

**Self-Regulation and the Executive Function: The Self as Controlling Agent**

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A man squanders his money on gambling. A woman beats her child. A drunk driver causes a crash that destroys three cars and injures several people. A student postpones studying until the night before the test and gets a bad grade. A young couple engages in unprotected sex and creates an unwanted pregnancy. A delinquent shoots an acquaintance during an argument. A dieter eats seven donuts and a pint of ice cream at one sitting. An athlete trains off and on for a year without any improvement in performance. A girl breaks a promise and betrays a friend's confidence. An old man again neglects to take his daily dose of insulin and goes into diabetic shock.

What these disparate events have in common is failure of self-regulation. When self-regulation works well, it enables people to alter their behavior so as to conform to rules, plans, promises, ideals, and other standards. When it fails, any one of a broad range of human problems and misfortunes can arise. Self-regulation is thus a key to success in human life and, when it falls short, a contributing cause that helps explain many forms of human suffering.

In this chapter, we provide an overview of the psychology of self-regulation. We shall review what it is, its importance, how it functions, how it fits into the broader context of human psychological functioning, and what some of its principal applications are.

### **Importance of Self-Regulation**

To appreciate the importance of self-regulation, it is necessary to consider both practical and theoretical implications. The practical ones were anticipated in the opening paragraph of this chapter, but they can be stated more systematically as follows: Most of the social and personal problems that afflict people in modern western society have some element of self-regulatory failure at their root. This is not to say that better self-regulation would alone solve all society's problems — but it would probably go a long way toward that end.

Perhaps the problems that most obviously revolve around self-control failure are those of impulse control. Drug and alcohol addiction has multiple determinants, but to

the extent that people can regulate their consumption of these problematic substances, they will be less vulnerable to addiction. Many of the problems associated with sexual behavior are fully preventable, if only people would control themselves sufficiently to minimize risks. These include the paradoxical epidemic of unwanted and out-of-wedlock pregnancy (paradoxical because those problems have proliferated in recent decades despite the concomitant, historically unprecedented availability of highly effective contraceptive methods), as well as epidemics of sexually transmitted diseases. Eating disorders likewise have remained problematic for young women, and obesity has been officially declared a national and even international health problem (the so-called 'globesity epidemic'), as people find themselves unable to regulate the most basic human function of eating.

Self-regulation failure is less obvious but perhaps no less central to many other problems. A landmark work of criminology concluded that deficient self-control is the single most important key to understanding criminality (Gottfredson & Hirschi, 1990). Subsequent work testing this hypothesis has confirmed the central importance of low self-control, even if it is not the only key predictor. Apparently, people become criminal because they are poor at regulating their antisocial impulses and hence violate many of society's formal (and informal) rules. This pattern helps explain many hitherto baffling aspects of criminality, including the so-called versatility of criminals (i.e., most criminals are arrested repeatedly but for different crimes).

Money problems are also often linked to self-regulatory problems. Americans often fail to save money, and the low rate of savings is a problem both for individuals, who find themselves unable to cope with unexpected financial needs, and for the society and economy as a whole, for which the low reservoir of savings creates a lack of available capital. Many people earn good incomes but suffer from heavy debt loads, often attributable to unregulated use of credit cards.

Underachievement in school and work likewise has a dimension of poor self-control. Procrastination is now generally regarded as both a cause of poor performance and a reflection of poor self-regulation, and so it is one dimension of underachievement.

Poor self-regulation can contribute in other ways to underachievement, such as by making people less willing to persist in the face of failure, less able to choose effective performance settings, less able to set and reach goals, and less able to sustain effort over a period of time.

Another way of appreciating the benefits of self-regulation is to compare the lives of people with good versus bad self-control. Although such comparisons are inherently correlational, and as a result it is in principle possible that self-control is the result rather than the cause of such differences, most theorists assume that personality traits precede behaviors and are therefore more likely the cause than the consequence. A recent set of studies by Tangney, Baumeister, and Boone (2004) included a trait measure of self-control and then examined multiple indices of effective functioning. People with high scores on self-control were better off than those with low self-control on virtually all of them. They had better grades in school. They had better relationships with family and friends: less conflict and more cohesion. They were better able to understand others and scored higher on empathy. They showed better psychological adjustment, including fewer psychological problems, fewer signs of serious psychopathology, and higher self-esteem. Not surprisingly, they reported fewer impulse control problems, such as overeating and problem drinking. They had healthier emotional lives, such as being better at managing their anger, and being more prone to guilt than shame. They had less juvenile delinquency.

Other work using the same scale has confirmed the benefits. Supervisors who score higher in self-control are rated more favorably (e.g., as fairer) by their subordinates (Cox, 2000). People with high self-control make better relationship partners, especially because they are better able to adapt to partners (Finkel & Campbell, 2001; Tangney et al., 2004; Vohs & Baumeister, 2004).

Probably the most dramatic and conclusive evidence of the long-term benefits of self-regulation comes from the research by Walter Mischel and his colleagues. Mischel was a pioneer of self-regulation research because of his studies on delay of gratification, beginning in the 1960s. Self-regulation is required to override the impulse

to seek immediate gratification in order to obtain greater but delayed rewards. His research group then followed up the early studies, which were typically done with young children, to see how they fared on into adulthood. Four- and five-year olds who were able to resist the temptation of one cookie in order to eat two cookies a short while later grew up to earn better marks on the SAT, to be rated by others as rational and socially competent, and to cope with frustration and stress better than those kids who were relatively unable to resist the tempting cookie at a young age. Thus, effective self-regulation can be recognized as an important key to success in life (see Mischel & Ayduk, 2004).

If practical benefits are not enough, however, self-regulation can also be recognized as important based on its theoretical implications. It is an important key for understanding what the human self is and how it operates. An analysis of psychological and behavioral processes is inadequate without it. Perhaps the emergence of self-regulation is one of the central steps in human evolution and a crucial aspect of human nature — one of the traits that most distinguishes the human psyche from the majority of other life forms on this planet. These implications cannot be easily summarized, however, and certainly not until the theoretical context and inner processes of self-regulation have been more thoroughly elucidated. In the coming sections, we shall attempt to do that. First, however, some definitions are required.

### **Definitions**

Self-regulation refers to the self altering its own responses or inner states. Typically this takes the form of overriding one response or behavior and replacing it with a less common but more desired response. For example, when a dedicated smoker has an urge to smoke but does not then light up a cigarette, he self-regulates his own impulses. Self-regulation also includes the ability to delay gratification, such as when a child overrides the desire to eat the cookie on her plate and waits instead for the two in the oven.

Self-regulation is one the self's major executive functions. The executive function of the self refers to its active, intentional aspects (see Baumeister, 1998; Gazzaniga,

Ivry, & Mangun, 1998) and may be thought of as that part of the self which is ultimately responsible for the actions of the individual. The other major executive function of the self is choice. Not only may a self initiate behavior or control it, but a self also is responsible for deliberating and making choices from among the universe of possible options. As we shall see, choice and self-regulation are intertwined, and they often work in concert to achieve novelty and diversity in human behavior.

Technically speaking, a self does not regulate itself directly, but it may control behaviors, feelings, and thoughts that comprise it. In this sense, self-regulation refers to the regulation of processes *by* the self. Regulation *of* the self also falls under the rubric of self-regulation, but note that this may mean the regulating is done by something (or someone) else. For example, when otherwise quite different people go to the movie theater, they tend to behave in similar ways. They sit quietly, they occasionally whisper, and they pay attention to the action on the screen. Most of this behavior occurs without much in the way of active self-regulation, although to a naïve observer it may appear that the movie-goers are inhibiting their normal behavior. Instead, it is likely that the context – the movie theater, the presence of other movie-goers, the start of the movie – triggers behavior directed toward watching the movie (e.g., Schank & Abelson, 1977). Thus, the environment surrounding the self is also a powerful shaper of behavior, one that occasionally reduces the necessity of active regulation *by* the self. Thus, although self-regulation has typically implied regulation of behavior by the self in pursuit of a conscious intention or purpose, some forms of self-regulation occur without conscious awareness or active intervention by the self.

Finally, our view of self-regulation is consonant with the notion of secondary control derived from a dual-process view of control (see Rothbaum, Weisz, & Snyder, 1982). According to this view, people strive to achieve a better ‘fit’ with their environment using either primary or secondary control strategies. Primary control involves attempts to change the world to accommodate the self, such as by donating to political candidates in order to influence policy decisions in one’s favor. Secondary control strategies refer to attempts to change the self in order to fit the world, such as by

regulating one's own actions so as not to violate current policy or law. Given the difficulties inherent in changing the world to fit one's self, secondary control probably represents the more common and more consistently successful strategy of achieving harmony between self and world.

### **BROADER CONTEXT**

We said earlier that the theoretical importance of self-regulation can only be appreciated within a broader perspective of relevant contexts and concepts. In this section, we seek to describe the place and importance of self-regulation amid human psychological functioning.

#### **The Self**

Self-regulation is one important function of the human self and perhaps a significant dimension of its *raison d'être*. In this, it is not simply one of many functions, but one of a select few that help define the self. Higgins (1996) spoke of the "sovereignty of self-regulation," referring to its pre-eminent importance as compared with many of the other everyday activities of the self. Self theory is incomplete without an account of self-regulation.

The activities and functions of the self, as well as the accumulated knowledge and understanding arising from research on the self, can be broadly grouped according to three main dimensions (Baumeister, 1998). These are presumably based on three basic phenomena that give rise to selfhood. The first is reflexive awareness: Consciousness can be directed toward its source, so that just as people become aware of and learn about the world, they can also become aware of and learn about themselves. The eventual upshot is a body of knowledge and belief about the self, often called the self-concept. Without this, a self would be inconceivable.

Second, the self is used to relate to others. People do not in fact develop elaborate self-concepts simply by contemplating themselves or reflecting on what they have done. Instead, they come to know themselves by interacting with others. Moreover, interpersonal relatedness is not just a root of self-knowledge, but an important goal of most human functioning. Human beings essentially survive and

reproduce by means of their interpersonal connections. The “need to belong” is one of the most powerful and pervasive human motivations (Baumeister & Leary, 1995), probably because evolution has designed us to achieve our biological successes through membership in groups and relationships. Throughout human evolutionary history, lone wolves have been few and far between, and they generally were less likely to pass along their genes than their more gregarious peers. Thus, the self is also a dynamic tool for connecting with others.

The third aspect of the self may be called its executive function, though it is also sometimes called the “agent” or “agentic aspect.” The first aspect of self was a knower and a known, the second a believer or member, but this third aspect is a doer. By means of its executive function, the self exerts control over its environment (including the social environment of other people), makes decisions and choices, and also regulates itself.

Self-regulation should thus be understood in connection with the self’s executive function, though it also has some relevance to self-knowledge and to interpersonal belonging. The executive function essentially does two things: it controls the self and controls the environment. Self-regulation is loosely related to decision-making and choosing. We shall review research showing that self-control is directly affected by making decisions, even if the decision-making is on something that has no apparent relation to the focus of self-control. Conversely, exercises in self-regulation have effects on decision-making. To foreshadow, we find that making choices and exerting self-control draw on a common, limited resource, and so doing either one of them temporarily reduces one’s effectiveness at the other. The connection between the two may shed light on one of the most enduring questions about human nature, namely free will. We now turn to that.

### **Free Will**

The magazine *The Economist* is fond of quoting Ronald Reagan’s surprisingly apt characterization of an economist as someone who sees something that works in practice and wonders whether it will work in theory. In our view, this captures the



approach toward choice and free will in psychology. All around us, every day, we see people facing choices in which multiple options are really viable and possible, and they exercise some sort of strength or power to make themselves select among them. Yet, in order to be good scientists, many psychologists think they must believe that every event is caused and that the apparent exercise of choice cannot be real. And so psychologists reject the evidence of our senses and our personal experience in order to insist that people are not really choosing. The outcome of each decision must have been the only outcome that was ever really possible.

Setting metaphysics aside, let us approach the question from an evolutionary perspective (Baumeister, 2005; Dennett, 2003). If free will exists in any sense, it is almost certainly the result of evolution, and it may therefore be more advanced in human beings than in other species. What sense of free will would produce gains in terms of survival and reproduction? We (along with Baumeister, 2005, Searle, 2001, and in some respects, Dennett, 2003) can suggest two.

The first of these is rational choice. The evolution of cognition is intricately linked to the evolution of choosing, in that organisms became more capable of selecting among behavioral options and modifying their behavior based on appraisal of their environment (Tomasello & Call, 1997). An animal that could alter its behavior so as to find more food or avoid newly arising dangers would survive and reproduce better than an animal that could not.

Most social sciences currently have a significant contingent of researchers whose research is based on a rational choice model. That is, they assume that people appraise their options and choose on the basis of what will further their self-interest in the long or short term. Rational analysis, which requires logical assessment (such as cost-benefit analyses) of possible outcomes, is assumed to underlie most of the decisions people make about whom to vote for (in political science) or how they invest their money (in economics). Rational analysis is a distinctively human process: As far as research as shown, no other animals engage in rational analysis, though they can make

somewhat sophisticated assessments of immediate situational choices (Tomasello & Call, 1997).

Rationality, however, presupposes free will, at least in some sense. As Searle (2001) has pointed out, rational analysis is useless without free will. That is, there is no point in being able to use logic to figure out the best thing to do — if you cannot then actually do it. At best, the human capacity for logical thought would enable people to think about why what they are doing is foolish or self-defeating. If evolution created free will, it was most likely for the sake of being able to do what logic chose as the most profitable course of action. Self-regulation is the second form of free will, if rationality is the first (and we concede that the two may be intertwined). The capacity to alter one's behavior so as to maximize situational payoffs, achieve long-term gains, and conform to meaningful (even abstract) standards, is also highly adaptive. From an evolutionary or biological standpoint, the capacity to override an initial response and substitute another response is an immense step forward and can be powerfully adaptive. This brings up perhaps the broadest context of all.

### **Cultural Animals**

One of us has recently argued that an adequate explanation of human psychological functioning requires a re-thinking of the nature-nurture debate that has defined social sciences' ultimate explanations of human nature for decades. The two opponents in the perennial debate are nature and culture. Nature, as represented by evolutionary psychology, emphasizes similarities, specifically similarities between humans and other animals. Culture, as represented by cultural psychology, focuses on differences, especially differences among cultures.

In contrast, Baumeister (2005) proposes that we also attend to evolutionary differences and cultural similarities. That is, in what sense are humans different from other animals, and in what respects are all or most cultures similar? Crucially, Baumeister (2005) proposes that these are linked — that what all cultures have in common is also what differentiates humans from other animals. By this reasoning, the key to human nature is that evolution created us to sustain culture, in the sense of an

organized network of relationships that makes the totality of its members more than the sum of its parts. Culture is the central biological strategy of human beings and the basic source of the success of the human species.

In order for human beings to become cultural animals, humans had to evolve to have multiple capabilities. These include language, theory of mind, reasoning — and, in some sense, free will.

Self-regulation, we think, is the evolutionary root of free will. Rational choice is the main rival for that claim. As we shall show, however, self-regulation and rational decision-making draw upon a common resource, which suggests these did not evolve as separate mechanisms. Rather, the common resource suggests that evolution created that resource for one of them, and human beings enjoy the second as a by-product (in biological terms, a spandrel). The question is therefore whether self-regulation or rational choice was the first to appear and was therefore the driving force.

We think self-regulation was more likely the first to appear and therefore deserves priority in the evolutionary analysis. We freely admit that this is mere educated guesswork, and we are willing to revise our assessment if contrary evidence (i.e., that rational choice preceded self-regulation) emerges. Let us however present the basis for our assumption.

Baumeister (2005) distinguishes social animals from cultural animals. It has become something of a truism in social psychology that human beings are social animals (Aronson, 1995). They are. But in no sense are they the only social animals — wolves, zebras, even ants are social animals. Humans may not even be the most social animals. We are however the most, and arguably the only cultural animals. The evidence of culture in other species is limited, and in no sense is any other species as fundamentally cultural as we are. Frans de Waal (2001a, 2001b), one of the most passionate and persuasive advocates of culture in other species, readily concedes that no nonhuman culture remotely approaches the extent of human culture. Although other animals do qualify as cultural in multiple respects, these reflect isolated adaptations that capitalize in a very limited manner on the powerful biological benefits that culture can

offer. In contrast, humans are thoroughly cultural, to the extent that human life is almost unimaginable without culture. Put another way, other animals occasionally dabble in culture, whereas human beings rely indispensably on culture for all our survival and reproduction. Among the six billion humans alive today on the planet, hardly any survive and reproduce independently of their culture.

The distinction between social and cultural animals is therefore crucial. Being social involves coordinated action between conspecifics. Being cultural depends on use of meanings to organize collective action. Social hunters may swarm, working together to achieve what none could do alone, but cultural hunters employ division of labor so as to benefit from expertise and generate systemic benefits. Social animals copy each other, thereby benefiting from one another's adaptive actions, but cultural animals can transmit knowledge from one generation to another. Thus, a pack of wolves today, though undeniably social, lives largely the same as a pack of wolves did ten thousand years ago, with no accumulation of knowledge or progressive improvement of techniques and technology, let alone redefinition of gender roles or organizational structures. In contrast, human life has changed drastically and dramatically even just in the past century, and less than 1% of the human population lives like its ancestors of ten thousand years ago.

To our (admittedly speculative) view, self-regulation was already important for social animals, whereas rational choice is limited to cultural animals. Therefore, if one of those deserves priority in evolutionary analysis, it should be self-regulation. Self-regulation is beneficial for social life. The ability to override one response, so as to substitute a more adaptive alternative, would be helpful to merely social (i.e., not cultural) animals. As one example, if the alpha male dictates that certain mates or certain foods should be reserved for him alone, then other males would benefit by being able to inhibit their impulses to pursue those gratifications for themselves. Pursuing them would lead to severe physical punishment and possibly expulsion from the group (if not death). Rational analysis here is irrelevant. The rules that operate in social groups of the biological relatives of humankind require self-regulation but not rationality,

because they depend on the immediate stimulus environment. If the alpha male is absent, his rules can be flouted: One can eat his favored food or perhaps even copulate with his favored mates. We think that nonhuman primates only follow rules when there is the prospect of immediate punishment. In contrast, human beings follow rules even in the absence of any visible enforcers. Such behavior would be unknown and incomprehensible to merely social animals, who mainly follow rules enforced by powerful others who are present and ready to enforce them immediately.

In contrast, rationality is reserved to cultural animals, who can use meaning and language and abstract reasoning to dictate the optimal course of action. Social animals without language cannot exploit the power of reasoning, for the most part, because logical reasoning operates within the rules of meaning which require language to understand and process. To be sure, logical reasoning may in some respects be even more powerfully adaptive than self-regulation, because choices can in principle be made on the most optimal and hence adaptive basis. Still, insofar as self-regulation arose earlier and is more basic than rationality, rational choice may have been a side effect (spandrel). The resource needed for both self-regulation and rationality was selected by evolution first to serve the need for self-regulation, and then it was applied to enable full rational choice.

If we abandon the absurd requirement proposed by some opponents of free will that free will should be for the sake of purely random action, and if we assume instead that free will evolved to promote adaptive actions and choices, then we can discern the themes that are in common between self-regulation and adaptation. Self-regulation is vital for social animals because it enables them to match their behavior to externally dictated standards, such as rules imposed by the alpha male. Rational choice entails that individuals can work out for themselves (by logical analysis) standards and rules, and so rational behavior enables people to alter their behavior so as to conform to standards that they themselves have constructed. It is thus a more advanced stage of free will, in the sense that conforming to one's own standards entails greater autonomy than conforming to someone else's rules. Psychologically, the same mechanism may be

involved in self-regulation and rational choice, even if rational choice represents a philosophically more advanced purpose. But both are highly adaptive.

### **BASIC THEORETICAL ISSUES**

Having explicated the theoretical context of self-regulation, we turn now to consider how it operates. We shall first survey several central or controversial theoretical issues and assumptions surrounding self-regulation. Then we turn to consider the three essential components of self-regulation, namely commitment to standards, monitoring of relevant behavior, and the capacity for overriding responses and altering behavior.

#### **Irresistible Impulses or Acquiescence?**

In everyday life, people seem to have a ready explanation for failures at self-control: “I couldn’t resist.” The implication is that certain impulses are irresistible, and so they overwhelm the powers of the self. This view depicts self-control as a struggle between the strength of the impulse and the strength of the self, and whether the person resists temptation depends on the strength of the impulse. Somehow, apparently, neither nature nor nurture has provided people with strong enough powers to resist many of the temptations they encounter, or so they say.

While reviewing the research literature on self-regulation, Baumeister, Heatherton, and Tice (1994) became increasingly skeptical of the doctrine of irresistible impulses. To be sure, there are some truly irresistible impulses. For example, the urge to go to sleep, stop standing up, or urinate can eventually become so overwhelming that no amount of self-regulatory power can restrain it. But these may be exceptions. When a shopper returns home and explains to a disgruntled mate that the lovely but overpriced sweater had to be purchased, wreaking havoc on the family budget, because “I just couldn’t resist,” the mate may justifiably think this irresistibility is not on a par with those unstoppable biological urges. Likewise, when jurors hear a defendant claim that he or she committed the crime because his or her anger created an irresistible urge to

kill the victim, they are probably justified in thinking that the defendant ought to have been able to resist that violent impulse.

There are empirical signs that so-called irresistible impulses may be resistible after all. Peele (1989) noted that addiction, which is commonly understood to cause irresistible cravings, is much less compelling than often surmised. For example, many American soldiers became addicted to heroin during the Vietnam War but then seemingly easily gave up heroin when they returned home. Even more surprisingly, others were able to use heroin occasionally after returning to the United States without resuming their addiction, contradicting the common view that a recovered addict is in constant danger of resuming full addiction if he or she gets any small amount of the addictive substance. Many heroin addicts may experience their cravings as irresistible, but this is perhaps attributable to their own chronic weakness of will rather than anything in the nature of heroin itself.

Converging evidence comes from studies of people who suffer from Obsessive Compulsive Disorder (OCD). The public may assume that obsessive thoughts are somehow unstoppable, but interviews with these individuals tend to yield the pattern that they attribute their problems to weakness of self and will rather than to any overwhelming power of the thoughts (Reed, 1985). Indeed, successful treatment of OCD is barely conceivable without acknowledging the person's capacity to alter their thoughts.

A similar observation comes from a very different source, namely violent criminals. Douglas (1996) rejected the view that serial killers and other brutal criminals are driven by unstoppable impulses to commit their crimes. He observed that he and his colleagues had investigated hundreds of such crimes by many different individuals, yet no such crime was ever committed in the presence of a police officer. Police officers are found in many places, perhaps especially in the sort of location where criminals pass by, and so the odds are good that sometimes police officers would be present when a violent killer gets an irresistible impulse to commit violence. The fact that no crimes take place under such circumstances suggests that these impulses are somewhat resistible

after all.

Cultures can certainly help individuals perceive some impulses as irresistible, but this may be more a matter of convention than of recognizing reality. One famous example of culturally sanctioned loss of control was the pattern of “running amok,” observed in the Malay of the Indian Archipelago. According to the local customs, young men who felt they had been treated unfairly or offended might lose control and go on a violent rampage, doing damage to property and even to other people. These rampages were strongly rooted in the belief that under those circumstances people could not possibly restrain themselves. One consequence was that such rampages were not punished or only lightly punished, which seems reasonable given the assumption that the individual could not have stopped himself from the violent and destructive acts. However, when the British colonized that area, they took a dim view of running amok and began punishing men who did it. The practice diminished with surprising rapidity indicating that it had been more controllable than people thought all along.

The “gun to the head” test was proposed by Baumeister et al. (1994; Baumeister & Heatherton, 1996) as a way of distinguishing the truly irresistible impulses from the more resistible ones. If an impulse is truly irresistible, then you will act on it even if someone with a gun were threatening to shoot you if you act that way. The examples we listed above, such as sleep, sitting or lying down, and urinating, all pass this test: Eventually the person will perform those acts even if threatened with imminent death. But buying the expensive sweater or committing the crime would probably turn out to be resistible (see Pervin, 1996).

The implication is that most undesirable thoughts and actions are probably far more resistible than people are likely to admit. To understand failures at self-regulation, therefore, we cannot simply invoke the commonsense model of powerful urges overwhelming the self. Rather, the person may acquiesce in yielding to temptation. The shopper could resist the sweater but somehow opts not to do so.

### **What is Controllable?**

The previous section suggests that many impulses are more controllable than



some people may admit. The human capacity for controlled processing is impressive, but it is certainly limited. Hence it becomes necessary to distinguish what is controllable from what is not.

In the 1970s and 1980s, psychology was heavily influenced by the distinction between automatic and controlled processes. This simple dichotomy has however evaporated with the accumulation of data (e.g., Bargh, 1994). Most relevant to the present analysis is the necessity to invoke a series of processes that might normally be automatic but that could potentially be controlled. These are thus ripe for self-regulation, whereas the hard-core uncontrollable processes are not.

Self-knowledge thus becomes an important resource for effective self-regulation (Higgins, 1996). It is helpful for people to know what they can versus cannot change about themselves. The more extensive and accurate that self-knowledge is, the more people can profitably alter the controllable responses and avoid wasting their time trying to change unchangeable things. Seligman (1994), for example, has written a book attempting to dispel myths about the controllability of some responses and the uncontrollability of others.

Much of self-regulation is often subsumed under the term “impulse control,” but impulse control may be a misnomer. Most impulses are automatic responses and cannot be prevented from arising. Strictly speaking, a person with so-called good impulse control does not really control the impulse itself but rather the behavior that would follow from it. Priests who live up to the Catholic Christian ideal of celibacy, for example, do not genuinely prevent themselves from having sexual desire. Rather, they experience desire, but they refrain from acting on it and seeking sexual activity (see Sipe, 1995).

Emotion is an important category of largely uncontrollable responses. That is, people cannot generally create or terminate an emotional state by act of will. Effective affect regulation is possible, but mostly by means of indirect strategies. For example, an angry person may not be able to exert control over the emotion directly, but by distracting oneself, or by reframing the issue so as to interpret the situation in less upsetting terms,

or by exercising to the point that one grows tired and the arousal dissipates, the person can possibly help the anger to dissipate. Someone with a false belief in the controllability of the emotion itself would thus be less effective at escaping the anger than someone who correctly appreciated the need to focus on controllable things (such as how one thinks, or whether to undertake vigorous exercise) and hence used those to exert indirect influence over the emotion.

**Lapse-Activated Patterns**

Lapse-activated responses refer to a class of behaviors that come into play after an initial (possibly quite minor) failure of self-control. Marlatt (e.g., Marlatt & Gordon, 1985) is one of the most influential researchers into lapse-activated responses. He documented an abstinence violation effect among problem drinkers. Once such drinkers believe they have had any alcohol, they may become consumed with a sense of futility and lose their confidence that they can resist temptation. (Zero tolerance doctrines support such a response by claiming that any alcohol will cause a problem drinker to lose control utterly.) Marlatt showed, moreover, that the abstinence violation effect is psychological rather than physiological, in the sense that it depends more on the beliefs, perceptions, and assumptions of the drinker than on any irresistible, physiological consequence of consuming alcohol. In some studies, drinkers who falsely believed they had consumed alcohol were prone to go on a binge, whereas drinkers who falsely believed they had not had alcohol maintained restraint.

Similar findings have been documented in the eating realm, under the rubric of counterregulation or, more colloquially, the “what the hell” effect (Cochran & Tesser, 1996; Herman & Mack, 1975). Dieters who believe their diet is blown for the day eat more than dieters whose diets are presumably intact. Moreover, these responses depend on the perception rather than the actual caloric consumption. In one classic set of studies, dieters who ate salads maintained control over their eating subsequently, whereas those who ate ice cream abandoned restraint and overate — even if the salad contained twice as many calories as the ice cream (Knight & Boland, 1989).

Thus, again, beliefs about the self and about the controllability of responses

contribute to effective (or ineffective) self-regulation. Researchers who proposed that some recovering alcoholics can learn to use alcohol in controlled amounts have been vilified, because their recommendations go against the prevailing zero-tolerance doctrines (Sobell & Sobell, 1984). But it can be counterproductive for people to believe that any lapse will inevitably lead to a full-blown binge. In reality, preventing the first sip or first bite is probably easier than stopping after a couple, but people can also learn to stop after a limited indulgence.

Beliefs are of course not the only factor relevant to lapse-activated patterns. Alcohol abuse has been implicated in nearly every form or sphere of self-control failure (see Baumeister et al., 1994, for review), from sex and violence to overeating to just drinking all the more alcohol. Apparently alcohol has special powers to undermine self-regulation. In our view, this is most likely connected with the fact that alcohol undermines self-awareness, thereby making it difficult for the person to continue keeping track of behaviors. We will return to this issue below, as we explore how exactly self-regulation operates. For now, it is sufficient to observe that alcoholic indulgence facilitates loss of control over a broad range of behaviors, enabling initial lapses to snowball into serious breakdowns.

### **Transcendence, and Delay or Gratification**

The ability to regulate or inhibit behavior is not uniquely human. Most dog owners have been able to observe that dogs can follow simple rules, at least when the owner is present to enforce them. (Our experience is that when you try to teach the dog not to get up on the couch, it mainly learns not to get up on the couch when you are present; when you come home from the office, there may still be dog hairs on the couch.) If your dog has learned the “stay” command, it will sit still and stare fixedly at the bacon biscuit until you say the word that permits the dog to come forward and eat it. If the treat is tempting enough, you can even observe the inner struggle, as the dog’s legs shake with incipient motions and the dog has to struggle to remain in place.

No doubt this capacity for restraint was something that natural selection favored during human evolution, producing perhaps increased willpower among humans.

However, there appears to be one crucial aspect of self-regulation in which people differ seriously, perhaps categorically, from other species. Humans can respond to circumstances beyond the immediate stimulus environment. This is crucial for our success as cultural animals.

We favor the term transcendence to refer to the human capacity to process and respond to things or events that lie beyond the immediate stimulus environment. Transcendence thus does not imply any kind of spiritual or metaphysical experience (e.g., transcendentalism) but simply a psychological capacity to respond to something that is not physically present. There is little evidence that any nonhuman animal can do this.

Much of self-regulation depends on transcendence. Indeed, perhaps the most common dilemma concerns a conflict between being tempted to enjoy something in the immediate stimulus environment versus being restrained according to some abstract rule or standard, which may be linked to something in the distant past or future. The Jewish practice of keeping kosher, for example, involves refusing to eat what most animals would regard as perfectly good food, on the basis of religious principles that were laid down centuries ago.

Such self-regulation is qualitatively different from the earlier example of the dog's regulatory efforts. The dog resists the tempting food but mainly because the master is in view and presents an imminent threat of physical punishment if the dog's self-control fails. In contrast, a Jew may refuse to eat a ham sandwich even if no one else is present and no one would ever know he ate it.

In the same way, self-regulation can be guided by distal future goals. A college student who passes up a tempting beer party in order to study at the library may be guided by concerns that have little force in the present, and indeed the immediate stimuli (such as beer-guzzling roommates) may all favor joining the party. The conscientious, good student (they do exist, even at Florida State) may however transcend the party-favoring stimulus environment in favor of doing something that will contribute to goals that may lie weeks (the final exam) or even years (graduating with

honors and going on to a better career) in the future.

Transcendence is thus instrumental for delay of gratification, and the capacity for delay has contributed both collectively and individually to human success. Farming is just one of the many activities that depend on the capacity to delay gratification and that also have provided immense benefits to human beings as a species. (We also noted that the capacity for delay produces immense benefits for individuals, including in modern society.) Getting an education is a fine illustration of the importance of pursuing delayed gratifications. Attending class, going to the library, reading, studying, taking examinations, and similar activities are not intrinsically enjoyable for either human or nonhuman animals, but humans are willing to perform them over and over, in part because they confer immense advantages in the very long run. Americans with college degrees earn tens, even hundreds of thousands of dollars more than those without such degrees, but these benefits are over a lifetime, and in the short run most people could earn more money and live more comfortably by dropping out of college and taking a job.

Research by Mischel and his colleagues (Mischel, Ebbesen, & Zeiss, 1972; Mischel, Shoda, & Peake, 1988; Mischel, Shoda, & Rodriguez, 1989; for a review, see Mischel & Ayduk, 2004) has underscored the importance of transcendence for effective self-regulation in delaying gratification. In his studies, children must resist the highly salient temptation to enjoy a cookie or marshmallow in order to garner greater pleasures and rewards in the (admittedly not-so-distant) future. Observations of children in these studies show them attempting to blot out the immediate stimulus environment, such as by shutting their eyes, turning away from the sight of the tempting stimulus, or distracting themselves via singing. To the initial surprise of the research team, seeing representations of the rewards (e.g., pictures of cookies) facilitated self-regulation, in the sense that children who looked at pictures (and not the actual cookies) were better able to delay gratification. The implication is that such representations can enable transcendence by helping the child to think of the large future reward and to disregard the most appealing properties of the immediate temptation, thereby bolstering the

child's ability to delay gratification.

### **BASIC ELEMENTS OF SELF-REGULATION**

Self-regulation depends on three main components, and below we discuss each in turn. The first is commitment to standards. The second is monitoring of the self and its behaviors. The third is what is needed to change the self's responses. All are necessary for effective self-regulation. Hence a breakdown or problem with any one of them can produce failure at self-regulation.

#### **Commitment to Standards**

Goal-directed behavior is impossible without a goal. In the same way, self-regulation cannot proceed without a standard, insofar as self-regulation is the effortful attempt to alter one's behavior so as to meet a standard. Standards are concepts of possible, often desirable states. They include ideals, expectations, goals, values, and comparison targets (such as the status quo, or what other people have done). Self-regulation is essentially a matter of changing the self, but such change would be random or pointless without some conception of how the self ideally ought to be.

There is some evidence that problems with standards can contribute to self-regulation failure. In particular, vague, ambiguous, or conflicting standards can undermine self-regulation. For example, if the two parents disagree as to how the child should behave, or even if they disagree as to the desirability of some particular kind of behavior, children are far less likely to learn to behave properly. Conflicting standards is one important source of self-regulatory breakdown (Baumeister et al., 1994)

Probably the most important work on standards comes from Higgins (1987) and his colleagues (e.g., Higgins, Roney, Crowe, & Hymes, 1994; Shah, Higgins, & Friedman, 1998). They distinguish between "ideal" and "ought" standards. Ideals form the basis of positive strivings toward the way one would like to be. Oughts are also rooted in concepts of how one would like to be, but the focus is on what to avoid rather than what to pursue. Ideals and oughts can come from within the self (e.g., if a person embraces a particular goal or value system) or from other people (e.g., parents can communicate expectations about their offspring's behavior). Higgins (1987) further

proposed that different sets of emotions are associated with the different types of regulatory standards, though of course both types of regulatory failure produce bad (negative) emotions. That is, failures to self-regulate toward ideals produces dejected, low-arousal emotions, such as sadness and disappointment. In contrast, failures to self-regulate according to oughts lead to agitated, high-arousal emotions, such as anxiety and worry.

One possible way of accounting for these differential emotional responses is that violating ought standards is more troubling than violating ideal standards, and so failures in the “ought” domain produce arousal. Arousal, as generally understood, prepares the body for action and mobilizes physical responding. It is more important or at least more pressingly urgent not to break important rules, such as by performing immoral behavior, than it is to move toward one’s ideals. This may reflect the broader principle that bad is stronger than good (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Rozin & Royzman, 2001). A single violation of moral rules, for example, can directly cause ejection from social groups or create other problems for a long period of time, whereas a failure to move toward one’s ideals does not necessarily have such ramifications and might simply mean that the person will have to seek another opportunity. Put another way, failing to advance toward ideals does not generally do as much harm to one’s social position as does violating one’s “ought” requirements.

Thus far we have emphasized having and knowing standards, but there is a motivational aspect as well. Specifically, the person must have some inner wish or proclivity to conform to the standards. If people do not care about being good, they will not be so good! Variation in self-regulatory motivation is an important but understudied aspect of self-regulation. A dieter, for example, may mostly want to keep to the diet, but under some circumstances that motivation may wane, and the person may knowingly violate the diet simply because at that moment he or she ceases to care much about losing weight.

Perhaps the most active area of research on self-regulatory motivation is Higgins’ and colleagues’ work on regulatory focus (see Higgins & Spiegel, 2004, for a review).

Building on Higgins' work on ideal and ought standards, regulatory focus refers to a person's characteristic motivational orientation. Some people are typically promotion-focused, meaning that they are mainly motivated to achieve desirable outcomes using eager, approach oriented strategies (i.e., to pursue ideals and obtain nurturance). Other people are prevention-focused, meaning that they are mainly motivated to achieve desirable outcomes using vigilant, avoidance oriented strategies (i.e., to satisfy oughts and to obtain security). A burgeoning literature attests to both the subjective and objective consequences of these two regulatory foci. For example, people who are characteristically promotion-focused experience greater success when a task is framed as a pursuit of ideals. Conversely, people who are prevention-focused experience greater success when a task is framed as an opportunity to do what one ought to do (Shah et al., 1998). Thus, when people experience regulatory fit – when their preferred regulatory motivation is matched by characteristics of the task at hand (Higgins, 2000) – self-regulatory outcomes are improved. To return to the dieting example, the regulatory focus view would suggest that promotion-focused individuals would best adhere to a diet if they considered it as a way to obtain an ideal body image, whereas prevention-focused individuals would best maintain motivation if their diet was framed as a way to eat in a responsible manner.

### **Monitoring**

One hotbed of research activity in the 1970s was the study of self-awareness (from Duval & Wicklund, 1972). A landmark event in the evolution of that line of work was Carver and Scheier's (1981) book, which was received as a book on self-awareness but that presented itself (starting with its title) as a book on self-regulation. At the time, the term self-regulation was quaint and obscure, whereas self-awareness was a familiar term. But Carver and Scheier were proposing that the main purpose of self-awareness was to facilitate self-regulation.

Linking self-awareness to self-regulation was a key, relevant point: It is very hard to change or otherwise a behavior if you are not aware of it. Monitoring one's behavior is an indispensable component to regulating it.



The writings of Carver and Scheier (1981) persuaded most social psychologists that feedback-loop theory, originally developed by cybernetics theorists to enable missiles to hit and destroy their targets more effectively, could be profitably adapted to the psychology of self-regulation of human behavior. The core concept of the feedback loop (see Powers, 1973) involved a sequence of steps, under the acronym TOTE for test, operate, test, exit. The test phases consist of comparing the self's current status against the relevant standards. This fact alone represents a key insight from the self-awareness research of the 1970s, which is that attending to self is not a mere act of noticing the self, but rather it almost invariably involves comparing the perceived aspect of self against some standard.

The operate phase consists of attempts to alter discrepancies between the perceived aspect of self and the relevant standards. Thus, if the test phase determines that the self is not trying hard enough, the operate phase will most likely consist of efforts to reduce that discrepancy by trying harder. During or after these operations, the self may perform additional tests to see whether the discrepancy has been resolved.

The exit phase terminates the process (as the name implies). When the self has met the relevant standards, there is no need for further operations, and the self's attention can turn to other issues.

The feedback loop is a rather cognitive theory, but of course emotion is a powerful feedback system in the human psyche, and emotion does influence self-regulatory processes. One mechanism is that emotions serve to highlight discrepancies that arise in test phases. Thus, being below the standard is likely to yield aversive emotions, whereas positive emotions may arise when the test reveals the self to have surpassed the relevant standard.

A more nuanced theory was proposed by Higgins (1987), who distinguished different types of standards. As noted above, he proposed that different categories of emotion are linked to different kinds of discrepancies. Failing to live up to "ought" goals produces high-arousal, agitated emotions such as anxiety, whereas failing to live up to "ideal" standards causes low-arousal, dejected emotions such as sadness.

Another useful advance was contributed by Carver and Scheier (1990), who concluded that emotions do not simply react to whether a discrepancy exists or not. Emotions are better designed to register change, and so Carver and Scheier proposed that emotions react to the rate of progress toward the goal or standard. If the person is moving toward the goal on or ahead of schedule, positive emotions will be felt, whereas if progress is overly slow, negative emotions will be felt. The novel contribution is that emotion can be positive long before one reaches one's goal, simply because the person feels he or she is making satisfactory progress.

We noted above that alcohol is implicated in a broad range of self-regulatory failures, probably because alcohol reduces self-awareness (Hull, 1981). Alcohol use thus leads to more alcohol consumption, partly because drinkers soon lose track of how much they have consumed. Based on the notion of external monitoring, we can suggest one policy that might work to reduce problem drinking: Prohibit bartenders and other liquor servers from removing the empty glasses until the patron leaves the establishment. That way, someone who has had six drinks cannot fool himself or herself into thinking it has been just a couple. The empty glasses will furnish a clear tally of the number of drinks consumed.

Improving monitoring is one good way to improve self-regulation. Success is more likely when people observe their own behavior, such as by noticing the types of situations that induce anxiety so as to anticipate them or even avoid them in the future. People may also rely on external monitoring, such as if they keep a journal of when they exercise or how they spend money, or when they ask the bartender not to remove the empty beer bottles.

### **Strength Model**

The third component of self-regulation is the capacity to make changes. This corresponds to the "Operate" phase in the TOTE model, and cybernetic and other theorists were often rather vague about just how self-regulatory "operations" operated. It was plausible that a wide assortment of behaviors could be invoked to resolve discrepancies and bring the self into line with standards. Few obvious generalizations

about such operations were apparent.

Recently, however, some evidence has accumulated to suggest that self-regulatory operations tend to consume a limited resource that seems to operate like an energy or strength. The idea that self-regulation depends on such a resource has long been anticipated in various places, including folk wisdom which has treated “willpower” as an important ingredient in self-control. The term “willpower” implies a strength or energy that the self uses to bring about the changes that it seeks. In a more scientific source, the research literature on self-regulation reviewed by Baumeister et al. (1994; Baumeister & Heatherton, 1996) also led those authors to conclude that self-regulation seemed to operate as if it depended on a limited resource resembling strength or energy. This would provide a useful explanation for an assortment of empirical findings and informal or anecdotal observations pointing to the apparent pattern that after people exert self-control to regulate some behavior, they seem vulnerable to self-regulatory breakdowns in other and seemingly unrelated spheres. For example, most university personnel have observed that students seem around examination time to exhibit a multitude of signs of poor self-control, such as they may eat badly or irregularly, become irritable or rude, resume smoking or other bad habits, or neglect personal grooming. Saying that “stress” causes these consequences is too vague: Stress produces no one of those effects reliably. Instead, the common mechanism may be that when examinations loom, students need to use all their limited self-regulatory resources (i.e., their willpower) to manage their studying, including completing assignments that may be late or have been neglected, and trying to master a complex amount of material in a short period of time. Because the demands of studying and preparing for the examinations consumes a large share of their self-regulatory resources, they have less left over for other, more everyday concerns of self-regulation, such as eating properly, being polite, managing their feelings, and keeping their bad habits under control.

These observations led to the formation of a strength model of self-regulation. Its main ideas are as follows. First, acts of self-regulation consume the limited resource, so that after performing such an act, the person’s stock of this resource is at least

temporarily reduced. Second, when the resource has been somewhat depleted, the person will be less effective at other self-regulatory tasks. Third, the same resource is used for a wide assortment of self-regulatory activities. Fourth, as with strength, the resource can be restored via rest and possibly other mechanisms. Fifth, also as with strength, regular exercise can increase strength over the long term. Thus, although the immediate result of exercising self-control is to reduce the person's capacity for more self-control, the long term effect is the opposite, namely to increase the capacity. Sixth, the self may begin to alter its responses long before the resource is fully depleted. Like athletes conserving their muscle strength when the first part of the athletic contest has begun to produce some degree of fatigue, everyday self-regulators may seek to conserve what is left of their strength when some of it has been depleted.

A series of laboratory investigations sought to test the strength model against other plausible models, including the idea that self-regulatory processes are essentially knowledge modules and hence would operate along the lines of information processing systems, and the view that self-regulation is a skill that is gradually acquired during development and socialization. Those theories make competing predictions as to what would happen if a person engages in one act of self-regulation and then, soon thereafter, engages in another act of self-regulation, possibly in a very different sphere. The strength model is based on the notion that the same resource is used for a wide range of different self-regulatory efforts, and so once some of that resource has been expended, subsequent self-regulation will likely be impaired, even in seemingly unrelated areas.

In one study by Muraven, Tice, and Baumeister (1998), participants watched an emotionally distressing film clip under instructions to try to suppress their emotional reactions, to amplify and maximize these reactions, or to let their emotions go without trying to alter or manage them. The first two of those conditions consumed self-regulatory resources as people tried to alter their emotional state, but the third condition would not consume them. Then all participants were given a test of physical stamina in the form of a handgrip exerciser, which they were to squeeze as long as possible. The

people who had tried to alter their emotional reactions subsequently performed poorer on the handgrip stamina task, as compared to participants who had not tried to regulate their emotions. Thus, apparently, the effort to regulate emotional responses consumed some of the resource, leaving the people with less to use in performing well on the handgrip task.

In other studies, people who first tried to control their thoughts by suppressing any thoughts about white bears (adapted from Wegner, Schneider, Carter, & White, 1987) subsequently gave up faster on unsolvable anagrams. Trying to suppress the thought of a white bear seems to have consumed some strength, leaving less available for making oneself keep trying and working on the anagram test (Muraven et al., 1998). Likewise, people who had to resist the temptation to eat chocolates and cookies so as instead to make themselves eat radishes subsequently gave up faster on difficult puzzles (Baumeister, Bratslavsky, Muraven, & Tice, 1998).

These and similar studies (e.g., with solvable puzzles and other dependent measures) yielded generally consistent support for the first crucial aspect of the strength model, namely that self-regulation depends on a limited resource that becomes depleted when the person exerts self-regulation. Thus it became appropriate to speak of “regulatory depletion” (Muraven et al., 1998).

**Other Executive Functions: Making Choices**. Not only self-regulation, but also acts of effortful choice and volition use the same resource. The stimulus for these studies was Baumeister’s (1998) review of research on the self. Baumeister grouped self-regulation under the broader category of the self’s executive function, which involves exerting control or choice in relation to the external world alongside efforts to exert control over the self. Baumeister wondered whether the self-regulatory resource would prove to be relevant to choice as well. A first study (Baumeister et al., 1998) borrowed the choice procedure from cognitive dissonance research: Participants were either assigned to make a counterattitudinal speech with no attempt to enlist their concurrence or make them decide, or else they were requested and subtly pressured into making it, despite the experimenter’s insistence that “the decision is entirely up to

you” (e.g., Linder, Cooper, & Jones, 1967). Afterward, all participants were given the task of solving unsolvable geometric puzzles, and their perseverance was measured as an index of self-regulatory powers. Apparently, making the choice depleted the resource, insofar as participants in the high-choice conditions quit significantly faster than participants in the various control conditions. This provided a first indication that making an effortful choice depleted the same resources that were needed for self-regulation. The concept of regulatory depletion therefore seemed too narrow. In homage to Freud, whose theory of the ego was one of the last and only energy models of the self, we adopted the term “ego depletion.” In the new formulation, this limited resource was needed not only for self-regulation but also for all acts of volition, including choice and active responding (as opposed to passivity).

The link between ego depletion and choice has been made in a further series of studies by Vohs, Baumeister, Twenge, Schmeichel, Tice, and Crocker (2005). Using a variety of procedures and measures, these authors repeatedly showed that making an effortful choice (or, more commonly, a series of choices) depletes some resource relevant to self-regulation, as reflected in poorer self-regulation afterward. Thus, in one study, participants who made a series of choices about which commercial products they would prefer to own (and one of which they were slated to receive) subsequently showed impaired self-regulation as compared to people who merely rated the same products on a variety of dimension without having to make choices among them. The self-regulation measure consisted of making oneself drink an ostensibly healthful but quite bad-tasting beverage. Ego-depleted participants drank less than one-third as much as those in the control conditions. In another study, participants who had made more choices while shopping gave up faster on a mathematical computation task.

**Increasing Strength.** Another aspect of the strength model is that self-regulation should improve with regular exercise. If self-control does resemble a muscle, then exercise should strengthen the muscle. Several studies have yielded findings consistent with this view, though each has found considerable noise in the data. A variety of self-control exercises have been used, such as using one’s non-dominant hand for routine

tasks such as opening doors and brushing teeth, modifying one's speech such as by using complete sentences and avoiding abbreviations or profanity, and cultivating good posture. Participants who perform these exercises regularly for some weeks have been found to perform better afterward in laboratory tests of self-regulation (Muraven, Baumeister, & Tice, 1999; Oaten & Cheng, 2004; Oaten, Cheng, & Baumeister, 2004; for review, see Baumeister, DeWall, Gailliot, & Oaten, in press).

**Replenishing the Depleted Self.** Perhaps the least well understood aspect of the strength model is how the resource is replenished. Rest appears to be the most common route to replenishment, such that when people get a good sleep their self-control (even if previously depleted) is better. One sign of this is that self-control appears best after a good night's sleep, whereas it gets weaker as the day wears on, as indicated by the diurnal distribution of self-regulatory failures: Diets are broken in evenings more than mornings, drug or alcohol binges are rare in the morning, most impulsive crimes are committed after midnight, and so forth. These patterns suggest that a person gets up (at least after a good night's sleep) with a full complement of resources, which are then gradually expended as the day wears on. There are also some indications that sleep deprivation weakens self-regulation, though more systematic data would be desirable.

The hypothesis that rest replenishes the self also received some support in a dissertation by Smith (2002). After an initial exercise designed to deplete the self, participants performed a variety of tasks, after which their self-regulatory effectiveness was measured. Participants who had been guided through a brief meditation period prior to the final regulatory task performed much better on it than those who performed other tasks such as reading magazines. Even resting quietly did not work as well as meditation for restoring the self's powers.

Several studies have suggested that positive emotion may help restore the self's resources. In a series of laboratory studies, affect inductions have been interpolated between two self-regulatory tasks. Neutral and bad moods do little to reverse ego depletion, but positive moods (such as induced by watching a humorous video clip)

seem to improve the individual's performance at subsequent self-regulation tasks (Tice, Muraven, Slessareva, & Baumeister, 2004). Similarly, asking people to think and write about what is truly important to them (a method of self-affirmation; see Steele, 1988) appears to offer some protection from ego depletion. Three experiments have found that self-affirmation prior to or immediately after initial self-regulatory acts prevents impaired performance on subsequent, target self-regulatory tasks (Schmeichel, Vohs, & Baumeister, 2005). In the main, however, finding strategies to prevent or counteract ego depletion remains an important avenue for further research.

**Possible Mechanisms.** Thus, self-regulation operates like a strength or energy. It becomes depleted when used, regular exercise appears to increase the resource, and rest may be crucial for replenishing it. What exactly this resource is remains a formidable challenge for future research. At present, there are some early signs that have begun to illuminate the inner processes that attend ego depletion.

The resource does not appear to be closely linked to emotion. Many ego depletion studies have administered emotion measures, and these typically show no effects or changes as a result of depletion manipulations (e.g., Baumeister et al., 1998; Muraven et al., 1998; Vohs & Schmeichel, 2003). The only exception is that sometimes depleted people rate themselves as more tired than other participants, but this effect has only been found in some studies and with some measures. It is possible that depletion is felt as tiredness only when it reaches a certain threshold, even though its effects on behavior appear well before that.

Recent studies addressing the interrelation between the restraint component of self-regulation and the impulse component suggest that depletion may affect how strongly an urge is felt. Vohs and Baumeister (2004) depleted participants by asking them to control their thoughts about a white bear, whereas other participants were given free rein to think about a white bear, and thus were not taxed of self-regulatory resources. Subsequent to the mental control task, participants were shown an emotionally provocative video and then immediately afterwards described their feelings in response to the video. Participants who had earlier suppressed thoughts about a



white bear reported stronger emotional reactions to the video. This study and others like it (see Vohs & Faber, 2004, who showed that people report more intense urges to buy impulsively when they are depleted) indicate that one consequence of initial self-regulation attempts is an amplification in the experience of impulses and urges, suggesting another route by which self-control fails under depletion.

Most of the work on the ego depletion model has tested new spheres in which self-control processes may be operating (e.g., interpersonal processes, intelligent thought, addictions), boundary conditions, and specifications of the tenets of the model. A recent paper by Vohs and Schmeichel (2003) attempted to pin down a mechanism to account for the negative effects of resource depletion on subsequent self-control capacity. They identified time perception as one potential signal that people are in a state that precedes a lack of self-control. The experience of time as moving very slowly (that is, that tasks seem to take more time than they do in actuality) as a mechanism was suggested by findings from the animal literature and from the time perception literature. Animals appear not to have a sense of the far future (Roberts, 2002). Rather, they experience reality as an “extended now” period in which impulses take precedent over anything resembling long- or mid-term goals, such as accruing resources (e.g., acorns) to consume later (e.g., in the winter). From the time perception literature, it is known that being highly aware of time (e.g., asking oneself “how long has it been?”) leads to perceptions of longer duration (Block & Zakay, 1997). Vohs and Schmeichel (2003) tested the idea that depletion leads to altered time perception and this reduces later self-regulatory ability. More precisely, the researchers found that ego depletion made people more likely to think that they have been continuing their activity longer than people who have not been regulating. Thus, in a sense, depleted people become like animals who are stuck in the present and unable to orient their behaviors toward future outcomes.

### **Nonconscious Self-Regulation**

The self-control strength model, and indeed the majority of research we have reviewed so far, has considered self-regulation to be a conscious, active process.

However, evidence continues to mount for the existence of highly efficient, automatic self-regulatory mechanisms as well.

First, the auto-motive model of Bargh and colleagues (Bargh, 1990; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troschel, 2001) explains that goal pursuit, from goal setting to goal completion, may proceed completely outside of conscious awareness. Hence some goal-directed activity may occur in the absence of conscious intent and even without the person being aware that they are engaging in goal-directed behavior.

For example, one recent set of laboratory experiments demonstrated that social and behavioral goals could be activated outside of conscious awareness and then pursued as if they were consciously intended (Bargh et al., 2001). Research participants who had been primed with the concepts “achievement” or “cooperation” went on to achieve better performance or to cooperate with a partner more readily on a task, respectively, compared to participants who had not been primed with those concepts.

Similarly, simply thinking about a significant other (such as a family member) can prime goals that one associates with that significant other (Fitzsimons & Bargh, 2003) and also prime goals that the other has for the self (Shah, 2003). Once those goals are activated, even though they may not occupy conscious awareness, behavior may conform to the activated goal. For example, among students who believed that their mothers would be pleased by their academic achievement, priming by stimuli related to their mothers led to improved performance on a verbal achievement task compared to participants who did not associate their mothers with academic achievement (Fitzsimons & Bargh, 2003).

Not just goal-directed behavior but also emotional states may also be regulated outside of conscious awareness and without intentional intervention. For example, recent research found that shortly after an emotional experience, people spontaneously generated mood-incongruent thoughts presumably as a way to alter their mood state (Forgas & Ciarocchi, 2002). Similarly, Gilbert and colleagues (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998) have posited the existence of a “psychological immune system” which works to ameliorate negative feelings and protect the self from

psychological threat. This system is thought to operate automatically, without purposeful self-direction. Again, then, it appears that some emotional states may be regulated nonconsciously.

What is the relationship between conscious and nonconscious self-regulation? Research by Gollwitzer and colleagues (Gollwitzer, 1999; Gollwitzer & Brandstätter, 1997) provides some insight into this relationship. In their study of *implementation intentions*, they have found that forming explicit behavioral plans (e.g., by designating a specific time and place in which goal-directed activity will be pursued) triggers subsequent goal-directed behavior efficiently and automatically, without continued self-intervention. For example, participants who formed explicit implementation intentions enacted goal-directed behavior immediately upon discerning the appropriate conditions to do so (Gollwitzer & Brandstätter, 1997). Similarly, establishing an implementation intention to ignore a target person's gender led to less gender-stereotypic responding after exposure to the target than having no such intention (Gollwitzer, Achtziger, Schaal, & Hammelbeck, 2002). Thus, it appears that conscious intentions can facilitate nonconscious or automatic self-regulation.

According to the self-regulatory strength model outlined earlier in this chapter (see also Baumeister, Muraven, & Tice, 2000; Schmeichel & Baumeister, 2004), conscious and active self-regulation leads to ego depletion, which results in poorer subsequent self-regulation. It is likely that nonconscious self-regulation, because it does not entail purposeful intervention by the self, would not deplete self-regulatory resources. Further, ego depletion should not interfere with efficient nonconscious self-regulation because this type of regulation does not require active involvement by the self.

One recent pair of studies touched on the links between conscious and nonconscious self-regulation by combining implementation intentions and ego depletion (Webb & Sheeran, 2002). These researchers had participants perform the Stroop color-word interference task, a classic cognitive task that depletes self-regulatory strength. The Stroop task requires the performer to inhibit the natural tendency to read a word

and to replace the reading tendency with the naming of the ink color in which the word is printed. Webb and Sheeran found that participants who performed the Stroop task gave up more quickly on an ensuing test of self-regulation, consistent with the self-regulatory strength model. However, if participants had formed explicit implementation intentions about Stroop task performance (i.e., to ignore the meaning of the words and to name the colors), they did not show the ego depletion effect. Apparently, forming an implementation intention made Stroop task performance less dependent upon conscious self-regulation, and so it became less taxing of self-regulatory strength.

Similar findings come from recent research showing that nonconscious priming can overcome the damaging effects of ego depletion. Weiland, Lassiter, Daniels, and Fisher (2004) depleted some participants using a task involving complex rules about when to cross out “e”s in a page of printed text, whereas other participants were given simple rules to follow. Prior to the editing task, some participants encountered supraliminal but nonconscious achievement-related primes in a scrambled sentence task whereas others were encountered neutral primes. On a subsequent task involving unsolvable puzzles, depleted participants who received the neutral prime quit significantly sooner than depleted participants who received the achievement prime. These findings suggest that at least some self-regulatory resource depletion effects involve motivation more than ability, insofar as goals activated outside of awareness can overcome deficits in self-control ability due to depletion.

Thus, there is some evidence that depleting self-regulatory tasks may be made less depleting by an act of conscious will. Forming an implementation intention can make later self-regulation more automatic, and therefore less reliant on regulatory strength. Moreover, one study found that nonconscious achievement-goal primes can protect self-regulated behavior from weakened regulatory strength. These encouraging notions deserve further research attention, as does the broader issue of the relationship between conscious and non-conscious forms of self-regulation.

### **APPLICATIONS**

In this section, we focus on applications of the self-regulatory strength model.

These show some of the phenomena that are involved in self-regulation.

### **Cognitive Processing**

Intelligent thought, especially logical reasoning, is a supreme achievement of the human intellect that sets humans substantially apart from what other animals are capable of doing. Logical reasoning is hardly natural, in that sense, and so it may well require guidance by the self's executive function. Simply put, self-regulation of thought may be necessary for successful thinking. Ego depletion may therefore impair the self's ability to think effectively.

A series of studies by Schmeichel, Vohs, and Baumeister (2003) confirmed that some (but not all) forms of intelligent thought are impaired by ego depletion. Specifically, the relatively simple forms of thinking that may proceed automatically were largely unimpaired, whereas thought that required active work to transform one set of ideas into another often showed substantial impairments. To use the terms favored by (some) intelligence researchers, depletion should affect *fluid intelligence* (the capacity to reason, manipulate abstractions, and discern logical relationships) but it should have relatively little effect on *crystallized intelligence* (involving the retrieval of knowledge acquired via learning and experience; Cattell, 1987; Garlick, 2002). Sure enough, depletion impaired people's performance on fluid intelligence tasks, such as extrapolating from a known to an unknown quantity, or logical reasoning, or being able to take newly acquired information and apply it to novel problems or questions. In contrast, depletion had no substantial effect on such crystallized intelligence tasks as rote memory for nonsense syllables and responding to a test of general knowledge. Thus, apparently, some forms of thought involve self-regulation and depend on the self's precious resource, whereas other (simpler and more automatic) processes do not use this resource. Put another way, ego depletion makes people stupid in complex ways but leaves them intelligent in simple ways (see also Schmeichel, Demaree, Robinson, & Pu, in press).

Recent work has begun to explore the links between self-regulation and memory. Schmeichel, Gailliot, and Baumeister (2005) set out to show that active self-involvement

in memory processes can improve memory, and that resource depletion may undermine this benefit. Previous work had suggested a *self-choice effect* on memory, which is to say that people remember stimuli they have chosen better than stimuli chosen by others or not chosen (e.g., Kuhl & Kazén, 1994). Schmeichel et al. found signs that ego depletion destroys the self-choice effect. The most likely explanation is that when the self has been depleted, people choose in a less effortful and possibly more arbitrary manner, with the result that such choices leave a weaker memory trace. Thus, in one study subjects were instructed by the experimenter to remember some items and forget others; depleted subjects performed just as well as non-depleted ones on this task. However, when subjects were permitted to choose which items to remember and which to forget, depleted subjects performed more poorly (as measured by total recall of both ‘remember’ and ‘forget’ items) than non-depleted subjects. In another study, subjects were given a list of possible tasks. They chose some for themselves to perform, and others were chosen for them by the experimenter (and others were unchosen). Nondepleted subjects remembered the ones they chose best, followed by the ones the experimenter chose, and followed by the unchosen ones — which would seemingly be an adaptive pattern of memory. Depleted subjects, however, recalled the unchosen ones just as well as the self-chosen ones, with the experimenter-chosen ones recalled even worse. The memory for self-chosen items was significantly worse among depleted than among non-depleted subjects.

The idea that the self regulates thought processes is not new, and indeed many of Freud’s theories can be read as support for this view. For example, defense mechanisms involve the attempt to think certain thoughts and especially to avoid other thoughts. To be sure, Freudian defense mechanisms did not typically invoke conscious, deliberate control, but presumably some forms of self-regulation can become automated, resulting in nonconscious self-regulation (e.g., Bargh, 1990; Higgins et al., 1994; see Nonconscious Self-Regulation section above).

A systematic treatment of (often motivated) self-regulation of cognitive processes was provided by Baumeister and Newman (1994). Insofar as self-regulation involves

seeking to bring inner responses and processes into line with standards, it was necessary to distinguish two main types of standards that guide thought. One is the truth, in which case self-regulation may seek to guide processing toward the most accurate conclusions, whatever they may be. The other is an a priori preferred view, in which case self-regulation tries to guide thought toward the preordained conclusion. Baumeister and Newman used the metaphors of intuitive scientist for the first (insofar as scientists ideally seek the truth, whatever it may be) and intuitive lawyer for the second (because lawyers try to make the best case for their client, such as to establish his innocence even if he is guilty).

The two self-regulatory goals then yield different prescriptions for regulating thought across four stages of cognitive processing. The first stage involves gathering evidence. The intuitive scientist seeks to get the most thorough and reliable evidence available, whereas the intuitive lawyer seeks evidence that fits the desired conclusion, such as by means of selective attention and confirmation bias. The second step involves recognition of the implications of various pieces of evidence. This step is mostly automatic, and as such it offers relatively little opportunity for self-regulation.

The third step is reassessment of implications. The automatic conclusions arising from the second step can be scrutinized. The intuitive lawyer may search for sources of bias or distortion that might render some evidence less conclusive than they first seemed. If so, the person might adjust or re-compute the tentative conclusions. Meanwhile, the intuitive lawyer may reject some tentative conclusions or implications insofar as they conflict with the preferred conclusion. Selective criticism of unwelcome evidence is one strategy that can be used, such as when people subject hostile evidence to critical scrutiny while accepting congenial evidence uncritically (Lord, Ross, & Lepper, 1979).

The fourth step is to combine and integrate the various implications so as to formulate a general conclusion. The intuitive scientist can try extra hard to make sure that all viewpoints are considered and that the decision criteria are maximally fair. In contrast, the intuitive lawyer can channel the decision process toward the desired

conclusion by selecting decision rules or criteria that favor it.

Probably most people are capable at both intuitive lawyer and intuitive scientist modes of regulating cognitive processes. The intuitive lawyer is useful for self-deception, for supporting a party line or boss's dictates, and generally for helping people sustain the comfortable views they prefer. The intuitive scientist is useful for careful decision-making and, more generally, for making decisions in which the person does not have a vested interest in a particular outcome.

Another influential line of research on the self-regulation of thought processes has considered some of the unintended consequences of intentional thought control. Wegner and colleagues (Wegner, 1989; 1994; Wegner et al., 1987) have created an elegant model of the ironic processes of mental control. According to their model, attempts to suppress or inhibit particular thoughts often have as a consequence an increase in those very thoughts. For example, when people try not to think about a white bear, they may succeed temporarily only to experience an abundance of white-bear thoughts a short while later (Wegner et al., 1987). This rebound in the unwanted thought is a result of two related mental processes – a monitoring system, which operates automatically to scan the mental landscape for the occurrence of the forbidden thought, and the conscious operator system, which attempts to occupy the mind with anything but the unwanted thought. The operator requires mental resources to function, and so successful thought suppression depends on the workings of the conscious operator system. When mental resources are diverted, however, the conscious operator fails to fulfill its function while the automatic monitor continues to operate normally. This combination of events leads to increases in awareness of the unwanted thought.

Earlier we considered the relationship between conscious and nonconscious self-regulation, and Wegner's work on thought control is also relevant in this connection. The automatic monitor in Wegner's model, responsible for detecting occurrences of an unwanted thought, is a nonconscious aspect of self-regulation initiated by the person's conscious attempt at thought control. However, the nonconscious monitor may actually work against the conscious goal of thought suppression by making the forbidden



thought more available to conscious awareness. When the conscious operating system is distracted or depleted (which is apparently all too often), the automatic monitor continues to report occurrences of the forbidden thought to conscious awareness, and so the nonconscious monitor may work against the conscious attempt at mental control.

### **Interpersonal Processes**

We have suggested that self-control abilities probably played a vital role in the social and cultural lives of our forebears, such that those who could suppress or hide their selfish desires acquired advantages that their more uninhibited counterparts did not. For example, keeping one's unpopular views to oneself may have made it easier to get along with others in the group, and it would also have reduced the likelihood of being socially sanctioned or even cast out of the tribe. Recent research has begun to support these speculations by indicating the role of self-regulatory strength in interpersonal functioning.

**Self-Presentation.** Projecting to others just the right impression of oneself is a tricky task, but one that is crucially important for meeting social goals. Meeting prospective in-laws, negotiating a higher salary, and trying to talk one's way out of extra housework are only a few instances in which self-presentation demands are high. Research by Vohs, Baumeister, and Ciarocco (2005) demonstrated that self-presentation and self-regulation are linked, with each process affecting the other. In a series of studies, Vohs et al. (2005) found that self-presentation demands influenced self-regulatory ability.

In one study, presenting oneself very positively to a friend or modestly to a stranger – patterns that run counter to typical self-presentational patterns of being modest with friends and enhancing with strangers (see Tice, Butler, Muraven, & Stillwell, 1995) – led to decreased persistence on a series of math problems as compared to acting in ways that are consonant with typical self-presentational patterns. In four additional studies, Vohs et al. (2005) found that diminished self-regulatory resources led to less successful self-presentation. In one study participants were asked to ignore (by carefully controlling attention) a series of irrelevant words scrolling across

the bottom of the screen of a videotaped interview, whereas other participants saw the same tape (with the same extraneous words) but were not instructed to ignore the words. The former group would presumably use more regulatory resources than the latter, and therefore be poorer at effortful self-presentation afterward. The self-presentation task in that experiment was self-descriptions of oneself on a narcissism scale. Sure enough, the depleted group was more egotistic, as evidenced by higher scores on the narcissism scale.

The ability to control one's expressive behaviors so as to make a very specific impression on other people is crucial to interpersonal success. It is however costly in the sense that such effortful self-presentation depletes the self of resources that could otherwise be used for a broad variety of goal-related and self-regulatory endeavors. These findings may perhaps explain why people are sometimes unable (or unwilling) to manage their self-presentations optimally so as to be seen in a socially acceptable light: They are using those limited resources to achieve other regulatory goals.

**Close Relationship Maintenance**. Interpersonal interactions presumably require some degree of self-regulation, but interacting with people who are demanding or difficult likely requires even more self-regulation. This hypothesis was tested by Finkel, Campbell, Brunell, and Bruke (2004), who parsed interactions into two kinds: high and low maintenance. High maintenance (HM) relationships take effort and are relatively inefficient at accomplishing complex tasks, whereas low maintenance (LM) relationships are relatively effortless and efficient. Finkel et al. (2004) found that participants assigned to interact with a HM (vs. LM) confederate later exhibited passivity by choosing to work on easy anagrams as opposed to more challenging anagrams. Indeed, 85% of HM-condition participants chose to work on easy rather than challenging anagrams, whereas only 38% of LM participants preferred the easy task.

In order for romantic relationships to survive, persons in them must be able to cope constructively with negativity on the part of one's partner. Finkel and Campbell (2001) found that the ability to be accommodative and constructive in the presence of a partner's bad behavior relies upon self-regulatory resources. In one study, participants

in the depletion condition were assigned to control their emotional responses during an emotionally evocative film, whereas participants in the no depletion condition watched the same film but did not have to control their emotions. Later, all participants were asked how they would respond to a series of potentially destructive partner behaviors (e.g., being two hours late for a date), a measure that tapped participants' accommodative tendencies. Finkel and Campbell found that tendencies to be accommodative were lower among participants who had earlier controlled their emotions than among those who had been allowed freely to express their emotional reactions. Hence, people whose regulatory resources had been drained by previous instances of self-control were at risk for responding destructively to others' bad behaviors.

he tendency for people to credit successes to their own internal, stable abilities but to blame others or the situation for failures is called the self-serving bias (SSB) and it is one of the most reliable attribution effects in psychology (see Campbell & Sedikides, 1999). In the context of a romantic relationship, shared credit for success and taking responsibility for one's role in failure would seem to be beneficial to the health of the relationship. Two persons in a couple who both behaved that way would have a very nice relationship indeed ("Without your help we never would have made it this far" or "I am sorry that I made a mistake"). Initial findings suggest that having more self-regulatory strength allows one to think and speak in these unselfish ways (Vohs & Baumeister, 2004).

Remaining committed to a romantic partner not only means turning a blind eye to the partner's potentially destructive behavior (see Finkel & Campbell, 2001) but also to the positive, attractive aspects of alternative potential partners. Miller (1997) demonstrated that eye-gaze length is an indication of attraction toward another: Short gazes reflect superficial consideration and long gazes reflect deeper processing of the person's attributes. Moreover, Miller's research showed that length of time spent looking at pictures of attractive persons predicted relationship dissolution two months later.

Vohs and Baumeister (2004) hypothesized that ego depletion would cause people to look longer at such tempting alternative partners. Just as dieters must turn their attentions away from tempting but forbidden snacks in order to remain faithful to their diet, would-be faithful relationship partners must turn their attentions away from the temptations of new partners. To deplete participants of their regulatory strength, participants were asked to read aloud dull historical biographies under instructions to exaggerate their emotional and facial expressions. In the no-depletion condition, participants read aloud the same biographies but were not given explicit instructions on how to do so. The former was presumed to require more behavioral control and thus tax self-regulatory resources more than the latter. Subsequently participants were told to page through a booklet of scantily-clad male and female models, a task they performed while being secretly videotaped. Time spent paging through the booklet was the dependent measure. Consistent with predictions, depleted participants spent more time looking through the book of attractive, near-naked models than non-depleted participants. Moreover, their slowness did not reflect mere passivity, because the effect was stronger for pictures of opposite-sex models than for same-sex models, as would be consistent with an attraction to alternates hypothesis. When people are low in regulatory strength, they may not have the willpower to turn their eyes away from attractive alternate partners.

**Resisting Persuasion.** Getting people to do what one wants often entails having to wear down their resistance, which suggests that depleting people's regulatory strength is one route to increasing persuasion. A series of studies by Knowles and colleagues tested this hypothesis by predicting that initial persuasion attempts will be rebuffed more easily than later persuasion attempts because strength will have been drained combating the earlier attempts, leaving people unable to resist later on. In one study, Knowles, Brennan, and Linn (2004) gauged people's reactions to political advertisements. The results showed participants were indeed most skeptical (i.e., most resistant) when rating the first ad as compared to the last ad, indicating that regulatory resources and thus resistance were worn away with each need to be critical.

Moreover, before rating the last ad, participants were given the task of either listing all the potential problems of going on a Fiji vacation or listing which activities they would like to do on a Fiji vacation. (Participants had earlier watched a video of Fiji vacations so they had the information necessary to complete this task.) The hypothesis was that by having a break from being skeptical and describing the Fijian activities they thought they would enjoy, participants' regulatory strength would be able to rebuild and therefore ratings of the final ad would be more skeptical than if they had to spend the extra time continuing to be skeptical (this time of tropical vacations). The results confirmed this hypothesis in showing that when participants got a pleasant rest from having to be critical, they were then able to be more skeptical when evaluating the last political ad relative to participants who had listed problems with Fiji. However, the finding emerged only for participants who reported being fairly accepting of political ads, suggesting perhaps a practice effect or an individual difference that moderates these effects. In sum, people who battled repeated persuasive attempts became less able to defend against those attempts and consequently became accepting of advertising messages. After a pleasant break, though, the strength rebounded and enabled people to be resistant again. These results also converge with other findings that positive feelings help restore depleted regulatory strength (see Tice et al., 2004).

**Controlling Prejudice.** Interacting with people of an ethnicity other than one's own may also represent a self-regulatory challenge. Stereotypes and expectations about outgroup members appear to spring automatically to mind in interracial interactions (e.g., Devine, 1989), and so attempting to keep these thoughts at bay may deplete self-regulatory strength. Richeson and Shelton (2003) found support for this view in their study of interracial interactions. When prejudiced white participants interacted with a black person, they went on to perform more poorly on the Stroop task (a classic measure of cognitive control) compared to when they had just interacted with a white person.

Apparently, face-to-face interaction with an outgroup member is not the only context in which stereotype suppression may deplete self-regulatory strength. Research

by Gordijn and colleagues (Gordijn, Hindriks, Koomen, Dijksterhuis, & Van Knippenberg, 2004) found that suppressing stereotypes while writing a short narrative about an outgroup member also led to ego depletion effects. Reduced self-control strength after stereotype suppression was most pronounced among people low in internal motivation to suppress stereotypes (see Plant & Devine, 1998). Moreover, when people with low internal suppression motivation had to suppress stereotypic thoughts, they subsequently showed an increased reliance on stereotypes in general, even stereotypes unrelated to the ones that had initially been suppressed. Presumably, suppressing stereotypes depleted self-control strength so that all manner of stereotypic thoughts increased in salience subsequently.

If suppressing stereotypes is depleting, can exercises aimed at increasing self-regulatory strength enable people to resist stereotypes more easily (that is, without the detrimental effects)? A series of studies by Gailliot, Plant, Butz, and Baumeister (2004) suggested a positive answer.

The emergence of perceptions and attendant stereotypic associations of stigmatized individuals are affected by people's current self-control strength, according to the results of recent research. Participants who performed a strength-reducing version of the Stroop color-naming task were more likely to mistakenly identify a gun (when it was a tool) after the presentation of a black (vs. white) face (Govorun & Payne, 2004). This effect occurred only among participants who possessed a strong automatic race bias. Thus, prejudicial tendencies to associate black faces with dangerous weapons were more likely to emerge and affect behavior when people's regulatory strength was weakened.

Having a stigmatized social identity will likely affect self-regulatory resources in contexts that contain threats related to the social identity. Research by Inzlicht, McKay, and Aronson (2003) supports this contention. The Stroop color-naming task was used to threaten participants, who in the threat condition were told that the task was an intellectual test, which acts as a threat to black more so than white participants. Time spent completing the Stroop task was used as the dependent measure of self-control,

and this measure showed that blacks who thought the task was diagnostic of intellectual ability performed the task more slowly than blacks who were not told of the task's purported diagnosticity and more slowly than whites in the threat condition. A second study with men and women showed effects on a second self-control task, such that women who thought an initial math task was related to gender differences performed worse on a handgrip task than women who did not believe the task was related to gender. They also performed worse than men in the gender differences condition. Thus, self-identification as a stigmatized person can render one vulnerable to ego depletion when faced with a task that accentuates perceived deficits of that identity.

**Rejection and Ostracism.** Given the supreme importance other people play in our lives and the fundamental nature of the human need to belong, working actively against belongingness needs by ostracizing another person probably requires self-control. Thus, purposefully ostracizing another person may cause ego depletion. In one set of studies, participants who actively ignored another person subsequently showed poorer self-regulatory performance in terms of physical stamina and persistence in the face of failure (Ciarocco, Sommer, & Baumeister, 2001). Actively ostracizing another person also led to worse mood in the ostracizer, but poorer mood did not account for the poorer self-control. These studies suggest that although self-regulatory abilities probably exist to increase belongingness and interpersonal bonds, they may also be used to ostracize others and prevent bonds from being formed (see Vohs & Ciarocco, 2004).

Rejection can also be bad for self-regulation among the people who are rejected. A series of studies by Baumeister, DeWall, Ciarocco, and Twenge (2005) showed that people who had been rejected by a group or told that their future lives would be lonely performed worse on a variety of self-regulation tasks, including making themselves drink a bad-tasting beverage, restraining their consumption of snack foods, persisting on a frustrating task, and attention control (dichotic listening). Further studies indicated that rejected people were able to self-regulate if there was a compelling, self-interested reason, such as a cash incentive. Thus, apparently, rejection does not render people

unable to self-regulate but merely unwilling.

The impact of rejection brings us back to the importance of self-regulation for social connection. Self-regulation enables people to get along with each other, but some of this occurs at a cost to the self, insofar as self-regulation functions to stifle selfish and self-interested impulses in order to do what is best for others (or for the relationship). Humans are social and cultural animals, and so in general the rewards of belongingness are sufficient to justify the sacrifices required for self-regulation. However, when people are socially excluded, they act as if they no longer find it worthwhile to regulate themselves. In that sense, self-regulation is part of an implicit bargain between the individual and society, such that the individual makes the effortful sacrifices in exchange for the benefits of belonging to the group. The bargain can break down on either side. Individuals who fail to self-regulate sufficiently are often rejected by others, such as in divorce, peer ostracism, and even imprisonment. Conversely, when society withholds belongingness, such as by rejecting the person, the individual responds with a significantly decreased willingness to self-regulate — except for explicitly selfish rewards.

### **Individual Differences**

Undoubtedly some people are better at self-regulation than others. As noted earlier, a trait measure of self-control was recently published by Tangney et al. (2004). It appears to be an effective manner of differentiating people who are good self-regulators from those who are not, although undoubtedly some people may claim better self-control than they actually have. Tangney et al. went to great lengths to include many different spheres of self-control in their measure so as to be able to advance self-regulation theory by establishing a clear factor structure (which would be reflected in the subscales of their measure). However, the factor structure did not replicate well, and all the subscales essentially performed as weaker measures of the full scale. The implication is that self-control is a fairly unidimensional construct, and people who are good at some aspects of self-regulation tend to be good at most of them. This too fits the view of self-regulation as depending on a single, common resource or strength.



Another question that individual difference measures can illuminate is whether there is such a thing as too much self-control. Popular wisdom and anecdotal evidence suggests that people with too much self-control might alienate friends (e.g., by lacking spontaneity) or perform less well in work (e.g., by obsessing about details and failing to make progress). Tangney et al. (2004) included a broad set of outcome measures including adjustment, school performance, mental health, and relationship quality, and they aggressively conducted statistical tests for nonlinearity in order to find any downturn in outcomes at the high end of self-control scores. None of these tests yielded any results supporting the notion that a person may have too much self-control ability. Thus, at least to the extent that self-report measures are valid, there is no sign that high levels of self-control produce bad outcomes. The better the self-control, the better the person's other outcomes.

The investigation of individual differences in self-control has also yielded an interesting twist. Self-control trait scores were significantly correlated (at around .5) with scores on a social desirability questionnaire (Crowne & Marlowe, 1960). Social desirability scales are often used as "lie scales" in research, on the assumption that they assess people's willingness to distort the truth to make themselves look good. By this reasoning, it might be assumed that self-control scores are tainted by deceptive self-presentations. On the other hand, we have proposed that self-regulation functions primarily to enable people to overcome selfish impulses so as to behave in ways that are better for interpersonal relations, which means that having self-control should actually and honestly make people perform more socially desirable acts. Tangney et al. (2004) found that the effects of self-regulation remained significant and nearly unchanged when they controlled for social desirability, whereas the effects of social desirability on the dependent measures dropped below significance when they controlled for self-control. Thus, it appears that self-control (rather than social desirability) is the more fundamental predictor of positive outcomes, and indeed self-control is probably responsible for many socially desirable acts.

Apart from individual differences in self-control, other individual differences may

affect self-regulatory performance. Any given challenge may require self-regulation for one person but not another. Consider alcohol consumption. Restraining alcohol intake probably requires only very little self-control for a person who does not normally drink or who does not particularly care for alcohol. However, some people drink alcohol regularly and may even be addicted to it. Thus, only frequent drinkers should become depleted by restricting alcohol intake. Further, ego depletion should only interfere with alcohol restraint among those who must actively self-regulate their drinking impulses. This view was supported in experiments reported by Muraven, Collins, and Nienhaus (2002). They found that people who reported a high level of preoccupation with alcohol drank more beer after a depleting thought-control task than similarly preoccupied people who had not done the thought-control task. Beer consumption among people only modestly interested in alcohol was not substantially affected by prior ego depletion.

People may also differ with regard to their social orientation, such that some people are more sensitive to society's demands (i.e., are "other-oriented") than others. As we suggested earlier, self-control abilities probably developed in order to facilitate social interaction and the development of culture. Therefore, people who are preoccupied with smooth social interaction and who prioritize the needs of the group over the needs of the individual should be well-practiced at self-control. In support of this view, Seeley and Gardner (2003) found that people high in other-orientation were more resistant to ego depletion than people low in other-orientation, consistent with the view that other-orientation is linked with frequent self-control and therefore greater self-control strength.

Framing a given task in a manner that is concordant or discordant with one's preferred regulatory style is also like to affect how depleting the task will be. Work by Grant and Park (2003) and Johnson and Shah (2003) indicated that situational demands interact with people's chronic regulatory focus (Higgins, 1997) to affect depletion levels.

In Grant and Park's (2003) studies, students from America and Korea completed two consecutive tasks in which each task was framed either as a promotion task or a

prevention task. The researchers took advantage of the finding that Americans are typically promotion-focused and Asians are typically prevention-focused and hypothesized that it would be less depleting to perform consecutive tasks with a shared regulatory focus (i.e., either two promotion tasks or two prevention tasks), especially when the tasks matched the chronic style of the performer. Their findings were generally supportive of this expectation, such that American students persisted longest on an anagram task (a measure of self-control capacity) when the task and a typing task that preceded it were framed as promotion tasks. Thus, for American students who are mainly promotion-focused, two promotion tasks in a row were less depleting than two prevention tasks or either set of mixed-focus tasks. Korean students, conversely, showed the most depletion in the promotion-promotion condition. For Korean students, performing a task that contained at least one prevention-focused aspect buffered against depletion.

Johnson and Shah (2003) took a more evolutionary approach to the study of regulatory focus and self-regulatory strength. They surmised that accomplishing promotion-related tasks would be dependent on the availability of self-regulatory strength, whereas accomplishment of prevention-related tasks would be independent of regulatory strength. In one study they found evidence for this pattern in showing that participants who were depleted by having to use a rule that became more complex between a practice task and the test task were more likely to solve difficult anagrams under a prevention-frame than a promotion-frame. In a second study, Johnson and Shah tested for positive emotional states that would suggest a fit between regulatory focus and the situation (e.g., Higgins, Idson, Freitas, Spiegel, & Molden, 2003) and found that depleted participants felt less dejected and more satisfied if they had performed a task under prevention, compared to promotion, instructions, suggesting that prevention was a better fit under depletion than promotion.

These two sets of studies give a hint of what is to come for self-regulatory strength research: the integration of different theories of self-regulation to see where and how they converge. Research by Grant and Park (2003) and Johnson and Shah

(2003) illustrates the important role that chronic regulatory focus plays in determining how taxing a given self-control task will be.

The specificity of ego depletion effects among individuals preoccupied with alcohol and people with different social and regulatory orientations highlights the role that chronic differences play in the fluctuation of self-regulatory strength. Surely other individual differences play a role in making some self-regulation particularly depleting for some people but hardly depleting for others. For example, some people are more emotionally expressive than others, and so suppressing emotional reactions should be more depleting for the highly expressive people. Continued study of individual differences and how those differences relate to self-regulatory strength promises to increase understanding of when, and why, some self-regulatory behaviors are particularly taxing.

### **Affect Regulation**

The control of emotional states is a self-regulatory problem that probably touches the lives of every person. Only some people must regulate their alcohol intake or gambling behavior, whereas all people feel emotions and must occasionally strive to manage them. We mentioned earlier some findings suggesting that emotional states may be regulated outside of conscious awareness, but much more work has considered the purposeful and active regulation of emotion.

The process model of emotion regulation (see Gross, 1998; 2001) distinguishes between emotion regulation that occurs before the onset of an emotional experience (antecedent-focused emotion regulation) and regulatory effort initiated during or after an emotional experience (response-focused regulation). The best understood antecedent-focused strategy is reappraisal, which entails anticipating an emotional event and resolving not to react to the event by re-interpreting its meaning. For example, a person might remind oneself prior to viewing a scary movie that the events to be depicted are fictional, and that the people in the movie are not actually being tormented by a knife-wielding psychopath. Contrast this reappraisal strategy to the one that requires the active stifling of fear and disgust while watching the movie. By the time the fear hits, one

may be too involved in the movie to think rationally about its fictional nature.

Richards and Gross (1999; 2000) studied the cognitive consequences of these two forms of emotion regulation. They found that when people suppressed their emotional reactions while watching a gory slide-show, they later had poorer memory for the information presented with the slides than participants who had reappraised what they were seeing. Apparently, stifling emotional reactions interfered with the cognitive processing of the non-emotional information. Reappraisers, by contrast, successfully limited their emotional responses and also showed good memory for the presented information.

The pattern of findings reported by Richards and Gross (1999) suggests that response-focused emotion regulation taxes self-regulatory strength, whereas antecedent-focused regulation may not. Research by Vohs and Schmeichel (2003) confirmed this view. They had research participants suppress, exaggerate, or reappraise their reactions while watching an emotional film clip. Only the response-focused regulators (i.e., the suppressors and the exaggerators) showed reduced self-regulatory strength, while the reappraisers showed no evidence of reduced strength. Thus, consistent with the work of Gross and colleagues, only response-focused emotion regulation reduced self-control strength.

Finally, some evidence suggests that low self-control strength impairs emotion regulation ability. In one study, one group of participants purposefully suppressed a forbidden thought while the other group was free to think whatever they wanted. Later, all participants watched a funny film clip and were instructed to limit their laughter. Those who had suppressed thoughts were relatively unable to prevent themselves from laughing subsequently (Muraven et al., 1998). Thus, ego depletion due to mental control disrupted later response-focused emotion regulation. Whether depletion influences emotion reappraisal or other antecedent-focused regulation strategies is still an open question.

### **Dieting and Addiction**

In everyday life, people most often decide for themselves whether an object is “off-limits” or should be denied. That is, individuals frequently create their own regulatory guides (Higgins, 1996). Individual differences in chronic inhibitions are examples of rules or guides individuals undertake to reach their goals. Chronic inhibitions have been studied in terms of their influence on self-regulation under tempting conditions.

Externality theory (Schachter, 1968) proposed that obese individuals—who presumably are trying to inhibit food intake—are guided more by external cues than by their internal states. Research by Schachter and his colleagues demonstrated that one consequence of external responsiveness is diminished ability to resist temptation. For instance, Herman, Olmsted, and Polivy (1983) found that obese diners were more likely to order dessert after being given a luscious description of it, relative to when they were simply told that dessert was available. Additionally, chronic dieters consumed significantly more snack foods in the presence of salient food cues relative to neutral cues, but this effect did not obtain among nondieters (Collins, 1978). Thus, dieters appear especially vulnerable to food cues, perhaps because the presence of such cues is more tempting for them than it is for nondieters.

Studies of addictive and compulsive behaviors provide additional evidence for the idea that chronically resisting temptation can lead to deleterious effects, especially with respect to self-regulatory processes (Polivy, 1998). For instance, research on consumer buying habits demonstrates that when consumers resist the temptation to purchase a product, they experience a dramatic increase in desire for the product, which apparently is due to feelings of deprivation (Hoch & Loewenstein, 1991). This effect is exacerbated by the presence of environmental cues that encourage buying, such as free trial periods or free samples. Many people who are dependent on an addictive substance actively try to minimize use of that substance, and research has shown that addicts are especially vulnerable to cues relevant to their particular addiction. For example, smokers exposed to smoking-related cues have been found to exhibit shorter latencies to begin smoking, smoke more cigarettes, report stronger urges to smoke, and show changes in heart rate

and blood pressure (Herman, 1974; Rickard-Figueroa & Zeichner, 1985). Likewise, alcoholics who have been exposed to salient alcohol cues report stronger urges to drink (for a review, see Niaura, Rohsenow, Binkoff, Monti, Pedraza, & Abrams, 1988). These studies suggest that individuals set themselves up for failure when they engage in chronic inhibition.

Research on chronic dieting directly tested this suggestion within the framework of the self-regulatory strength model. Vohs and Heatherton (2000) exposed chronic dieters and nondieters to tempting foods that were said to be either available for eating or that were not allowed to be touched (as they were there, supposedly, for a future experiment). The researchers reasoned that dieters but not nondieters would have to actively exert control over their desire to eat the available candies by virtue of their ongoing restriction of “off-limit” foods. (Indeed, although several of the nondieters dipped in and ate the candies, only one of the dieters did so.) Later, dieters and nondieters were asked to sample three flavors of ice cream ostensibly for the purposes of completing a perceptual ratings task. Dieters who had been tempted by the freely available snack food ate considerably more ice cream than did their counterparts who were told “please, don’t touch” the snacks. Nondieters’ eating (tested only among those who did not partake in the snacks earlier) was unaffected by these manipulations, presumably because they did not have to expend self-regulatory strength in order to not eat the snacks in the earlier phase. Two additional studies confirmed the globality of this effect in showing that a food temptation led dieters to give up sooner on a task involving persistence, and also that an emotional regulation task caused dieters to consume significantly more ice cream consequently.

More recently, work by dieting researchers showed that interpersonal demands in the form of conforming to the group can have significant effects on consumption among people who chronically inhibit their eating. Kahan, Polivy, and Herman (2003) used an Asch-type conformity task in which dieters and nondieters responded to a visual task either while in a room alone or in a room with confederates who uniformly gave the wrong answers to certain target stimuli. Under the pressure of having to

conform, the researchers reasoned, dieters would use up regulatory strength that would otherwise help them not to overconsume food, a prediction that was supported by the increased eating among dieters who were in the conformity condition. Nondieters' eating was unaffected by conformity pressures, not because conformity did not deplete their resources but rather because they normally do not put their resources toward curbing caloric intake.

Hence, work on chronic dieters shows how habitual goals interact with situational demands to affect regulated behavior. Whether through emotion control, resisting temptation, or a need to conform, even chronic self-regulation goals can be undermined when momentary pressures deplete precious self-regulatory strength.

### **CONCLUDING REMARKS**

Social scientists have been fascinated by questions of self and identity for many years, but only the past two decades has there been widespread recognition that self-regulation is a centrally important process. Not only does it hold important keys to self theory, but it also has extensive pragmatic applications. Indeed, the majority of personal and social problems faced by modern Western citizens — addiction, violence and crime, debt, sexually transmitted diseases, underachievement, unwanted pregnancy, obesity, failure to exercise, gambling, failure to save money, and others — are rooted in failures of self-regulation.

Self-regulation is one of the key adaptations of the human psyche to enable it to live in cultural groups. It allows people to change their behavior so as to conform to the expectations of others and, as culture develops, to the abstract rules of the group such as morals and laws. It is an important root of free will, in the sense that it enables people to override their first impulses and it furnishes people more complex and flexible ways of deciding and behaving.

This chapter has emphasized a strength model of self-regulation. Altering the self's responses consumes a limited resource that can be conserved, replenished, and even strengthened via exercise. This model is compatible with other contributions to self-regulation theory, such as Higgins' (1987, 1996) self-guides model and Carver and



Scheier's (1981) feedback-loop model.

Decades ago, Freud (1930/1961) proposed that most animals could not easily live together in a cultural civilization, and he suggested that some of the psyche's energy had to be re-channeled into the superego in order to make the human being capable of such collective life. Although the march of progress in psychology has moved beyond many of Freud's ideas, in retrospect there does seem to have been something correct about the view that an energy-based capacity for self-regulation is vital for the success of human culture, both at the individual and the collective level. Further research on self-regulation promises to shed light on one of the key aspects to human nature.

## REFERENCES

- Aronson, E. (1995). *The social animal*. New York: Worth/Freeman.
- Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Vol. 2. Foundations of social behavior* (pp. 93-130). New York: Guilford Press.
- Bargh, J. A. (1994). The Four Horsemen of automaticity: Awareness, efficiency, intention, and control in social cognition. In R. S. Wyer, Jr., & T. K. Srull (Eds.), *Handbook of social cognition* (2nd ed., pp. 1-40). Hillsdale, NJ: Erlbaum.
- Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology*, *81*, 1014-1027.
- Baumeister, R. F. (1998). The self. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4<sup>th</sup> ed, pp. 680-740). New York: McGraw-Hill.
- Baumeister, R. F. (2005). *The cultural animal: Human nature, meaning, and social life*. New York: Oxford University Press.
- Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology*, *5*, 323-370.
- 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., DeWall, C. N., Ciarocco, N. J., & Twenge, J. M. (2005). Social exclusion impairs self-regulation. *Journal of Personality and Social Psychology*, *88*, 589-604.
- Baumeister, R.F., DeWall, C.N., Gailliot, M., & Oaten, M. (in press). Self-regulation and personality: Strength-boosting interventions and trait moderators of ego depletion. *Journal of Personality*.
- Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry*, *7*, 1-15.
- 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., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*, 497-529.
- Baumeister, R. F., Muraven, M., & Tice, D. M. (2000). Ego depletion: A resource model of volition, self-regulation, and controlled processing. *Social Cognition*, *18*, 130-150.
- Baumeister, R. F., & Newman, L. S. (1994). Self-regulation of cognitive inference and decision processes. *Personality and Social Psychology Bulletin*, *20*, 3-19.
- Block, R. A., & Zakay, D. (1997). Prospective and retrospective duration judgments: A meta-analytic review. *Psychonomic Bulletin & Review*, *4*, 184-197.
- Campbell, W. K., & Sedikides, C. (1999). Self-threat magnifies the self-serving bias: A meta-analytic integration. *Review of General Psychology*, *3*, 23-43.
- Carver, C. S., & Scheier, M. E. (1981). *Attention and self-regulation: A control theory approach to human behavior*. New York: Springer-Verlag.
- Carver, C. S., & Scheier, M. E. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review*, *97*, 19-35.
- Cattell, R. B. (1987). *Intelligence: Its structure, growth and action*. Amsterdam: North Holland.
- Ciarocco, N. J., Sommer, K. L., & Baumeister, R. F. (2001). Ostracism and ego depletion: The strains of silence. *Personality and Social Psychology Bulletin*, *27*, 1156-1163.
- Cochran, W., & Tesser, A. (1996). The "what the hell" effect: Some effects of goal proximity and goal framing on performance. In L. L. Martin & A. Tesser (Eds.), *Striving and feeling: Interactions among goals, affect, and self-regulation* (pp. 99-120). Mahwah, NJ: Lawrence Erlbaum.
- Collins, J. E. (1978). Effects of restraint, monitoring, and stimulus salience on eating behavior. *Addictive Behaviors*, *3*, 197-204.

- Cox, S. P. (2000). *Leader character: A model of personality and moral development*. Doctoral dissertation, University of Tulsa.
- Crowne, D., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting and Clinical Psychology, 24*, 349-354.
- de Waal, F. B. M. (2001a). *The ape and the sushi master*. New York: Basic Books.
- de Waal, F. B. M. (2001b). *Tree of origin: What primate behavior can tell us about human social evolution*. Cambridge, MA: Harvard University Press.
- Dennett, D. C. (2003). *Freedom evolves*. New York: Penguin.
- Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology, 56*, 5-18.
- Douglas, J. E. (1996). *Mindhunter: Inside the FBI's Elite Serial Crime Unit*. New York: Pocket Books.
- Duval, S., & Wicklund, R. A. (1972). *A theory of objective self-awareness*. New York: Academic Press.
- Feather, N. T. (1961). The relationship of persistence at a task to expectation of success and achievement related motives. *Journal of Abnormal and Social Psychology, 63*, 552-561.
- 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.
- Finkel, E. J., Campbell, W. K., Brunell, A. B., & Burke, B. J. (2004). *High-maintenance interaction: Poor interpersonal coordination impairs self-regulatory effectiveness*. Unpublished manuscript, Northwestern University, Evanston, IL.
- Fitzsimons, G. M., & Bargh, J. A. (2003). Thinking of you: Nonconscious pursuit of interpersonal goals associated with relationship partners. *Journal of Personality and Social Psychology, 84*, 148-164.
- Forgas, J. P., & Ciarrochi, J. V. (2002). On managing moods: Evidence for the role of homeostatic cognitive strategies in affect regulation. *Personality and Social Psychology Bulletin, 28*, 336-345.

- Freud, S. (1961). *Civilization and its discontents* (J. Riviere, Trans.). London: Hogarth Press. (Original work published 1930)
- Gailliot, M. T., Plant, E. A., Butz, D. A., & Baumeister, R. F. (2004). *Increasing self-regulatory strength can reduce the depleting effect of suppressing stereotypes*. Manuscript submitted for publication.
- Gazzaniga, M. S., Ivry, R. B., & Mangun, G. R. (1998). *Cognitive neuroscience: The biology of the mind*. New York: Norton.
- Garlick, D. (2002). Understanding the nature of the general factor of intelligence: The role of individual differences in neural plasticity as an explanatory mechanism. *Psychological Review*, *109*, 116-136.
- Gilbert, D. T., Pinel, E. C., Wilson, T. D., Blumberg, S. J., & Wheatley, T. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology*, *75*, 617-638.
- Glass, D. C., & Singer, J. E. (1972). *Urban stress: Experiments on noise and social stressors*. New York: Academic Press.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, *54*, 493-503.
- Gollwitzer, P. M., Achtziger, A., Schaal, B., & Hammelbeck, J. P. (2002). *Intentional control of stereotypical beliefs and prejudicial feelings*. Unpublished manuscript, University of Konstanz, Germany.
- Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology*, *73*, 186-199.
- Gordijn, E. H., Hindriks, I., Koomen, W., Dijksterhuis, A., & Van Knippenberg, A. (2004). Consequences of stereotype suppression and internal suppression motivation: A self-regulation approach. *Personality and Social Psychology Bulletin*, *30*, 212-224.
- Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.

- Govorun, O., & Payne, B. K. (2004). *Ego depletion and prejudice: Separating automatic and controlled components*. Unpublished manuscript, The Ohio State University.
- Grant, S. J. & Park, J. W. (2003, October). *The effect of goal orientation on self-regulatory depletion*. Paper presented at the annual meeting of the Association for Consumer Research, Toronto, Ontario, Canada.
- Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology, 74*, 224-237.
- Gross, J. J. (2001). Emotion regulation in adulthood: Timing is everything. *Current Directions in Psychological Science, 10*, 214-219.
- Herman, C. P. (1974). External and internal cues as determinants of the smoking behavior of light and heavy smokers. *Journal of Personality and Social Psychology, 30*, 664-672.
- Herman, C. P., & Mack, D. (1975). Restrained and unrestrained eating. *Journal of Personality, 43*, 647-660.
- Herman, C. P., Olmsted, M. P., & Polivy, J. (1983). Obesity, externality, and susceptibility to social influence: An integrated analysis. *Journal of Personality and Social Psychology, 45*, 926-934.
- Higgins, E. T. (1987). Self-discrepancies: A theory relating self and affect. *Psychological Review, 94*, 319-340.
- Higgins, E. T. (1996). The "self digest": Self-knowledge serving self-regulatory functions. *Journal of Personality and Social Psychology, 71*, 1062-1083.
- Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist, 52*, 1280-1300.
- Higgins, E. T. (2000). Making a good decision: Value from fit. *American Psychologist, 55*, 1217-1230.
- Higgins, E. T., Idson, L. C., Freitas, A. L., Spiegel, S., & Molden, D. C. (2003). Transfer of value from fit. *Journal of Personality and Social Psychology, 84*, 1140-1153.

- Higgins, E. T., Roney, C. J., Crowe, E., & Hymes, C. (1994). Ideal versus ought predilections for approach and avoidance distinct self-regulatory systems. *Journal of Personality and Social Psychology, 66*, 276-286.
- Higgins, E. T., & Spiegel, S. (2004). Promotion and prevention strategies for self-regulation: A motivated cognition perspective. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation* (pp. 171-187). New York: Guilford Press.
- Hoch, S. J., & Loewenstein, G. F. (1991). Time-inconsistent preferences and consumer self-control. *Journal of Consumer Research, 17*, 492-507.
- Hull, J. G. (1981). A self-awareness model of the causes and effects of alcohol consumption. *Journal of Abnormal Psychology, 90*, 586-600.
- Inzlicht, M., McKay, L., & Aronson, J. (2003, February). *Losing control: Stereotype threat as ego depletion*. Paper presented at the presented at the annual meeting of the Society for Personality and Social Psychology, Los Angeles, CA.
- Johnson, C.S., & Shah, J. (2004, January). Running on empty: The effects of self-regulatory depletion on goal pursuit. Paper presented at the presented at the annual meeting of the Society for Personality and Social Psychology, Austin, TX.
- 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.
- Knight, L. and F. Boland (1989). Restrained eating: An experimental disentanglement of the disinhibiting variables of calories and food type. *Journal of Abnormal Psychology, 98*, 412-420.
- Knowles, E. S., Brennan, M., & Linn, J. A. (2004). *Consuming resistance to political ads*. Manuscript in preparation.
- Kuhl, J. & Kazén, M. (1994). Self-discrimination and memory: State orientation and false self-ascription of assigned activities. *Journal of Personality and Social Psychology, 66*, 1103-1115.

- Linder, D. E., Cooper, J., & Jones, E. E. (1967). Decision freedom as a determinant of the role of incentive magnitude in attitude change. *Journal of Personality and Social Psychology, 6*, 245-254.
- Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology, 38*, 257-269.
- Marlatt, G. A., & Gordon, J. R. (Eds.). (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press.
- Miller, R. S. (1997). Inattentive and contented: Relationship commitment and attention to alternatives. *Journal of Personality and Social Psychology, 73*, 758-766.
- Mischel, W., & Ayduk, O. (2004). Willpower in a cognitive-affective processing system: The dynamics of delay of gratification. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation* (pp. 99-129). New York: Guilford Press.
- Mischel, W., Ebbesen, E. B., & Zeiss, A. R. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of Personality and Social Psychology, 21*, 204-218.
- Mischel, W., Shoda, Y. & Peake, P. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology, 54*, 687-696.
- Mischel, W., Shoda, Y. & Rodriguez, M. L. (1989). Delay of gratification in children. *Science, 244*, 933-938.
- Muraven, M., Baumeister, R. F., & Tice, D. M. (1999). Longitudinal improvement of self-regulation through practice: Building self-control through repeated exercise. *Journal of Social Psychology, 139*, 446-457.
- Muraven, M., Collins, R. L., & Nienhaus, K. (2002). Self-control and alcohol restraint. An initial application of the self-control strength model. *Psychology of Addictive Behaviors, 16*, 113-120.



- 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.
- Niaura, R.S., Rohsenow, D., Binkoff, J.A., Monti, P.M., Pedraza, M., & Adams, D.B. (1988) Relevance of cue reactivity to understanding alcohol and smoking relapse. *Journal of Abnormal Psychology, 97*, 133-152.
- Oaten, M., & Cheng, K. (2004, February). *Longitudinal gains in self-control*. Poster session presented at the annual meeting of the Society for Personality and Social Psychology, Austin, TX.
- Oaten, M., Cheng, K., & Baumeister, R. F., (2004). *Strengthening the regulatory muscle: The longitudinal benefits of exercising self-control*. Manuscript in preparation.
- Peele, S. (1989). *The diseasing of America*. Boston, MA: Houghton Mifflin Co.
- Pervin, L. A. (1996). Does it take a gun to the head to assess problems of volition? *Psychological Inquiry, 7*, 72-74.
- Plant, E. A., & Devine, P. G. (1998). Internal and external motivation to respond without prejudice. *Journal of Personality and Social Psychology, 75*, 811-832.
- Polivy, J. (1998). The effects of behavioral inhibition: Integrating internal cues, cognition, behavior, and affect. *Psychological Inquiry, 9*, 181-204.
- Powers, W. T. (1973). *Behavior: The control of perception*. Chicago: Aldine.
- Reed, G.F. (1985). *Obsessional experience and compulsive behaviour: A cognitive-structural approach*. Orlando FL: Academic Press.
- Rickard-Figueroa, K., & Zeichner, A. (1985). Assessment of smoking urge and its concomitants under an environmental smoking cue manipulation. *Addictive Behaviors, 10*, 249-256.
- Richards, J. M., & Gross, J. J. (1999). Composure at any cost? The cognitive consequences of emotion suppression. *Personality and Social Psychology Bulletin, 25*, 1033-1044.

- Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology*, *79*, 410-424.
- Richeson, J. A., & Shelton, J. N. (2003). When prejudice does not pay: Effects of interracial contact on executive function. *Psychological Science*, *14*, 287-290.
- Roberts, W. A. (2002). Are animals stuck in time? *Psychological Bulletin*, *128*, 473-489.
- Rothbaum, E., 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.
- Rozin, P., & Royzman, E. B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, *5*, 296-320.
- Schachter, S. (1968). Obesity and eating. *Science*, *161*, 751-756.
- Schmeichel, B. J., & Baumeister, R. F. (2004). Self-regulatory strength. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation* (pp. 84-98). New York: Guilford Press.
- Schmeichel, B. J., Demaree, H. A., Robinson, J. L., & Pu, J. (in press). Ego depletion by response exaggeration. *Journal of Experimental Social Psychology*.
- Schmeichel, B. J., Gailliot, M. T., & Baumeister, R. F. (2005). *Ego depletion undermines the benefits of the active self to memory*. Manuscript submitted for publication.
- Schmeichel, B. J., Vohs, K. D., & Baumeister, R. F. (2003). Intellectual performance and ego depletion: Role of the self in logical reasoning and other information processing. *Journal of Personality and Social Psychology*, *85*, 33-46.
- Schmeichel, B. J., Vohs, K. D., & Baumeister, R. F. (2005). *Self-affirmation and the self's executive function*. Manuscript in preparation.
- Searle, J. R. (2001). *Rationality in action*. Cambridge, MA: MIT Press.
- Seeley, E. A., & Gardner, W. L. (2003). The "selfless" and self-regulation: The role of chronic other-orientation in averting self-regulatory depletion. *Self and Identity*, *2*, 103-118.
- Seligman, M. E. P. (1994). *What you can change and what you can't*. New York: Knopf.

- Shah, J. (2003). Automatic for the people: How representations of significant others implicitly affect goal pursuit. *Journal of Personality and Social Psychology, 94*, 661-681.
- Shah, J., Higgins, E. T., & Friedman, R. S. (1998). Performance incentives and means: How regulatory focus influences goal attainment. *Journal of Personality and Social Psychology, 74*, 285-293.
- Schank, R. C., & Abelson, R. P. (1977). *Scripts, plans, goals and understanding: An inquiry into human knowledge structures*. Oxford, England: Lawrence Erlbaum.
- Sipe, A. W. R. (1995). *Sex, priests, and power: Anatomy of a crisis*. New York: Brunner/Mazel Publishers.
- Smith, R. W. (2002). Effects of relaxation on self-regulatory depletion. (Doctoral dissertation, Case Western Reserve University, 2002.) *Dissertation Abstracts International, 63* (5-B), 2605.
- Sobell, M. B., & Sobell, L. C. (1984). The aftermath of heresy: A response to Pendery et al.'s (1982) critique of "Individualized behavior therapy for alcoholics". *Behavior Research and Therapy, 22*, 413-440.
- Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 21, pp. 261-302). New York: Academic Press.
- 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*, 271-322.
- Tice, D. M., Butler, J. L., Muraven, M. B., & Stillwell, A. M. (1995). When modesty prevails: Differential favorability of self-presentation to friends and strangers. *Journal of Personality and Social Psychology, 69*, 1120-1138.
- Tice, D. M., Muraven, M., Slessareva, L., & Baumeister, R. F. (2004). *Replenishing the self: Effects of positive affect on performance and persistence following ego depletion*. Manuscript submitted for publication.
- Tomasello, M., & Call, J. (1997). *Primate cognition*. New York: Oxford University Press.

- Vohs, K. D. & Baumeister, R.F. (2004). *Depletion of self-regulatory resources makes people selfish*. Unpublished manuscript, University of British Columbia, Vancouver, BC, Canada.
- 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., Twenge, J. M., Schmeichel, B. J., Tice, D. M, & Crocker, J. (2004). *Decision fatigue: Making multiple decisions depletes the self*. Manuscript in preparation.
- Vohs, K. D., & Ciarocco, N. J. (2004). Interpersonal functioning requires self-regulation. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation* (pp. 392-410). New York: Guilford Press.
- Vohs, K. D., & Faber, R. J. (2005). *Spent resources: Self-regulation and impulse buying*. Unpublished manuscript, University of British Columbia, Vancouver, BC, Canada
- Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science*, *11*, 249-254.
- Vohs, K. D., & Schmeichel, B. J. (2003). Self-regulation and the extended now: Controlling the self alters the subjective experience of time. *Journal of Personality and Social Psychology*, *85*, 217-230.
- Webb, T. L., & Sheeran, P. (2002). Can implementation intentions help to overcome ego-depletion? *Journal of Experimental Social Psychology*, *39*, 279-286.
- Wegner, D. M. (1989). *White bears and other unwanted thoughts*. New York: Vintage.
- Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review*, *101*, 34-52.
- Wegner, D. M. (2002). *The illusion of conscious will*. Cambridge, MA: MIT Press.
- Wegner, D. M., Schneider, D. J., Carter, S. R., & White, T. L. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology*, *53*, 5-13.

Weiland, P.E., Lassiter, G.D., Daniels, L., & Fisher, A. (2004, January). *Can nonconscious goals moderate self-regulatory failure?* Paper presented at the annual meeting of the Society for Personality and Social Psychology, Austin, TX.

### Author Notes

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