**	328.54†††	65%	Observed	2,473	8	–.16*	8.44		
Time interval	Cross-sect	9,892	32	–.23***	322.78†††	68%	Prospective	2,473	8	–.14***	6.83		
Sample characteristics													
Sample	Student	5,564	18	–.24***	33.41		Nonstudent	49,467	16	–.21***	303.55†††	75%	
Age###	Adolescent	3,091	10	–.26***	200.47†††	75%	Adult	5,873	19	–.11***	94.61††	81%	.20
Gender###	Male	3,709	12	–.26***	183.65†††	72%	Female	8,036	26	–.14***	129.08†††	39%	.11
Country Conceptual factors	United States	3,709	12	–.20***	16.23		Europe	7,110	23	–.21***	321.34†††	68%	
Controlled vs. automatic###	Controlled	6,800	22	–.16***	204.27†††	65%	Automatic	5,255	17	–.40***	66.05††	76%	.23
Imagined vs. actual###	Imagined	6,180	20	–.30***	143.88†††	59%	Actual	7,725	25	–.17***	169.70†††	60%	.42

N = average N per study (309) × k; k = number of tests; r = correlation coefficient; Q = heterogeneity; I^2 = proportion unexplained variance ($Q - df/Q$); δ =Cohen's δ = ρ – ρ/SE_{pooled}.

*Significant ES: *$p < .05$. **$p < .01$. ***$p < .001$.

#Significant difference between groups: ###$p < .001$.

†Significant Q = heterogeneity (per group, after meta ANOVA random model): †$p < .05$, ††$p < .01$, †††$p < .001$

Table 3 Effects of self-control in different behavioral domains (as assessed by the self-control scale)

	N	*k*	*r*	*SD*	*Q*	I^2
Behavioral domains						
School and work	1,546	5	.36***	.048	8.87	
Eating and weight	4,328	14	.17***	.029	14.40	
Interpersonal functioning	5,255	17	.25***	.018	75.71	
Well-being and adjustment	4,946	16	.33***	.022	114.22†††	51.8%

N = average *N* per study (309) × *k*; *k* = number of tests; |*r*| = correlation coefficient; *Q* = heterogeneity; I^2 = proportion unexplained variance (*Q*– *df*/*Q*).
*Significant ES: ***$p < .001$.
†Significant *Q* = heterogeneity (per group, after meta ANOVA random model): †††$p < .001$.

between the measurement of self-control and behavior. Such a difference was not observed in studies examining prospective effects of self-control on the performance of desired behavior, which was similar to the overall effect found in cross-sectional studies albeit not significant (probably related to the small number of studies). Taken together, examination of study moderators warrants some caution in interpreting effects of self-control as measured by the Self-Control Scale on behavior as studies with more rigorous designs (experimental and/or longitudinal) result in smaller effect sizes. In addition, "true" effects of self-control may be somewhat lower than published studies suggest because unpublished studies report significantly lower effect sizes. Finally, when examining the effects of self-control on undesired behavior, the version of the Self-Control Scale should be taken into account.

Sample moderators. Next, we considered four potential moderating factors that related to sample characteristics: sample type, age, gender distribution of the sample, and country where the study was conducted. There were significant differences with regard to the type of sample that was studied. Effect sizes in student samples were smaller than those reported in community samples, but only for desired behaviors. This finding suggests that community samples may experience more benefit from self-control, regardless of whether their trait self-control scores are high or low. There was a significant effect of age on the association between self-control and behavior with stronger effects of self-control on behavior in younger samples, in case of both desired and undesired behavior, suggesting that relatively younger samples experience more benefit from self-control than older samples. With regard to gender, the effect of self-control proved equally strong in females and males for the performance of desired behavior. For the inhibition of undesired behavior, the effects of self-control in predominantly female samples were much smaller than the effects found in males.[8] With regard to the country where the study was conducted, studies of American and European samples showed equally small to medium effect sizes for self-control, for both the performance of desired behaviors and the inhibition of undesired behaviors. Taken

together, our analysis of sample moderators suggests that samples of people with relatively stronger impulses (males, adolescents) benefit more from having higher self-control than other categories of people.

Conceptual moderators of the association between self-control and behavior

Behavioral domains. We distinguished among nine domains of behavior (school and work performance, eating and weight behavior, sexual behavior, addictive behavior, interpersonal functioning, affect regulation, well-being and adjustment, deviant behavior, and planning and decision making), but because of an insufficient number of tests ($k < 4$), we were unable to calculate separate effect sizes for the domains of sexual behavior, addictive behaviors, affect regulation, deviant behavior, and planning and decision making. For the remaining four categories absolute effect sizes composing both desired and undesired behaviors (with recoded effects for undesired behavior) were computed because the relatively low number of studies addressing each of these behavioral domains did not allow for a distinction between desired and undesired behavior. Table 3 shows that the effect sizes of self-control vary across behavioral domains, ranging from a relatively small effect size of .17 for eating behavior and weight control to a medium to strong effect size of .36 for school and work performance.[9] Effect sizes for the impact of self-control on prosocial behavior ($r = .25$) and well-being ($r = .32$) were in the medium range. For most behavioral domains, effects were homogeneous with the exception of studies in the domain of well-being. These findings suggest that the effects of self-control generalize across life domains but that behavioral domains that are (partly) regulated by biological regulatory mechanisms (e.g., eating) may be less susceptible to the influence of self-control than behavior involving (in part) external or social regulation (such as school and work).

Controlled versus automatic behavior. There were significant differences between the effect sizes for controlled versus automatic behavior, in case of both desired and undesired behavior (see Tables 1 and 2). Although the overall effect sizes for controlled behaviors (both desired and undesired) were small, those established for automatic behaviors were medium to strong and in fact comprised the largest effect sizes found in this meta-analysis. This somewhat unexpected finding shows that the benefits of self-control are most manifest in behavior that is performed relatively effortlessly and without conscious attention or conscious control, suggesting that people with high self-control are good at automatizing their behavior (Baumeister & Alquist, 2009) regardless of whether it relates to doing what they want to do or not doing what they are supposed to inhibit.

Imagined versus actual behavior. Effect sizes for imagined behaviors—things people want to do or think they should do—were significantly larger than those for actual behavior. Regardless of whether desired or undesired behavior was involved,

thoughts and feelings about behavior were more strongly associated with self-control (small to medium effects) than reports of actual behavior (small effects). These differential effects of self-control for thinking and doing suggest that high levels of self-control are associated with inflated beliefs about what one is capable of doing without respect to whether people can actually enact those imagined behaviors when action is required.

Heterogeneity in effect sizes for undesired behavior. Overall, the results reported in Table 1 show that effect sizes for desired behaviors are homogeneous with few exceptions, indicating there is no additional variance to explain that cannot be attributed to the moderator variables that were included in the present analysis. This implies that self-control predicts desired behavior in a relatively straightforward manner that does not depend on other factors that were not considered. In contrast, effect sizes for undesired behavior (reported in Table 2) still show considerable heterogeneity that could not be explained by the moderator variables. Given that the overall relationship of self-control with the inhibition of undesired behavior was just as strong as the overall relationship with the promotion of desired behavior, the higher variability in self-control effects on undesired behavior suggests that other factors that were not examined may qualify these effects. At this point, we can only speculate about these other factors. It may be that the category of undesired behaviors is more heterogeneous than we initially thought, comprising behaviors that are undesired because they violate social norms about what is appropriate (being violent to significant others, being absent at work) as well as behaviors that are undesired because they pose a personal long-term risk (drinking alcohol, eating fatty foods).

Barratt Impulsiveness Scale

Descriptive data. Of the 31 studies employing the Barratt Impulsiveness Scale, 20 were descriptive and 11 had an experimental design (see the appendix for all descriptive data). Most studies ($n = 29$) were cross-sectional, leaving too few tests (< 4) of prospective designs to include in the moderator analysis. The majority of studies were conducted in the United States ($n = 19$), 6 took place in Europe, and the remainder in a variety of other countries. We recoded this variable into United States versus other countries. In all, 20 studies focused on student samples, 8 focused on clinical samples, 2 focused on community samples, and 1 included a mixed sample. We recoded sample type into student versus non-student samples. The majority of studies (64%) used samples that were about equal in the distribution of males and females, whereas about one third studied samples that were either predominantly male (13%) or female (23%). The mean age of the total sample was 27.65 years ($SD = 8.60$), ranging from 18 to 48 years, thus precluding a comparison of adolescent and adult samples. The mean level of impulsiveness was 63.80 ($SD = 5.78$; theoretical range = 30–120), with higher scores reflecting higher levels of impulsiveness. The majority of studies examined the relation between impulsiveness and undesired behavior

(86%); the remaining studies that examined desired behaviors (e.g., number of advantageous choices in the Iowa Gambling Task) were recoded. Positive correlations thus represent a relation between impulsiveness and undesired behavior. The behavioral domains under study varied, including planning and decision making (58%; e.g., actual or hypothetical reward choice), addictive behavior (31%; e.g., cocaine abuse, Internet addiction), deviant behavior (6%; e.g., speed deviations), and some other behaviors (5%; e.g., binge eating, symptoms of psychopathology). All dependent variables related to controlled behavior, making it impossible to conduct moderator analyses for controlled versus automatic behavior. In addition, there were fewer than four tests of imagined behavior, making it impossible to compare the effect of self-control on imagined versus actual behavior. To control for potential dependencies between moderators, we examined correlations between moderator variables.[10] The sole correlation greater than .35 between moderator variables related to study design and type of dependent variable, showing that experimental studies more often examined observed behaviors as the dependent variable.

Overall effect size of Barratt Impulsiveness Scale. The average absolute effect size $|\rho|$ was .19 ($p < .001$), with a 95% confidence interval ranging from .16 to .22, based on 31 studies and a total sample size of 4,791. This finding shows that low self-control (impulsiveness) had on average a significant but relatively modest effect on undesired behavior that was slightly lower than the overall effect size found for studies using the Self-Control Scale. No significant differences relating to sample size of the study were found. The homogeneity test of the overall absolute effect size was not significant ($Q = 53.01$, $df = 90$, $p = .90$), which may be the result of using the absolute *r*, which does not express all the variance between studies. We therefore also computed the homogeneity test of the simple *r*, which proved significant ($Q = 127.96$, $df = 90$, $p = .005$) and larger than the heterogeneity found in the studies that employed the Self-Control Scale. The percentage of between-study variance was low to medium (30%; J. P. Higgins & Thompson, 2002), which is higher than the I^2 of the studies using the Self-Control Scale. We therefore examined the potential impact of study and sample moderators.

Table 4 displays the results from these moderator analyses, showing that effects of impulsiveness on undesired behavior were significantly larger when a survey design (as compared to an experimental design) was employed and when the dependent variable was self-reported (as compared to observed). Considerable unexplained variance in the effect of self-reported behavior remained, however, probably relating to the wide variety of behaviors that were assessed. There were no moderator effects of sample type (students vs. nonstudents), although there was still considerable unexplained variance in case of the nonstudent samples, which may relate to the fact that we combined community samples and clinical samples and/or to the diversity of clinical samples that were studied. The moderator analysis for gender revealed no significant effects. There were larger effects of impulsiveness on behavior in American samples compared to non-American samples. We also examined potential differential effects of impulsiveness across behavioral

Table 4 Moderators of the self-control behavior relation for undesired behaviors (as assessed by the barratt impulsiveness scale)

Moderator	*Level 1*	*N*	*k*	*r*	*Q*	I^2	*Level 2*	*N*	*k*	*r*	*Q*	I^2	δ
Study characteristics													
Design[###]	Survey	2,664	24	.23***	34.85		Experimental	7,437	67	.05*	61.54		.81
Self-report vs. observed[###]	Self-report	3,663	33	.20***	62.77[††]	49%	Observed	6,438	58	.05*	43.75		.68
Sample characteristics													
Sample	Student	6,660	60	.14***	73.75		Nonstudent	3,441	31	.13***	54.12[††]	45%	
Gender	Male	1,998	18	.10*	1.20		Female	1,776	16	.10**	20.39		
Country[#]	United States	6,660	60	.14***	60.17		Non–United States	1,332	12	.05	15.03		.31

N = average *N* per study (111) × *k*; *k* = number of tests; *r* = correlation coefficient; *Q* = heterogeneity; I^2 = proportion unexplained variance (*Q*– *df*/*Q*); δ = Cohen's δ = ρ – ρ/SE_{pooled}.

*Significant ES: *$p < .05$. **$p < .01$. ***$p < .001$.

[#]Significant difference between groups: [#]$p < .05$. [###]$p < .001$.

[†]Significant Q = heterogeneity (per group, after meta ANOVA random model): [††]$p < .01$.

Table 5 Moderators of the self-control behavior relation for undesired behaviors (as assessed by the low self-control scale)

Moderator	*Level 1*	$\mathcal{N}$	k	r	Q	I^2	*Level 2*	$\mathcal{N}$	k	r	Q	I^2	δ
Sample moderators Sample$^{\#\#\#}$	Student	15,372	28	.07***	430.20†††	93%	Nonstudent	x	12	–.01	135.46†††	92%	.62
Age	Adolescent	4,392	8	.01	148.12†††	95%	Adult	x	32	.05***	428.78†††	92%	
Conceptual factors Imagined vs. actual	Imagined	8,235	15	.05*	168.23†††	92%	Actual	x	25	.04**	412.48†††	94%	

$\mathcal{N}$ = average $\mathcal{N}$ per study (549) × k; k = number of tests; r = correlation coefficient; Q = heterogeneity; I^2 = proportion unexplained variance (Q– df/Q); δ = Cohen's δ = ρ – ρ/ SE_{pooled}.
*Significant ES: *$p < .05$. **$p < .01$. ***$p < .001$.
$^{\#}$Significant difference between groups: $^{\#\#\#}p < .001$.
†Significant Q = heterogeneity (per group, after meta ANOVA random model): $^{\dagger\dagger\dagger}p < .001$.

Table 6 Effects of self-control in different behavioral domains (as assessed by the barratt impulsiveness scale and the low self-control scale)

Barratt Impulsiveness Scale	N^a	*k*	*r*	*SD*	*Q*	I^2
Behavioral domain	3,219	29	.23***	.022	33.54	
Addictive behavior						
Deviant behavior	666	6	.25***	.046	0.97	
Planning and decision making	6,105	55	.14***	.026	10.47	
Low Self-Control Scale	N^b	*k*	*r*	*SD*	*Q*	I^2
Behavioral domain	7,605	13	.25***	.018	41.58	71%
Addictive behavior						
Deviant behavior	12,870	22	.15***	.011	139.87	85%

k = number of tests; *r* = correlation coefficient; *Q* = heterogeneity; I^2 = proportion unexplained variance (*Q*– *df*/ *Q*).
[a] *N* = average *N* per study (111) × *k*.
[b] *N* = average *N* per study (585) × *k*.
*Significant ES: ***$p < .001$.

domains and found that effect sizes for addictive and deviant behavior were about the same as the generic effect of impulsiveness (see Table 6). Ironically, the effects of impulsiveness were weakest in the domain in which it is most studied, namely, planning and decision-making tasks.

Low Self-Control Scale

Descriptive data. All 21 studies using the Grasmick Low Self-Control Scale employed a descriptive design (see the appendix for all descriptive data). Most studies (n = 18) were cross-sectional, precluding a comparison of cross-sectional and prospective designs. The majority of studies were conducted in the United States (n = 19), again precluding a comparison of effects across countries. In all, 17 studies focused on student samples and 4 on community samples. All studies examined samples that were about equal in male–female ratio, thus not allowing for a gender comparison of effects of self-control. The mean age of the total sample was 21.10 years (*SD* = 5.26). The mean level of self-control was 57.45 (*SD* = 11.83; theoretical range = 24–96), with higher scores reflecting *lower* levels of self-control. Almost all studies examined the relation between low self-control and undesired behavior (97%). Therefore, the remaining studies that examined desired behaviors (e.g., positive discipline) were recoded. Positive correlations thus represent a relation between low self-control and undesired behavior. The behavioral domains under study varied, including deviant behavior (42%; e.g., cheating, [non]violent crime, driving above speed limit), addictive behavior (30%; e.g., smoking, marijuana use), and a variety of other behaviors that were too heterogeneous to be categorized (28%; e.g., unsafe sexual behavior, eating disorder symptoms). All dependent variables related to controlled behavior, making it impossible to conduct moderator

analyses for controlled versus automatic behavior. We examined correlations between moderator variables to control for potential dependencies between moderators, which showed that student samples were significantly younger than community samples.[11]

Overall effect size of Low Self-Control Scale. The average absolute effect size $|\rho|$ was .22 ($p < .001$), with a 95% confidence interval ranging from .17 to .26, based on 21 studies (40 conditions) and a total sample size of 12,402, indicating that self-control had on average a significant but modest relationship with the prevention of undesired behavior. No significant differences relating to sample size of the study were obtained. The homogeneity test of the overall effect size was significant ($Q = 206.14$, $df = 39$, $p < .001$), indicating that the observed variation in the effect sizes derived from the primary studies was larger than could be expected from mere sampling error. The percentage of between-study variance was extremely high (81%; J. P. Higgins & Thompson, 2002). Examination of moderator variables relating to sample characteristics did not improve the model, as heterogeneity continued to be extremely high when comparing student and nonstudent samples or adolescent and adult respondents (see Table 5 for details). Comparing imagined (e.g., intention to cheat or steal) to actual behaviors (e.g., actual cheating of stealing) also did not decrease heterogeneity of variance. Examination of the two life domains that were studied most with the Low Self-Control Scale revealed a larger effect size for addictive behaviors than for deviant behaviors (see Table 6 for details), but again the variance remained heterogeneous. We therefore conclude that none of the moderators included in the present meta-analysis explains the heterogeneity in variance of effects of the Low Self-Control Scale on behavior.

Discussion

Many theories have characterized self-control as an important capability that contributes to effective functioning, both of society as a whole and of individuals within it. Our meta-analysis is a first attempt to integrate the findings from empirical studies that employ different designs and different populations. It examined the association of dispositional self-control with a variety of behavioral outcomes. In line with the literature arguing that self-control is an important influence on a broad range of behaviors, our review showed that dispositional self-control is related to a wide spectrum of human functioning, including love, happiness, binge eating, alcohol use, getting good grades, commitment in a relationship, occasional speeding, and lifetime delinquency. Despite this variety, our review found a small to medium relationship between self-control and such outcomes, regardless of the scale that was used to assess self-control. Thus, as many theories have asserted, self-control is associated with benefits in many spheres of human life.

That said, the Self-Control Scale had stronger relationships than the Barratt Impulsiveness Scale and the Low Self-Control Scale to behavior overall, and it also allowed for a more fine-grained analysis of its effects across different life domains

and different types of behavior. Many of the hypotheses that guided this meta-analysis could not be tested with results obtained from studies using the Barratt Impulsiveness Scale or the Low Self-Control Scale because of missing information on desired, automatic, or imagined behaviors. Moreover, the behavioral domains addressed with the Barratt Impulsiveness Scale (planning and decision making, deviant and addictive behavior) and the Low Self-Control Scale (deviant and addictive behavior) were different from those studied with the Self-Control Scale, making a comparison of effects of self-control obtained with the different scales impossible.

The relatively weaker performance of the Low Self-Control Scale and the Barratt Impulsiveness Scale may be the result, in part, of the selection of target variables by researchers who use those scales. The most commonly studied behavioral domains that are assessed with the Barratt Impulsiveness Scale (planning and decision making) and the Low Self-Control Scale (deviant behavior) produced the lowest effect sizes. Thus the lack of information on conceptual moderators in studies with the Barratt Impulsiveness Scale and the Low Self-Control Scale compromised the possibility of finding convergent results across scales of self-control.

In addition, all analyses with the Low Self-Control Scale produced exceptionally high levels of unexplained variance (which were much higher than those using the Self-Control Scale and the Barratt Impulsiveness Scale), indicating that other factors unaccounted for in the present meta-analysis influenced the effects of self-control obtained with this scale. Research has suggested that better specification of the conditions under which the Low Self-Control Scale is likely to have more or less effect on deviant behavior should be undertaken (Tittle, Ward, & Grasmick, 2003), and our research supports this recommendation. Gender and age effects of self-control that were revealed by the Self-Control Scale could not be replicated with the Barratt Impulsiveness Scale (gender) or the Low Self-Control Scale (age), suggesting that the Self-Control Scale is more sensitive to such differences.

In summary, despite its more recent publication date, the Self-Control Scale has been used more often to study a broader variety of behavioral categories than the two other self-control scales that were included in this meta-analysis. Despite the relatively large number of unpublished studies reporting lower effect sizes, studies employing the Self-Control Scale detected larger and more homogeneous effects of self-control on behavior. In line with the hypotheses that guided our meta-analysis, studies with the Self-Control Scale show that trait differences in self-control are significantly more relevant to some behaviors than others. Our analysis addressed a number of factors that may contribute to the explanation of variance in the strength of the relationship between self-control and behavior, including the usual suspects relating to study and sample characteristics but also encompassing conceptually important moderators that have implications for further research and theorizing about self-control. We turn now to consider the major findings and their implications based primarily on studies employing the Self-Control Scale.

Desired versus undesired behaviors. Much theorizing has emphasized that self-control is aimed more at inhibiting undesirable behaviors than at promoting desirable behaviors. (Indeed, even the items on the Self-Control Scale refer more to avoiding undesirable behaviors than to promoting desirable ones.) Therefore, we predicted that self-control effects would be larger and more consistent with undesired than desired behaviors. This hypothesis was not supported. The average effect size estimates for undesired behaviors were no different from the estimates for desired behaviors. Moreover, the effects of self-control on undesirable behaviors were significantly heterogeneous (for all three scales), unlike the effects on desirable behaviors. Thus, the effects of self-control on undesirable behaviors were less, rather than more, consistent than effects with desirable behavior.

These findings disconfirm the view of the self-control process as a general, all-purpose inhibiting mechanism. To be sure, it is still possible that self-control developed or evolved to facilitate the inhibition of some behaviors, and that its uses for fostering desirable behaviors were a fortunate side effect. Even so, self-control is apparently more effective at inhibiting some behaviors than others.

Our review was unable to explain the heterogeneity of effects on inhibiting bad behaviors, and this remains an important question for further research. One likely possibility is that some behaviors are far more amenable than others to self-control. Among other theorists, Seligman (1994) has written extensively about how adjustment depends on ascertaining which aspects of oneself can and cannot be changed. People may strive to change both changeable and relatively unchangeable undesired behaviors, and so their success would inevitably be mixed, thereby producing the heterogeneity we found. In particular, we found relatively small effects with eating and dieting behaviors, which are seen by many as the main spheres in which self-control is used. There is a fair amount of evidence that long-term success in dieting is rare (e.g., Seligman, 1994), and of course complete abstinence from eating (unlike smoking, drinking, and unprotected sex) is impossible. Hence, it is conceivable that some of the variability in self-control's links to undesired behaviors arises from people seeking unsuccessfully to lose weight.

Controlled versus automatic behaviors. If some behaviors are more easily controlled than others, then the degree to which a particular behavior is automatic may be one highly relevant consideration. Hence, we hypothesized that self-control would be more effective with controlled than with automatic behaviors. Surprisingly, the analyses clearly indicated the opposite conclusion. Although the association between self-control and automatic behaviors proved relatively strong, associations with controlled behaviors were small. The effects of self-control on automatic behaviors were consistent across both desired and undesired behaviors and were overall the largest effect sizes in our entire meta-analysis.

To be sure, it would be nonsensical to conclude that controllable behaviors are not controllable whereas automatic behaviors are. A more sophisticated interpretation is needed. We also note that if a behavior were fully and easily controllable by everyone in all cases, then the effect of individual differences in self-control might well be zero—which would produce a result consistent with what we found.

Hence, one possible explanation for the stronger relationship between self-control and automatic behaviors is that controllable behaviors are in general more easily controllable, whereas changing automatic behaviors is more difficult, so that individual differences in self-control have greater relevance with the latter. But that explanation seems unlikely, not least because researchers probably would not waste much time studying the easiest behaviors to control.

In our sample of studies, the behaviors classified as automatic consisted of acts that are normally performed effortlessly and without conscious attention, especially habits. The relatively large relationship between trait self-control and such behaviors thus suggests that people with good self-control are especially effective at forming and breaking habits. This suggests a change in emphasis for self-control theory. Although most theorizing about self-control has focused on the specific act of resisting temptation in a particular setting, self-control may in general operate more by forming and breaking habits. It is thus mainly by establishing and maintaining stable *patterns* of behavior rather than by performing single acts of self-denial that self-control may be most effective.

Working, playing, eating, relating. Our findings showed dramatically differential effects of self-control across life domains. The Barratt Impulsiveness Scale, for example, showed much stronger correlations with addictive and deviant behavior than with planning and decision making. The Self-Control Scale showed relatively strong effects on performance at work and school, whereas the effects on regulating eating and weight were relatively small. The impacts on interpersonal functioning and adjustment were in between those extremes. This pattern again turns conventional wisdom on its head, especially insofar as dieting is probably the single most commonly used source of examples in writings and talks about self-control.

The idea that self-control differences are largest on work and school behavior may run counter to some theoretical assumptions that self-control would be especially relevant for regulating impulsive behavior (Carver & Scheier, 1998; Metcalfe & Mischel, 1999; Vohs & Baumeister, 2004), but it does mesh well with the other results we have reported. Effective performance at work and school is rarely a matter of single, prodigious acts of willpower. Instead, it probably depends on forming and maintaining habits and routines that foster efficient, steady performance in a regular and disciplined manner. Some students may look back on memorable all-nighters as decisive feats of self-control, but the very need to study all night may often arise because the person has procrastinated, which can indicate a low self-control and a lack of regular study habits, and which moreover tends to produce significantly poorer performance overall than keeping on schedule and ahead of deadlines (e.g., Tice & Baumeister, 1997). In contrast, eating is partly under control of visceral and impulsive processes (e.g., Ditto, Pizarro, Epstein, Jacobson, & MacDonald, 2006; Hofmann, Friese, & Strack, 2009). Weight, moreover, depends on not only eating but also genetic predispositions and other factors, and so its amenability to conscious control may be relatively minimal (e.g., Seligman, 1994).

The effects of self-control within behavioral domains were generally homogeneous, with one exception: the domain of well-being and adjustment. The category of adjustment and well-being included a variety of concepts that have been categorized in the same way in previous research (Tangney et al., 2004) and comprised, for example, self-esteem and absence of depression. However, it is possible that variability was introduced by multiple factors. Low self-control may contribute to emotional lability, so that measuring happiness at different times and in different ways will produce different results. Low self-control may produce short-term gains but long-term costs (e.g., W. Mischel, 1974), which again would contribute to heterogeneity of effects. However, it is also possible that concepts of adjustment vary in the extent that biological factors are relevant, which may explain why the impact of self-control differs across these concepts. In any case, future research may find it useful to break this category down into subcategories and examine method variance instead of making broad generalizations about the contribution of self-control to well-being and adjustment.

How and when behavior is measured. Several findings indicated that the way in which behavior is measured relative to self-control has significant implications for the size of effects. Effect size was also related to publication status, with unpublished studies having smaller effects than published ones. This difference could arise if studies with weak, unreliable, or confounded measures remain unpublished because such measurement problems would also reduce the size of effects of self-control. If published and unpublished studies are both equally valid, however, then a reliance on published studies will furnish an inflated estimate of the size of effects of self-control.

Apart from publication status, multiple aspects of measurement were relevant. First, larger effects of self-control were obtained when behavior was measured by questionnaire self-report than by direct observation of actual behavior. Second, the effects were stronger when the (undesired) behavior was measured at the same time as the trait self-control measure, as opposed to measured after delay. Nevertheless, prospective studies with longitudinal designs that measure self-control initially and assess delayed behavioral consequences still produced significant effects. Third, self-control had significantly stronger relationships to imagined and hypothetical behaviors than to actual ones. That is, self-control was strongly related to what people say they would or should do, but the relationships to what people really do, though still genuine and significant, are weaker. Of course, it is easier to ask people about self-control than to actually observe them; asking how much they would eat or drink or whether they would have sex under certain circumstances, for example, is certainly more feasible than measuring what they actually do under those circumstances. Yet the present findings clearly illustrate that it may be important to include measures of actual behavior.

Taken together, this set of findings suggests that the effects of self-control are subject to dilution in the real world, where multiple factors come into play. The closer the measure of behavior was in kind and style to the measure of self-control,

the stronger the effects were. When both trait and behavior are measured by having the person go straight from one questionnaire to another on the same occasion, results tend to be larger than if the trait is measured by questionnaire whereas behavior is measured by direct observation or on another occasion. Studies that rely purely on questionnaire self-reports to measure behavior may overestimate the true influence of self-control.

One additional finding was that studies using the full Self-Control Scale found larger effects on the control and inhibition of undesired behaviors than studies using the brief or adapted version of the scale. Most likely this relates to the well-established principle of basic measurement theory that shorter versions of scales tend to be less reliable than longer versions (Emons, Sijtsma, & Meijer, 2007). Regardless of the reason, future researchers interested in studying the self-control of undesired behaviors may find it useful to employ the full version of the scale.

Sample moderators: age and gender. In general, self-control scores were fairly similar across different categories of people, but effects of self-control varied substantially with gender and age. Regarding gender, the relationship between trait self-control and undesirable behaviors was greater for males than for females. Most plausibly, males and females have similar psychological structures and capabilities for self-control (as indicated by having similar mean scores on self-control measures), but males may have stronger antisocial or problematic impulses than females. For example, men may be more attracted than women to drug and alcohol abuse, and they have stronger sexual and aggressive impulses (e.g., Baumeister, Catanese, & Vohs, 2001; Eagly, 1987). Hence, individual variations in strength of self-control will produce wider variations in behavioral outcomes among males than among females, insofar as low self-control is more likely to allow problematic impulses to manifest in behavior.

Although adults scored similar to adolescents on the self-control measures, the behavioral effects of trait self-control were larger with the younger samples. The same reasoning may apply as with gender: Antisocial and problematic impulses (e.g., sex, aggression, alcohol, drugs) are likely stronger and more frequent among younger than older people, and so weak self-control is more likely to lead to problematic behavior among younger than older people.

Future work should seek to establish separate measures of impulse strength and self-regulatory capability, though we recognize that teasing those constructs apart is difficult. Then it would be possible to test the hypothesis that individual differences in self-control strength are more strongly related to behavior when impulses are strong rather than weak. If that hypothesis turns out to be false, then another explanation of the age and gender differences may be needed. For the present, however, the evidence seems to fit this conclusion: Capabilities for self-control are broadly similar in different sociodemographic groups, but differences in the strength of undesirable, antisocial impulses produce different behavioral outcomes and also make individual differences in trait self-control more powerful predictors of behavior in some groups than in others.

Limitations and future directions. This study is the first systematic review of the relationship between dispositional self-control and a host of behaviors. Moreover, it is the first study that explicitly introduces a number of dimensions of behavior that are relevant to understanding the impact of self-control. Despite these strengths, several limitations should be acknowledged. First, we included only studies that employed a version of the Self-Control Scale (Tangney et al., 2004), the Barratt Impulsiveness Scale (Patton et al., 1995), and the Low Self-Control Scale (Grasmick et al., 1993). These scales are among the most widely used instruments to assess dispositional self-control in the way it is typically conceptualized in the literature. Although it was not our primary aim to compare scales, we found considerable differences in the way the three scales have been used to establish connections between trait self-control and behavior. Unfortunately, only the Self-Control Scale allowed for a test of our main hypotheses. Therefore, it remains to be determined whether our results can be replicated when other scales assessing dispositional self-control are employed. However, a recent meta-analysis that directly compared a number of self-report trait self-control scales concluded that there was convergence between constructs (r = .46; Duckworth & Kern, 2011), suggesting that other measures might generally be assumed to result in similar findings. A second limitation relates to the relatively high number of unpublished studies with the Self-Control Scale. Unpublished studies do not allow for a full appreciation of study characteristics, but we chose to include unpublished studies to avoid potential publication bias. Importantly, all findings reporting on the conceptual moderators that guided this meta-analysis were replicated when analyses comprised published studies only. Another limitation is the relative lack of behavioral domains that could be included in our analyses. Future research should examine whether self-control produces similar effects in behavioral domains that were not included in the present meta-analysis because of a lack of empirical studies, most prominently sexual behavior, risk behavior, and affective behaviors. Finally, as our study produced heterogeneous findings for the relationship between trait self-control and adjustment and well-being, future studies should employ more fine-grained analyses of how different components of adjustment and well-being relate to self-control.

Concluding remarks

The topic of self-control has attracted extensive theorizing and empirical study, presumably because of its widespread potential relevance. The present findings confirm some common themes of self-control theory but suggest that others need serious reconsideration. Our results confirm the view that having high trait self-control is relevant to a rich assortment of behaviors and outcomes. Furthermore, our findings confirm that these effects of self-control are generally beneficial and adaptive. Self-control is thus one of the most beneficial traits in personality.

However, contrary to the view that self-control is mainly aimed at inhibiting undesirable behaviors, we found that its effects on desirable and undesirable effects were approximately equal in size. There was however greater heterogeneity with

the undesirable effects, possibly because some problem behaviors are far more controllable than others. Trait self-control may be most important and most effective among individuals who grapple with relatively strong and problematic impulses, such as young males.

Contrary to some assumptions about self-control, our meta-analysis suggests that the trait differences have their strongest effects neither in the dieting sphere nor via single feats of willpower. Rather, some of the strongest effects obtained were in connection with automatic behaviors, such as forming and breaking habits. Other strong effects were found in school and work performance. Possibly, those two large effects overlap insofar as effective work depends on steady and regular performance and good work habits.

In sum, the benefits of self-control appear to justify the amounts of research and theory that have been devoted to it, even if that work has yielded some surprises and some changes in direction are indicated.

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Notes

1 We also searched for studies using the Rosenbaum Self-Control Schedule (Rosenbaum, 1980), but there were not enough studies that met the inclusion criteria (< 10) to be included in the meta-analysis.

2 The high number of studies reporting insufficient statistical details was related primarily to reporting on the Barratt Impulsiveness Scale-13 (BIS-13) for the whole sample including both experimental and control conditions instead of for the specific conditions that were included in the meta-analysis.

3 Our data comprise a hierarchical structure with tests nested within studies. Such a data structure warrants a meta-analytical multilevel approach, which not only has the advantage of allowing for the calculation of average effect sizes across studies but also has the possibility of explaining variance at the study level (Lensvelt-Mulders, Hox, Van der Heijden, & Maas, 2005; Van den Noortgate & Onghena, 2003). In the present study we did not employ this approach, however, because of the variability in behavioral measures. To do justice to the fact that tests were nested within studies, and therefore add extra weight to studies including many tests, we corrected the inverse weight by a factor equal to the number of tests in a study. We dealt with the heterogeneous variability of the studies by employing a random model, using maximum likelihood estimation.

4 A direct comparison of the three self-control scales could be tested only for the overall effect on undesired behavior, revealing similar effect sizes as with analyses per scale. However, it should be kept in mind that the overall effect sizes are difficult to compare because they relate to different types of behavior per scale.

5 Correlations were computed for dichotomized variables. We also examined associations with nonparametric tests (Mann–Whitney), but this resulted in similar findings.

6 We reran all analyses (including the overall effect, desired vs. undesired behavior, and moderator analyses for desired and undesired behaviors separately) with published

studies only and found that the analyses confirmed the pattern of results obtained with the analyses on both published an unpublished studies.

7 We also compared the brief and adapted versions of the Self-Control Scale but found similar effect sizes.

8 See Note 6.

9 As research on eating behavior almost exclusively employs female samples, we examined whether this differential gender effect could be explained by studies in the eating domain. However, the effect was similar when studies on eating were excluded.

10 See Note 5.

11 See Note 5.

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