

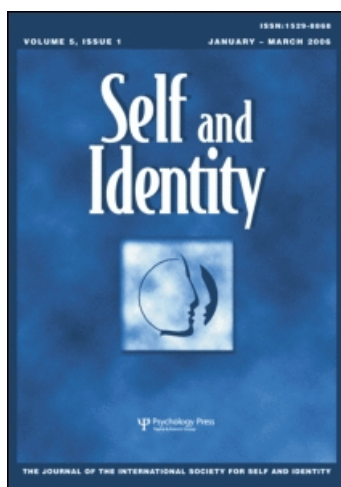
This article was downloaded by: [Florida State University Libraries]

On: 1 September 2009

Access details: Access Details: [subscription number 789349894]

Publisher Psychology Press

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Self and Identity

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713685324>

Is There a Downside to Good Self-control?

Roy F. Baumeister^a; Jessica L. Alquist^a

^a Florida State University, Tallahassee, Florida, USA

Online Publication Date: 01 April 2009

To cite this Article Baumeister, Roy F. and Alquist, Jessica L.(2009)'Is There a Downside to Good Self-control?',Self and Identity,8:2,115 — 130

To link to this Article: DOI: 10.1080/15298860802501474

URL: <http://dx.doi.org/10.1080/15298860802501474>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Is There a Downside to Good Self-control?

ROY F. BAUMEISTER

JESSICA L. ALQUIST

Florida State University, Tallahassee, Florida, USA

Most discussions of self-control have focused on its benefits rather than its costs. The most important cost appears to be the depletion of limited self-control resources. Acts of self-control both consume and require self-control resources, and, until these resources can be replenished, people's ability to perform many adaptive behaviors is compromised. These impairments affect not only self-control but also intelligent thought, effective decision making, and initiative. The limited resource itself presents further potential costs, insofar as the person must manage the limited resource (e.g., conserving for future demands), and managing the resource itself is presumably another demand for self-regulation and hence a drain on the limited resource. Trait self-control, in contrast, appears to have few or no downsides.

Keywords: Self-control; Self-regulation; Self; Tradeoff; Ego depletion.

The evolutionary beginnings of selfhood may have been part of the attempt to exert control over the external environment, but selves soon began to develop the capacity to exert control over themselves too, in the sense that the self came to alter its own inner processes, inner states, and behavioral responses. The terms *self-control* and *self-regulation* have been used to refer to the capacity of the self to alter itself. The need to be able to alter behavior to accord with standards has figured prominently in human social life because of the proliferation of standards: laws, distant goals, social norms, religious ideals, moral and ethical principles, traditions and customs, and more. Civilized life in human cultural societies would be unthinkable without self-regulation, and inadequate self-control would be central to the inability of most nonhuman animals to live and function in the human social world.

Viewed in that way, self-regulation is a highly desirable and adaptive trait. And in fact an assortment of field studies and applied research has confirmed that exercising effective self-control is highly beneficial, both to individuals and to society. Yet an accumulating body of laboratory studies has depicted the immediate effects of exercising self-control to be mainly detrimental and negative. In this manuscript, we shall review both sets of findings, consider their contradictory nature, and seek to offer a resolution.

Correspondence should be addressed to: Roy Baumeister, Department of Psychology, Florida State University, Tallahassee, FL 32306-4301, USA. E-mail: Baumeister@psy.fsu.edu

Definitions

Self-regulation refers to the efforts by the self to alter its own responses. Dictionaries define *regulation* as change designed to bring something into agreement with a standard. Applied to the self, then, regulation involves changing the self or aspects of it to bring it into line with any sort of standard, such as a social norm, a cultural ideal, or a personal goal. Self-regulation can be used to change the person's thoughts, emotions or moods, motivated behaviors (aka impulse control), or task performance.

We use the terms *self-control* and *self-regulation* interchangeably, though we recognize that some scholars make a distinction. The distinction typically treats self-control as a large subset of self-regulation. In this view, self-control is seen as the conscious, effortful form of self-regulation, but there are also nonconscious processes and forms of self-regulation that would not be encompassed as self-control. Our focus is on the conscious, effortful variety, and so in our writing the terms *self-regulation* and *self-control* refer to the same phenomenon.

State and trait aspects of self-control can be distinguished. The state is the current act. The trait would be the broad, dispositional tendency to exert self-control. Measures of trait self-control have begun to appear in recent years (e.g., Tangney, Baumeister, & Boone, 2004). These have some relationship to several more traditional trait concepts. One is impulsivity, but as the term impulsivity implies, it focuses on strength of impulses as much as on the restraints. Another relevant trait is Conscientiousness, which is one of the so-called Big Five dimensions of personality. According to Roberts, Walton, and Hogg (2005), Conscientiousness in the Big Five is a blend of self-control, traditionalism, industriousness, responsibility, and orderliness. Trait self-control is thus a narrower, more specific concept than both.

There is also a question of how to define benefits and beneficial effects. Although these clearly refer to positive, desirable outcomes, one may ask who desires and benefits from them. In Freudian theory, for example, there was an overt tradeoff between personal and societal benefits. The superego was the Freudian analog to self-control, and Freud (1930) was explicit in depicting the superego as costly to the self even while beneficial to the larger social group. In fact, he proposed that the superego was created by having the socializing agents turn the child's aggression inward against the self, so that the young person learned to deprive himself or herself of desired pleasures in order to live by society's rules. A second tradeoff involved gaining safety in exchange for sacrificing one's own chances for untrammelled indulgence: I agree not to rob or harm you, and you agree not to rob or harm me. But, Freud went on to say, the tradeoff is not quite equal, because the mechanism by which it is accomplished (the superego) had a side cost of inducing guilt, and the rise in guilt was an extra added cost, constituting the "discontent" in civilized life. Thus, in that view, self-control was net costly to the individual, whereas the gains were primarily found in the harmonious and smooth functioning of society.

Even the concept of good can be debated. We shall argue that self-regulation is a tool, and that it is a good tool, which means that by using it people can improve their chances of getting what they want. But they may use it for ends that others would condemn. Most likely a mass murderer with good self-regulation would succeed in killing more people than a sloppy, careless, undisciplined one. Hence our use of the term "good" refers to pragmatic benefit within the basis of chosen goals, and it does not extend to passing moral judgment on those goals.

Benefits of Self-control

Why should self-control be beneficial? A context for answering this question begins with the basic principle that all organisms need to achieve some sort of harmony with their environment so that they can live in reasonable security and peace and can satisfy their needs. Changing the environment to suit the self is one way of achieving such harmony, but changing the self to fit the environment is also a viable strategy (Rothbaum, Weisz, & Snyder, 1982). In many cases, the environment cannot be changed to suit the wishes of the individual, and so changing the self may be the most promising option for achieving harmony. This fact may be especially true about social environments, because whenever people disagree or want incompatible things, one or more of these people must be disappointed. Hence social life places demands on the individuals to accommodate themselves to external circumstances.

Increased flexibility of behavior is a second important benefit of self-regulation. We have said that self-regulation can be conceptualized as the self overriding its current, incipient, prepotent response. Instead of acting on first impulse, the self-controlling individual can stifle that response, which makes it possible to act differently. The resulting freedom of action has tempted some writers to connect self-regulation with the folk notion of free will (e.g., Baumeister, 2008; Dennett, 2003). The advanced requirements and opportunities in human social life are again relevant, because they involve complex decisions, and the behavioral flexibility stemming from self-regulation enables the person to capitalize on them.

Needless to say, these benefits of self-control can be recognized for both individuals and social systems. Self-control enables individuals to fit in to societies and to navigate their way through the myriad constraints and opportunities society presents. The self-control of individuals also enables social systems to operate smoothly and serve their functions, because self-controlling individuals obey the society's rules and perform their roles within it.

Ample research has confirmed the benefits of self-control. Some of the most impressive evidence that self-control benefits individuals was provided by Mischel, Shoda, and Peake (1988) and Shoda, Mischel, and Peake (1990). They followed up children who had participated in laboratory studies of delay of gratification when they were four years old. In these procedures, which have become widely known under the rubric of "the marshmallow test," children had to choose between an immediate but small reward (e.g., one marshmallow) and a larger but delayed reward (e.g., three marshmallows after 20 minutes). Self-control is required to resist the temptation to take an immediate pleasure in order to procure a better outcome in the long run. ("Better" in this case involves the assumption, dubious to adults but presumably embraced by children, that three marshmallows are preferable to one.) The participants who had shown the best self-control at age 4 became more successful than others as adults, both socially and academically.

The diversity of benefits of self-control was suggested in a pair of studies by Tangney, Baumeister, and Boone (2004). A trait measure of self-control significantly predicted a host of positive outcomes, including interpersonal success, school achievement, and adjustment. That is, people scoring high on self-control were more likely than others to report good grades in school and college. They were more likely to report secure and satisfying relationships and less likely to report angry aggression. They were less prone to report an assortment of pathologies, including depression, anxiety, eating disorders, drinking problems, and psychoticism. Their emotional stability was better. These effects remained significant after controlling for

social desirability, which suggests they are not some mere expression of self-report bias.

What about bad effects? A noteworthy feature of the Tangney et al. (2004) investigation was that it contained a determined search for curvilinear effects, which would reveal negative effects of very high self-control. Such analyses were done on the presumption that some self-control is superior to little or none but that “over control” was possible and would be reflected in a downturn in positive outcomes among the people scoring highest on the scale. No hint of such effects was found. On that trait scale, at least, the higher the scores, the better.

Although the results in the Tangney et al. (2004) study were exclusively based on self-report, other studies have confirmed the benefits with objective measures. Smith and Baumeister (2006) used the same scale to predict actual grade point average, obtained from registrar’s records, and the findings confirmed that students scoring high in self-control really did get better grades than others, even after correcting for academic ability as measured by the SAT Reasoning Test. Wolfe and Johnson (1995) tested 32 trait predictors of actual grade point average in a large sample and found self-control was the only one to have a significant impact after controlling for high school Grade Point Average and SAT scores.

Perhaps most dramatically, Duckworth and Seligman (2005) showed that self-control predicted academic performance better than IQ. (This is dramatic because predicting academic performance was the central purpose of IQ scores and they have been quite consistently successful at doing so.) High self-control predicted higher grade point average, higher scores on tests of academic achievement, and better admission to selective high schools, as compared to low self-control. Students with high self-control had fewer school absences, spent more time on homework, and started their homework earlier than other students.

Another approach to providing objective confirmation is to have other people rate the target individual. Cox (2000) found that supervisors who scored high on self-control were rated more favorably by their peers and subordinates. The fact that having good self-control makes someone a better boss brings up the second category of benefits, which is benefits to society. The supervisors themselves may have benefited from their good work and from the appreciation of subordinates, but this is inferred, whereas it seems safe to assume that the appreciative subordinates have benefited most directly.

Another domain where the benefits of self-control for individuals and society overlap is the maintenance of long-term relationships. Individuals in satisfying long-term relations experience fewer mental and physical health problems (Bloom, White, & Asher, 1979; DeLongis, Folkman, & Lazarus, 1988), are less likely to have fatal heart attacks (Lynch, 1979), and are more likely to survive cancer (Goodwin, Hunt, Key, & Samet, 1987). Happily married individuals are also less likely to commit suicide (Rothberg & Jones, 1987) and less likely to commit crimes (Sampson & Laub, 1993).

Self-control is related to one important facet of relationship maintenance: accommodation. Accommodation involves an individual’s tendency to avoid responding destructively to the negative behaviors of his or her partner (Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991). A series of four studies showed that individuals’ self-reported trait self-control was consistently correlated with three of the four aspects of accommodation (Finkel & Campbell, 2001). Individuals with higher self-control were more likely to respond to a partner’s negative behavior by trying to talk through the problem and were less likely to respond by avoiding the partner or ending the relationship than individuals with lower self-control.

To be sure, in general the benefits of self-control to society are somewhat more difficult to document than the benefits to individuals, but they may be quite important. An influential work by Gottfredson and Hirschi (1990) concluded that poor self-control is the single most important cause of criminality. (We assume crime is detrimental and costly to society.) Subsequent research has confirmed strong links between poor self-control and criminal, violent, and antisocial behavior patterns (see Pratt & Cullen, 2000, for a review). Thus, good self-control is vital for sustaining socially desirable, law-abiding behavior and thus for the smooth and effective functioning of civilization.

Benefits of self-control to both the individual and society are evident in recent studies with a population notorious for low self-control, namely prison inmates. Among a sample of incarcerated offenders, low self-control was associated with more drug use, higher unemployment, and less education (preceding incarceration), as compared to people high in self-control (Mathews, Youman, Stuewig, & Tangney, 2007). More importantly, trait self-control was significantly correlated with recidivism. Even after controlling for IQ and social desirability, inmates with low self-control were more likely to be arrested again or report committing undetected crimes than those with high self control. Insofar as being arrested again for a new crime signifies a bad outcome for both the individual and society, good self-control appears to be a broadly beneficial trait.

Costs of Self-control

When assessing the costs and benefits of self-control, it is important to note that self-control is ultimately just a tool, and it can be used for bad purposes just as easily as for good, praiseworthy ones. Given that most individuals' goals seem to align with general social norms, self-control is most often used for positive ends for the self and society. However, some applications of effective self-control can produce destructive or antisocial results. A criminal or torturer with good self-control will be all the more effective at his or her heinous occupation, and the harmful results would thus be intensified. Still, this is a complaint that can be leveled against any tool, from physical ones (effective hammers can destroy more items than poorly designed ones) to psychological ones (intelligent evildoers will accomplish more harm than incompetent ones). For society, the cost of self-control is the negative effects of those individuals who use self-control for antisocial goals.

Whether they have socially acceptable goals or not, individuals bear costs from exerting self-control. These come in two quite different forms, sacrifice and process.

Self-control and Sacrifice

The very nature of self-control entails overriding some impulses and desires, and so forfeiting those satisfactions is a very real and substantial cost. The exertion of self-control in everyday life means that people do not eat or drink what they want, do not purchase items they desire, do not have sex with partners they fancy, do not strike or shoot people they despise, and in many other ways forfeit the satisfaction of their desires.

To be sure, self-control brings benefits to individuals too, as already noted, and the sacrifices are in many ways directly tied to those benefits. Tradeoffs (the theme of this special issue) are thus at the heart and essence of self-regulation. The self-regulated citizen respects the property of others, and in return lives in a social

world in which his or her property is equally respected by others. The sacrifice of not helping oneself to others' possessions is compensated by the secure enjoyment of one's own possessions.

The direct link between these costs and benefits of self-regulation is especially obvious in delay of gratification. In the laboratory, participants face choices between an immediate gain and a delayed but greater gain, and foregoing the immediate satisfaction is essential to the enjoyment of the delayed benefits (e.g., Mischel, 1974, 1996). Delay of gratification is thus a paradigmatic example of enlightened self-interest, because it increases the benefits to the self in the long run, even though it may involve short-term costs. Outside the laboratory, a great many patterns in human cultural life depend on the same sort of enlightened tradeoff. Agriculture, for example, would be impossible without delay of gratification, because it requires taking what is often edible food and burying it in the dirt instead of eating it now. That short-term sacrifice is exacerbated by risks of drought, blight, and theft, but throughout most of human history, the sacrifice has generally paid off well in terms of greatly increased yield of food when the crop ripened at the end of summer. Today, most citizens in the developed world are no longer farmers, but delay of gratification is still central to many forms of success in cultural life. Young people may forego taking a job that would pay enough to enable them to afford an apartment, nice clothes and food, and a car, and instead they attend a university where they live amid the chaos and squalor of dormitory life and eat the institutional food served in dining halls. The short-term sacrifices are thus palpable, but they are compensated. In the long run the university degree increases their lifetime earnings by approximately a million dollars.

Costs of Self-regulatory Process

The second cost of self-control is the cost of the internal mechanism and processes that override responses and make self-regulation possible. In that respect, it resembles Freud's (1930) analysis of the superego and guilt, though psychology's understanding of the processes and its costly side effects has come some way since Freud was writing. These costs of self-regulation have been a central focus of the research program with which we are affiliated, and so we furnish here a brief overview.

The idea that self-control requires the expenditure of energy has roots in folk wisdom and the colloquial concept of willpower. Whether folk psychology understood willpower as a limited resource that was subject to depletion is unclear, but there was at least the sense that some form of inner energy or strength was needed to resist temptation and remain on the path of virtue. To be sure, folk theories have had very mixed success in the psychology laboratory, and alternative theories of self-regulation (such as based on skill or computational models) were certainly plausible. These were noted by Baumeister, Heatherton, and Tice (1994) in an early literature review. Those authors concluded that the energy or strength model seemed to fit a smattering of observations better than the alternative theories.

Direct tests of the limited resource theory of self-regulation were first reported by Baumeister, Bratslavsky, Muraven, and Tice (1998) and Muraven, Tice, and Baumeister (1998). They showed that exerting self-control in one sphere led to impaired capacity to regulate one's behavior in another, ostensibly unrelated, sphere. For example, regulating one's emotions while watching an upsetting video clip

caused a significant drop in a test of physical stamina (handgrip). The implication is that a common, limited resource is used for many different exertions of self-control. When the resource was expended by the person in a first act of self-control, less of it remained to enable the person to regulate effectively on the second task.

There are many different situations in which individuals require self-regulatory resources to overcome impulses, habits, and temptations in order to respond in more beneficial and appropriate ways. Because of this, it is not surprising that performance is impaired on a variety of tasks when self-regulatory resources have been depleted. When individuals have their self-regulatory resources lowered by a previous act of regulation, they are more likely to spend impulsively (Vohs & Faber, 2007), to fail at upholding their diets (Kahan, Polivy, & Herman, 2003; Vohs & Heatherton, 2000), and to indulge inappropriate sexual impulses (Gailliot & Baumeister, 2007a), as compared to participants whose resources were not depleted by prior acts of self-regulation. Interpersonally, those with lowered self-regulatory resources are more likely than their non-depleted peers to respond aggressively to provocation (DeWall, Baumeister, Stillman, & Gailliot, 2007; Stucke & Baumeister, 2006), to present themselves in ways that fail to make the desired or optimal impression (Vohs, Baumeister, & Ciarocco, 2005), and to be persuaded by weak arguments (Wheeler, Briñol, and Hermann (2007). Thus, each individual act of regulation temporarily depletes self-regulatory resources, leading to decreased performance in a variety of domains. These impairments in performance reflect one important category of costs of self-regulation: In the aftermath of self-regulation, people's ability to perform effectively in many important spheres, including reasoning, acting appropriately, and dealing effectively with others, is compromised.

How the Cost is Paid

Just what is it that gets depleted? The folk concept of willpower was admittedly merely a metaphor, and the very idea that the self depended on a genuine energy source was considered fairly implausible if not downright absurd when these findings first came out. In fact, Baumeister et al. (1998) used the term "ego depletion" in homage to Freud, because Freud had been one of the last theorists to suggest that the human self depended on energy processes. In the intervening half century, writings about the self had depicted it almost exclusively as a cognitive structure (e.g., Greenwald & Banaji, 1989; Kihlstrom & Cantor, 1984).

In the 1990s, however, the influx of biological thinking into psychological theory made energy models seem more plausible than they had been. Biological processes do involve energy, and indeed life itself can be understood as a matter of energy transformations. Human life depends on frequent ingestion of food, from which the body derives the energy needed for all its activities.

Recent work has begun to suggest that the energy from food is linked to willpower. The mediating processes involve glucose, a chemical typically found in the bloodstream, which serves as the proximal source of energy for much of the body's work. In particular, neurotransmitters in the brain are made from glucose, and insofar as psychological processes are based on the firings of brain cells, one could argue that all psychological activities depend on fuel from glucose. Of particular importance is the fact that some psychological and brain activities consume considerably more glucose than others. Self-regulation might well be one of these biologically expensive forms of psychological activity.

Suggestive links between blood glucose and self-regulation can be found scattered through multiple research literatures, as compiled in a recent review by Gailliot and Baumeister (2007b). For example, performance on the Stroop task, which is a classic test of attention control, has been linked to glucose availability and consumption (Benton, Owens, & Parker, 1994; Fairclough & Houston, 2004), and other tests of attention control, such as dichotic listening and vigilance tasks, show similar covariation with glucose. Having more glucose seems to improve people's abilities to regulate their moods and tolerate frustration (e.g., Benton, Brett, & Brain, 1987; Benton & Owens, 1993). In many studies impulsive crimes and violence have been linked to low glucose and poor glucose tolerance. Alcohol, which is associated with deficits in self-control on almost any behavioral sphere one studies, reduces glucose (e.g., Altura, Altura, Zhang, & Zakhari, 1996; Wang et al., 2000).

Direct laboratory tests of the possible link between glucose depletion and self-regulatory impairments were reported by Gailliot et al. (2007). They found that blood-glucose levels dropped significantly from before to after performing tasks that involved self-regulation, whereas comparable tasks that did not require self-regulation had no such effect on glucose. Furthermore, low levels of blood glucose were associated with subsequent deficits in behavioral self-control, consistent with the view that ego depletion reflects a state of diminished availability of glucose in the bloodstream. Last, the patterns of ego depletion were counteracted by giving participants a dose of glucose.

Recent electroencephalogram (EEG) research suggests that the neurological costs of self-regulation may be incurred in individuals' abilities to nonconsciously monitor for errors in their behaviors (Inzlicht & Gutsell, 2007). Participants were asked to watch an emotional movie and either suppress their emotions or react normally. After the movie, participants completed the Stroop task while their neural activity was recorded. Neurological research has shown that there is a sharp negative voltage following behavior that is thought to reflect preconscious error monitoring (Nieuwenhuis, Ridderinkhof, Blom, Band, & Kok, 2001). This spike is referred to as error related negativity (ERN; Falkenstein, Hohnsbein, Hoorman, & Blanke, 1990; Gehring, Goss, Coles, Meyer, & Donchin, 1993). Participants who had suppressed their emotions showed diminished ERN during the Stroop task compared to participants in the control group. Even more impressive is that the relationship between emotion suppression and Stroop performance was mediated by ERN. This suggests that the preconscious monitoring of errors plays an important role in self-regulation and previous acts of self-control weaken this error monitoring system. In plain terms, one cost of having exerted self-control is that afterward the person will be more prone than usual to make mistakes.

Does ego depletion indicate a state of reduced capability or reduced willingness to exert further self-control? Evidence suggests both (and they may be related). Muraven and Slessareva (2003) showed that providing a motivational incentive to self-regulate despite ego depletion seemed to counteract the impact of depletion—but it left the person that much more depleted. Thus, the incentive did not truly replenish the depleted state. Rather, it appears to have motivated the person to continue spending the diminished resource, resulting in even more severe depletion.

Thus, the present state of evidence indicates that acts of self-control have an immediate and direct cost to the self-regulating person. Some limited resource, apparently involving the blood glucose that serves as fuel for brain and bodily activities, is depleted by effortful self-control. As a result, the person's capability and willingness to exert self-control are temporarily impaired.

Indeed, the costs may go beyond self-control. Recent studies have found that the same resource needed for acts of self-control is also used for decision making (Vohs et al., 2008). After exerting self-control, people become reluctant to make decisions, preferring to avoid or postpone them (Pocheptsaya, Amire, Dhar, & Baumeister, in press). If they do make choices when their resources have been depleted by recent acts of self-control, these decisions tend to follow relatively simple and more error-prone pathways, such as choosing a simple extreme rather than a compromise option and succumbing to irrational heuristic biases (Pocheptsova et al., in press). Glucose likewise appears to be involved in these choices, as shown by the finding that a dose of glucose after self-control can reduce the tendency to follow an irrational short-cut to an easy decision (Masicampo & Baumeister, 2008).

Several studies have also suggested that the same resource used for self-control is used for initiative, which is to say for responding actively rather than passively. The avoidance of decision making noted above (Pocheptsaya et al., in press) is one sign of this. More direct evidence of passivity was provided by Vohs et al. (2008), who assigned participants to perform a visual task and then left the room, after which the equipment obviously malfunctioned. Depleted participants waited longer before taking action to find the experimenter and report the problem. A similar finding was reported by Baumeister et al. (1998), who found that depleted participants were more likely to follow the default option rather than one that required an active response.

Coping with the Costs

Self-regulation is vitally important for effective human functioning and contributes to social, academic, and occupational success. Given that exerting self-control depletes a multiply useful resource and temporarily impairs the person's ability to function, how do people cope with this fact so as to maintain their capacity despite ongoing demands? The challenge is one of managing the limited resource so as to get the best results from it.

One approach to managing limited self-control resources is to reduce the amount of resources a desirable behavior requires by automatizing it. One basic tenant of the limited resource model is that controlled behaviors consume resources whereas automatic behaviors do not. Waking up early to go to the gym may initially leave one depleted but constant repetition will make going to the gym the dominant response. In a daily diary study, participants who were assigned to engage in depleting tasks performed fewer non-habitual behaviors than participants who were not assigned to do depleting tasks. However, there were no differences between conditions on habitual behaviors (Neal & Wood, 2006, as cited in Neal, Wood, & Quinn, 2006). Whether they were desirable or undesirable behaviors, these habits endured in the face of depletion because they no longer required resources.

Another standard response to limited resources is to conserve them (e.g., Hobfoll, 2002). Indeed, one way of looking at all the ego depletion effects is that they represent efforts to conserve a resource that has been only partly depleted, instead of viewing them as signs that the resource has been so thoroughly depleted that nothing can be done until it is replenished. The strength model of self-control compares it to a muscle, and muscular fatigue conforms to the pattern of conservation (e.g., Baumeister, Vohs, & Tice, 2007; Muraven & Baumeister, 2000). That is, athletes or physical workers begin to conserve their remaining strength as soon as they start to become tired, rather than exerting full effort until they reach exhaustion.

Direct evidence for conservation was reported by Muraven, Shmueli, and Burkley (2006). They adapted what had become the standard two-task procedure into a three-task one: a first task depletes the resource (or not, in the control condition), and a second task measures self-control performance, while a third task is anticipated to place further demands on self-regulatory resources. Crucially, participants were told about the third task before they performed the second. Muraven et al. (2006) found that anticipating a third self-control task led to poorer performance on the second, mainly among participants whose resources had been depleted by the first task. Thus, when one's resources have been depleted, one reduces current exertions so as to conserve the resources for upcoming demands. The conservation occurred only when the later task was expected to place demands on self-control, and not when the third task was possibly arduous but not a matter of regulating the self.

Is conservation effective? Muraven et al. (2006) included measures of performance on the third task. Sure enough, the demands and exertions of self-control in the first and second tasks led to poorer performance on the third—but these decrements were mitigated among participants who conserved. That is, by exerting less effort on the middle task, some participants were able to conserve their diminished resources, and these enabled them to perform relatively well on the third task. Participants who exerted more self-control on the second task despite being depleted suffered poorer performance on the third task. These findings strongly support the limited resource model and suggest that people know to conserve their resources—and that conserving them is effective at improving subsequent self-control.

Conservation is clearly a short-term strategy with regard to self-regulatory resources. A long-term strategy would be to increase the resource. The muscle analogy (Baumeister et al., 2007) would suggest frequent acts of self-control may increase the person's strength, just as a muscle becomes stronger as the result of regular exercise.

There is, in fact, some evidence that self-regulatory power can be increased by regular exercises (see Baumeister, Gailliot, DeWall, & Oaten, 2006, for a review). Multiple exercises have been used and proven effective, including correcting one's posture, using one's nondominant hand for minor routine tasks, cleaning up one's speech, modifying one's habits of money use and spending, and taking up an exercise program. These have been shown to reduce susceptibility to depletion on laboratory tasks. In some studies, they also led to improvements in other areas of self-regulation. For example, it is perhaps not surprising that several weeks' worth of regulating one's money usage can result in improvements in saving—but participants who completed the money course also reported that they began to study more regularly and effectively, became more scrupulous about completing household scores, smoked fewer cigarettes, and seemed to have better self-control in other spheres (Oaten & Cheng, 2007). They even reported improvements in healthy eating, which is noteworthy because healthy food tends to be more expensive than junk food, and given that they were concentrating on saving money, one might have expected them to shift toward cheaper (and less healthy) food.

To be sure, the results from research studies aimed at improving self-regulation have not been uniformly effective. In our laboratory, about half the studies have been successful. The basis for the mixed results remains unclear. It appears that self-control can be improved significantly via exercise, and these benefits have been replicated, but they are not yet thoroughly reliable. Further work is needed to

establish what factors moderate their effectiveness and how the gains can be maximized.

Are There Other Costs?

As reviewed earlier, individuals with high trait self-control attain better grades, have more satisfying relationships, and report fewer symptoms of psychopathology than those with low trait self-control. However, is there a cost to being able to resist temptation?

Reduced emotional sensitivity may be considered a cost, though in principle one might also regard it as a benefit. In a recent study by Zabelina, Robinson, and Anicha (2007), individuals were asked to answer the question, "What are you thinking?" on a daily basis for seven days, when they were prompted. In response to this prompt, participants with high self-control were less likely to write about either positive or negative affective states than participants with low-self control. This finding suggests that high self-control dampens affective responding (which could be regarded as either a cost or a benefit!). The same study also showed that individuals high in self-control were perceived as less spontaneous and extraverted than individuals low in self-control. Other research has shown that individuals describe the most self-controlled person they know as significantly less open to experiences than the least self-controlled person that they know (Stillman & Alquist, 2007). Insofar as people like spontaneity, extraversion, and openness to experience high self-control may have some interpersonal costs.

Some possible interpersonal costs of self-control have formed the basis of a research program by Kashdan and his colleagues (e.g., Kashdan, Elhai, & Breen, 2007). Some people (i.e., a subgroup of socially anxious individuals) believe that in their social environment, hedonic and risky indulgence promotes popularity, whereas restraint would reduce it. These people conclude that abandoning self-control is necessary in order for them to make and keep friends, and so they engage in binge drinking, heavy drug use, sexual promiscuity, and possibly other risky behaviors—all apparently in a deliberate and strategic manner.

At a more physiological level, another possible cost has been identified by Segerstrom and Nes (2007). Their findings suggest that exerting self-control increases variability in heart rate. One way of understanding these findings is that the body has several homeostatic mechanisms that help maintain the internal environment, such as by stabilizing heart rate, and that these regulatory processes use some of the same resources needed for effortful self-regulation of behavior. Hence when the resource is depleted, the body's homeostatic maintenance is compromised. Further work might explore whether these effects extend to matters such as immune system functioning. If so, that could explain why some people seem to become more vulnerable to illness when under stress or otherwise facing demands on their limited self-regulatory resources.

Integration of Costs and Benefits

To sum up what we have reviewed thus far, it seems necessary to distinguish trait self-control (as a capacity) from the state associated with current exertions. The costs and benefits are somewhat different when sorted in that way. To be sure, the distinction is imperfect, and trait self-control undoubtedly contributes to the ability to exercise self-control (as a state) on particular occasions.

Trait self-control seems an unmixed blessing. It benefits both individuals and society. People high in trait self-control end up better off in a multitude of ways, as compared to people with low or poor self-control. Society benefits because such people perform fewer antisocial acts (including violent and criminal ones) and because their superior performance contributes more goods, services, and social capital to society. The closest things to downsides of good self-control that we found were mainly from one study (by Zabelina et al., 2007) and were that the reduced emotional lability of people with high self-control entailed lesser reporting of positive emotional reactions (though this was balanced against lesser negative emotional reactions as well), and that other people tended to perceive them as relatively less spontaneous and less extraverted. Even so, it seems dubious to extol spontaneity as a definite advantage of low self-control, because its benefits are likely linked to drawbacks. Spontaneity means responding in unplanned, unpredictable, spur-of-the-moment ways, and self-control presumably evolved in order to enable people to behave in planned, predictable, and consistent ways, which in the long run are advantageous to the individual and socially appealing.

In contrast, current exertions of self-control carry a cost in depleted resources, even as these exertions contribute to pursuing benefits and achieving goals. The depleted resources undermine the person's ability to exert effective self-control subsequently, and may also hamper decision making. Physiological costs of having recently exerted self-control have begun to be identified, including temporarily diminished stocks of glucose (which is the basic energy source for the body's mental and physical activity), variable heart rate, and some compromise of the brain's capacity to monitor for errors.

These costs seem best understood by invoking a limited resource model. The capacity for self-control is based on a single, common resource that is used for a great many different and beneficial acts, and these acts may extend even beyond self-control to encompass decision making, initiative, and possibly other controlled processes. As with any limited resource (e.g., money), spending it on one thing means having less for something else. The conservation studies by Muraven and Slessareva (2003) highlight the dilemma of the limited resource. When the resource has already been somewhat depleted by exertions of self-control on an initial task, people often seek to conserve what is left for possible future demands and opportunities. Spending more of it on a second task entails having that much less left over for a third task. Some people conserve more than others, but this reflects the tradeoff of spending the limited resource on the second versus the third task.

The limitations of the resource present a particular challenge themselves. To negotiate human social life effectively, it may be necessary to make the right choices about where best to expend those limited resources. For example, should one expend one's limited resources to resist fattening food at lunch or conserve them for making important decisions in the afternoon? The obvious irony is that judicious management of the resource likely places further demands on that same resource. That is, the self likely depletes its resources to some extent in deciding where and when to allocate those resources. To be sure, this conclusion remains speculative at present, but it is hard to see why or how this could not be true. Almost certainly, however, these demands must normally be relatively minor, or else the cost of deciding when to exert self-control would undercut the capacity to exert self-control at all and hence wipe out many of its potential benefits.

Concluding Remarks

We have suggested that self-control is largely, even crucially, beneficial and adaptive. In considering its costs, we distinguished between trait and state. The trait capacity for self-control appears to be largely an unmixed blessing. In contrast, the momentary exertion of self-control, even though it is typically used to pursue outcomes that are positively valued by both the person and society, may produce significant costs. These are found in the diminished capacity for further self-control and for performing other psychological acts that depend on the same underlying resource, such as logical reasoning, wise decision making, and initiative.

If the costs of self-control stem from the limited nature of the resource it consumes, why has not evolution endowed human beings with a more abundant resource pool? One can easily speculate that human life would be better and happier if everyone's capacity for self-control were much greater than it is. But such wistful fantasies of limitless strength and virtue do not mesh well with the reality that psychologically beneficial acts are costly in physiological and psychological terms. Although cross-species comparisons of advanced psychological processes are hazardous, it does appear that the human capacity for self-control is already quite a bit more advanced than that of humans' evolutionary forebears. The glass of self-control is thus very much both half full and half empty.

Moreover, crucially, evolution will only favor devoting more of the body's precious energy to advanced psychological processes such as self-control insofar as they contribute to improved survival and reproduction in a competitive environment. The environment in which humans evolved was certainly competitive, but it did not likely contain the vast range of challenges and opportunities for which the modern individual finds self-control useful. Should natural selection continue to function amid modern cultural life so as some day to create a superior version of the human being, it seems likely that one central trait of this superior person would be an (even) greater capacity for self-regulation. Among other benefits, that would solve most of the problems we have found associated with self-regulation, so that even the momentary exertions of self-control could become purely beneficial without apparent downsides. Seen from the present, however, such a Utopian outcome seems extremely remote, and in the very long mean time, people will continue to have to cope with the fact that their capacity for self-regulation remains limited. Still, by managing the limited resource carefully, they can still enjoy the extraordinary benefits that human self-control has afforded to individuals, both in terms of direct benefits to them and indirectly via the facilitation of culture.

References

- Altura, B., Altura, B., Zhang, A., & Zakhari, S. (1996). Effects of alcohol on overall brain metabolism. In H. Begleiter & B. Kissin (Eds.), *The pharmacology of alcohol and alcohol dependence. Alcohol and alcoholism* (pp. 145–180). New York: Oxford University Press.
- Baumeister, R. F. (2008). Free will in scientific psychology. *Perspectives on Psychological Science*, 3, 14–19.
- Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource. *Journal of Personality and Social Psychology*, 74, 1252–1265.

- Baumeister, R. F., Gailliot, M., DeWall, C. N., & Oaten, M. (2006). Self-regulation and personality: How interventions increase regulatory success, and how depletion moderates the effects of traits on behavior. *Journal of Personality*, 74, 1773–1801.
- Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. San Diego, CA: Academic Press.
- Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, 16, 351–355.
- Benton, D., Brett, V., & Brain, P. F. (1987). Glucose improves attention and reaction to frustration in children. *Biological Psychology*, 24, 95–100.
- Benton, D., & Owens, D. (1993). Is raised blood glucose associated with the relief of tension. *Journal of Psychosomatic Research*, 37, 1–13.
- Benton, D., Owens, D. S., & Parker, P. Y. (1994). Blood glucose influences memory and attention in young adults. *Neuropsychologia*, 32, 595–607.
- Bloom, B. L., White, S. W., & Asher, S. J. (1979). Marital disruption as a stressful life event. In G. Levinger & O. C. Moles (Eds.), *Divorce and separation: Context, causes, and consequences* (pp. 184–200). New York: Basic Books.
- Cox, S. P. (2000). *Leader character: A model of personality and moral development*. Doctoral dissertation, University of Tulsa.
- DeLongis, A., Folkman, S., & Lazarus, R. S. (1988). The impact of daily stress on health and mood: Psychological and social resources as mediators. *Journal of Personality and Social Psychology*, 54, 486–495.
- Dennett, D. C. (2003). *Freedom evolves*. New York: Viking/Penguin.
- DeWall, C. N., Baumeister, R. F., Stillman, T. F., & Gailliot, M. T. (2007). Violence restrained: Effects of self-regulation and its depletion on aggression. *Journal of Experimental Social Psychology*, 43, 62–76.
- Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline out-does IQ in predicting academic performance of adolescents. *Psychological Science*, 16, 939–944.
- Fairclough, S. H., & Houston, K. (2004). A metabolic measure of mental effort. *Biological Psychology*, 66, 177–190.
- Falkenstein, M., Hohnsbein, J., Hoorman, J., & Blanke, L. (1990). Effects of errors in choice reaction tasks on the ERP under focused and divided attention. In C. H. M. Brunia, A. W. K. Gaillard, & A. Kok (Eds.), *Psychophysiological brain research* (pp. 192–195). Tilburg, The Netherlands: Tilburg University Press.
- Finkel, E. J., & Campbell, W. K. (2001). Self-control and accommodation in close relationships: An interdependence analysis. *Journal of Personality and Social Psychology*, 81, 263–277.
- Freud, S. (1930). *Civilization audits discontents* (J. Riviere Trans.). London: Hogarth.
- Gailliot, M. T., & Baumeister, R. F. (2007a). Self-regulation and sexual restraint: Dispositionally and temporarily poor self-regulatory abilities contribute to failures at restraining sexual behavior. *Personality and Social Psychology Bulletin*, 33, 173–186.
- Gailliot, M. T., & Baumeister, R. F. (2007b). The physiology of willpower: Linking blood glucose to self-control. *Personality and Social Psychology Review*, 11, 303–327.
- Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., et al. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology*, 92, 325–336.
- Gehring, W. J., Goss, B., Coles, M. G., Meyer, D. E., & Donchin, E. (1993). A neural system for error detection and compensation. *Psychological Science*, 4, 385–390.
- Goodwin, J. S., Hunt, W. C., Key, C. R., & Samet, J. M. (1987). The effect of marital status on stage, treatment, and survival of cancer patients. *Journal of the American Medical Association*, 258, 3125–3130.
- Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.
- Greenwald, A. G., & Banaji, M. R. (1989). The self as a memory system: Powerful, but ordinary. *Journal of Personality and Social Psychology*, 57, 4–54.

- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology*, 6, 307–324.
- Inzlicht, M., & Gutsell, J. N. (2007). Running on empty: Neural signals for self-control failure. *Psychological Science*, 18, 933–937.
- Kahan, D., Polivy, J., & Herman, C. P. (2003). Conformity and dietary disinhibition: A test of the ego-strength model of self-regulation. *International Journal of Eating Disorders*, 32, 165–171.
- Kashdan, T. B., Elhai, J. D., & Breen, W. E. (2007). Social anxiety and disinhibition: An analysis of curiosity and social rank appraisals, approach-avoidance conflicts, and disruptive risk-taking behavior. *Journal of Anxiety Disorders*, 22, 925–939.
- Kihlstrom, J. F., & Cantor, N. (1984). Mental representations of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 17, pp. 1–47). New York: Academic Press.
- Lynch, J. J. (1979). *The broken heart: The medical consequences of loneliness*. New York: Basic Books.
- Masicampo, E. J., & Baumeister, R. F. (2008). Toward a physiology of dual-process reasoning and judgment: Lemonade, willpower, and effortful rule-based analysis. *Psychological Science*, 19, 255–260.
- Matthews, J., Youman, K., Stuewig, J., & Tangney, J. (2007, November). *Reliability and validity of the Brief Self-Control Scale among incarcerated offenders*. Paper presented at the annual meeting of the American Society of Criminology, Atlanta, GA, USA.
- Mischel, W. (1974). Processes in delay of gratification. *Advances in Experimental Social Psychology*, 7, 249–292.
- Mischel, W. (1996). From good intentions to willpower. In P. Gollwitzer & J. Bargh (Eds.), *The psychology of action* (pp. 197–218). New York: Guilford Press.
- Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology*, 54, 687–696.
- Muraven, M. R., & Baumeister, R. E. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle. *Psychological Bulletin*, 126, 247–259.
- Muraven, M., Shmueli, D., & Burkley, E. (2006). Conserving self-control strength. *Journal of Personality and Social Psychology*, 91, 524–537.
- Muraven, M., & Slessareva, E. (2003). Mechanisms of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin*, 29, 894–906.
- Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, 74, 774–789.
- Neal, D. T., Wood, W., & Quinn, J. M. (2006). Habits—A repeat performance. *Current Directions in Psychological Science*, 15, 198–202.
- Nieuwenhuis, S., Ridderinkhof, K. R., Blom, J., Band, G. P. H., & Kok, A. (2001). Error-related brain potentials are differentially related to awareness of response errors: Evidence from an antisaccade task. *Psychophysiology*, 38, 752–760.
- Oaten, M., & Cheng, K. (2007). Improvements in self-control from financial monitoring. *Journal of Economic Psychology*, 28, 487–501.
- Pocheptsova, A., Amir, O., Dhar, R., & Baumeister, R. F. (in press). Deciding without resources: Psychological depletion and choice in context. *Journal of Marketing Research*.
- Pratt, T. C., & Cullen, F. T. (2000). The empirical status of Gottfredson and Hirschi's general theory of crime: A meta-analysis. *Criminology*, 38, 931–964.
- Roberts, B. W., Walton, K., & Bogg, T. (2005). Conscientiousness and health across the life course. *Review of General Psychology*, 9, 156–168.
- Rothbaum, F., Weisz, J. R., & Snyder, S. S. (1982). Changing the world and changing the self: A two-process model of perceived control. *Journal of Personality and Social Psychology*, 42, 5–37.
- Rothberg, J. M., & Jones, F. D. (1987). Suicide in the US army: Epidemiological and periodic aspects. *Suicide and Life-Threatening Behavior*, 17, 119–132.

- Rusbult, C. E., Verette, J., Whitney, G. A., Slovik, L. F., & Lipkus, I. (1991). Accommodation processes in close relationships: Theory and preliminary empirical evidence. *Journal of Personality and Social Psychology*, 60, 53–78.
- Sampson, R. J., & Laub, J. H. (1993). *Crime in the making: Pathways and turning points through life*. Cambridge, MA: Harvard University Press.
- Segerstrom, S. C., & Nes, L. S. (2007). Heart rate variability reflects self-regulatory strength, effort, and fatigue. *Psychological Science*, 18, 275–281.
- Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, 26, 978–986.
- Smith, S., & Baumeister, R. F. (2006). *Trait self-control, SAT score, and transcript versus self-reported grade point average*. Unpublished manuscript, Florida State University.
- Stillman, T. F., & Alquist, J. L. (2007). *The perception of five-factor differences in unusual acquaintances*. Manuscript in preparation.
- Stucke, T. S., & Baumeister, R. F. (2006). Ego depletion and aggressive behavior: Is the inhibition of aggression a limited resource? *European Journal of Social Psychology*, 36, 1–13.
- Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, 72, 271–324.
- Vohs, K. D., Baumeister, R. F., & Ciarocco, N. J. (2005). Self-regulation and self-presentation: Regulatory resource depletion impairs impression management and effortful self-presentation depletes regulatory resources. *Journal of Personality and Social Psychology*, 88, 632–657.
- Vohs, K. D., Baumeister, R. F., Schmeichel, B. J., Twenge, J. M., Nelson, N. M., & Tice, D. M. (2008). Making choices impairs subsequent self-control: A limited resource account of decision making. *Journal of Personality and Social Psychology*, 94, 883–898.
- Vohs, K. D., & Faber, R. J. (2007). Spent resources: Self-regulatory resource availability affects impulse buying. *Journal of Consumer Research*, 33, 537–547.
- Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science*, 11, 249–254.
- Wang, G., Volkow, N. D., Franceschi, D., Fowler, J. S., Thanos, P. K., & Panayotis, K. (2000). Regional brain metabolism during alcohol intoxication: Alcohol effects on the fetus, brain, liver, and other organ systems. *Alcoholism: Clinical & Experimental Research*, 24, 822–829.
- Wheeler, S. C., Briñol, P., & Hermann, A. D. (2007). Resistance to persuasion as self-regulation: Ego-depletion and its effects on attitude changes processes. *Journal of Experimental Social Psychology*, 43, 150–156.
- Wolfe, R. N., & Johnson, S. D. (1995). Personality as a predictor of college performance. *Educational and Psychological Measurement*, 55, 177–185.
- Zabelina, D. L., Robinson, M. D., & Anicha, C. L. (2007). The psychological tradeoffs of self-control: A multi-method investigation. *Personality and Individual Differences*, 43, 463–473.