

On Enhancing and Diminishing Energy Through Psychological Means: Research on Vitality and Depletion From Self- Determination Theory

F. Martela¹, C.R. DeHaan², R.M. Ryan^{2,3}

¹University of Helsinki, Helsinki, Finland; ²University of Rochester, Rochester, NY, United States; ³Australian Catholic University, Strathfield, NSW, Australia

INTRODUCTION

Vitality is one of the most phenomenally accessible variables in psychology. People can readily report on the available energy they have (Ryan & Frederick, 1997; Thayer, 2001). Even young children define wellness in terms of energy to do what one wants (eg, Natapoff, 1978). Many intellectual traditions also place concepts of energy at the heart of their definitions of health and wellness. For example, Chinese traditions refer to such vital energy as *chi*, and see it as a source of life, creativity, and organismic health. The Japanese concept of *Ki* carries similar implications. Among Western traditions, Freud (1923) proposed that humans have a limited supply of psychic energy, the availability or accessibility of which was defining of ego-strength and wellness. Selye (1956), a pioneer of stress research, conceptualized *adaptation energy* as a source of resilience, and argued that it could be depleted by stressful life events.

Recent research in social psychology has focused on the blocking and depletion of energy. Most notably, the *resource strength model* (Baumeister, Muraven, & Tice, 2000) proposes that the regulation or self-control of

behavior requires energy. Self-control works “like a muscle” and thus draws upon resources that become depleted through use. The resulting state of ego depletion is “a temporary reduction in the self’s capacity or willingness to engage in volitional action..., caused by prior exercise of volition” (Baumeister, Bratslavsky, Muraven, & Tice, 1998, p. 1253). In other words, it is the energy available for volitional activity that is undermined. Various experiments have indeed shown that self-control can deplete energy, and have connected this depletion to objective outcomes such as behavioral persistence and changes in blood glucose levels (eg, Baumeister & Vohs, 2007; Gailliot et al., 2007).

Research on ego depletion can tell us much about what diminishes energy. However, the processes that drain a person of energy are only one side of the coin. In addition to researching forms of regulation that deplete energy, we need complementary research on vitality and invigoration—on the processes that maintain or enhance energy. Whereas ego depletion is the state where a limited resource “akin to energy or strength is expended” (Tice, Baumeister, Shmueli, & Muraven, 2007, p. 379), *vitality* is its opposite, representing “the positive feeling of having energy available to the self” (Nix, Ryan, Manly, & Deci, 1999, p. 266).

Using the perspective of *self-determination theory* (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000), researchers have been exploring factors associated with the maintenance and enhancement of subjective vitality and its behavioral manifestations. SDT distinguishes between autonomous and controlled forms of regulation, the former of which are felt to be volitional and self-endorsed, and the latter of which are felt to be externally regulated (Deci & Ryan, 2000). Autonomous motivation, as used here, thus does not imply any distinction between whether goal pursuit is implicit or explicit, but is rather about whether the motivation is felt to be self-determined or externally controlled.

Herein we integrate research on subjective vitality based on SDT with research on ego depletion and self-control, aiming to show that they are “tapping into the same phenomenon” (Ryan & Deci, 2008, p. 711). We further argue that the ability to allocate energy to behavior is a function of both physical and psychological factors. Specifically, our SDT formulation suggests that controlled forms of motivation are particularly depleting, lowering available energy and subjective vitality, whereas autonomous activities can maintain or even enhance available energy. Moreover, experiences of basic need satisfactions for relatedness, competence, and autonomy (eg, falling in love as a relatedness satisfaction, finding a sense of purpose as an autonomy satisfaction, discovering a new skill as a competence satisfaction) can all enhance vitality precisely because they invigorate self-functioning. In fact, basic psychological need satisfactions mediate the effects of many factors on energetic and health outcomes. Such results have both basic science import, as well as

practical implications for schools, workplaces, and sports, among other applied domains.

VITALITY DEFINED

Subjective vitality is defined as the accessible “experience of having positive energy available to or within the regulatory control of one’s self” (Ryan & Frederick, 1997, p. 530). Vitality describes the positive feeling of aliveness, energy, enthusiasm, and spirit. As a sense that energy is available to the self, subjective vitality is predicted to support volitional activity and performance, among other salutary effects. Ryan and Frederick (1997) developed a subjective vitality scale (SVS) to measure subjective vitality. This construct is differentiated from generalized energy in three main ways. First, it represents a subjective appraisal rather than a physiological condition, even though physical states such as fatigue or blood glucose levels impact this experience. Many effortful activities require, for example, the expenditure of caloric energy, yet some of these activities can be experienced as vitalizing, particularly when they are fun or enjoyable, whereas others, though requiring equal physical effort, feel particularly draining and tiring. Thus although subjective vitality is impacted by both somatic factors such as diet, sleep, or exercise, psychological factors such as autonomous motivation or social relatedness can strongly moderate or buffer such effects. As such, subjective vitality is a reflection of both biologic and psychological factors (Ryan & Frederick, 1997) and these self-perceptions of available energy are generally predictive of persistence, performance, and relevant health outcomes (Muraven, Gagné, & Rosman, 2008; Ryan & Deci, 2008; see also Chapter 10).

Secondly, vitality is specifically about energy that is *available to the self*. Thus the mere presence of arousal or energies that are not typically associated with volition, such as anger, anxiety, pressure, or jitteriness, are expected (and have been found) to be unrelated (or even negatively related) to vitality (Ryan & Frederick, 1997). Vitality is thus distinct from activation or energy per se, which includes also such negatively toned states and varied types of arousal. As such, vitality is related to the concepts of vigor (McNair, Lorr, & Droppleman, 1971), activated positive affect (Yik, Russell, & Feldman Barrett, 1999), and calm (vs tense) energy (Thayer, 1996), which all entail positively toned, actively energized states. It is in these states a person can most effectively *mobilize* and *intentionally regulate* energy, as experimental evidence will show.

Third, it is important to note that vitality is distinct from happiness or mere positive affect. Although both happiness and vitality are positive and pleasant states, the latter is characterized by high energy or activation (Nix et al., 1999). As a number of distinct researchers have shown, positive

1. MODERATORS OF EGO CONTROL

affect as such includes both high-activation dimensions (eg, feeling active, energetic, vigorous) and low-activation dimensions (eg, feeling content, satisfied, pleased), and vitality as a construct is associated only with the former (eg, McNair et al., 1971; Nowlis & Green, 1964; Purcell, 1982; Thayer, 1987; Yik et al. 1999). We add, however, that vitality is experienced only when positively toned vigor and energy are seen as self-organized or within autonomous control. For example, obsessively passionate individuals, while often vigorous, are vulnerable to depletion effects relative to more autonomously engaged people (Vallerand, 2015).

Although vitality is a subjectively accessible state, it has been associated with behavioral and objective health outcomes (Hirsch, Molnar, Chang, & Sirois, 2014). When in more vital states, people are more active and productive, report greater mental health, and cope better with stress and challenge (eg, Penninx et al., 2000; Ryan & Frederick, 1997; Tremblay, Blanchard, Pelletier, & Vallerand, 2006). Activated forms of positive affect that are associated with vitality have also been shown to render people more resilient to physical and viral stressors and less vulnerable to illness (eg, Benyamini, Idler, Leventhal, & Leventhal, 2000; Cohen, Alper, Doyle, Treanor, & Turner, 2006; Polk, Cohen, Doyle, Skoner, & Kirschbaum, 2005).

Kasser and Ryan (1999) studied elderly persons in a nursing facility, showing that vitality was positively associated with perceived physical health and psychological well-being, and negatively associated with depression and anxiety. Moreover, it has been suggested that vitality is associated with specific configurations of brain activation (Barrett, Della-Maggiore, Chouinard, & Paus, 2004) and positive response mechanisms to life challenges (Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005). In addition to being a desirable phenomenological state in itself, vitality thus has important physical and psychological consequences that make it an important focus of research.

DISTINCT FORMS OF SELF-REGULATION: SELF-CONTROL AND AUTONOMOUS REGULATION

An important insight arising from research on subjective vitality is that whereas efforts to control oneself drain psychological energy and vitality, autonomous self-regulation typically does not. In fact, instead of resulting in ego depletion, autonomous self-regulation has in some experiments predicted increases in subjective vitality and the behavioral indicators of energy (or nondepletion) associated with it (eg, see Kazén, Kuhl, & Leicht, 2015). Although ego-depletion models typically equate the concepts of self-control and self-regulation, suggesting that all acts of self-regulation entail energy expenditure and depletion, SDT has long maintained that these concepts should be clearly differentiated (Ryan, 1982). Motivation

1. MODERATORS OF EGO CONTROL

is considered *self-controlling* when based in external and introjected regulations, whereas *autonomous self-regulation* refers to a situation where a behavior is maintained due to being intrinsically motivating or integrated with a person's sense of self. Self-control is thus highly effortful: One part of one's personality must override and suppress another. In fact, self-control, is defined in ego-depletion models as "the capacity to alter or override dominant response tendencies and to regulate behavior, thoughts, and emotions" (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012, p. 77) and thus seems similar to SDT's self-controlling forms of regulation. SDT would thus concur with the ego-depletion model that in cases where self-control is "controlling" in nature, behavioral regulation will be more effortful and result in the depletion of energy as well as subjective vitality. Yet because autonomous forms of self-regulation involve behavior that is more self-congruent and expressive of one's interests and values, SDT would argue that they do not require the same need for exhausting internal control or vigilant inhibition of competing motives.

Studies both by depletion model and SDT researchers have in fact well demonstrated that self-controlling forms of regulation clearly deplete energy as. For example, Vohs and Heatherton (2000) placed people adjacent to a bowl of candy where they had to control their urge to eat the candy. They showed that the performance on a subsequent activity demanding cognitive resources was worse for dieters sitting near the candy (who presumably needed to control themselves) than for either dieters sitting farther from the candy or participants not on a diet who sat near the candy. In another study, suppressing emotions while watching a sad movie decreased subsequent stamina in squeezing a handgrip exerciser (Muraven, Tice, & Baumeister, 1998). The decreased performance on subsequent tasks is interpreted as evidence of ego depletion, and a line of similar studies have shown that self-control used in one kind of task makes it less available in a subsequent task, even if that task would be of a completely different kind (for recent metaanalyses, see Hagger, Wood, Stiff, & Chatzisarantis, 2010; de Ridder et al., 2012).

SDT's studies of the undermining effects of self-controlling states on intrinsic motivation and autonomous persistence are longstanding (Deci & Ryan, 1985; 2000). SDT's approach to vitality and depletion makes the additional, and corollary, prediction that autonomous self-regulation, which involves less inhibition and control, is less depleting than the same activities when controlled by external or internal forces (Ryan & Frederick, 1997). The more the *perceived locus of causality* (de Charms, 1968) for actions is external to the self, the more that activity feels forced and thus more draining of energy. For example, Nix et al. (1999) performed three experiments to examine the difference between autonomous and nonautonomous regulation on their effect on vitality. In the first experiment, one group of participants were able to freely work on a cognitive

1. MODERATORS OF EGO CONTROL

problem-solving task, while other group had to enact identical behaviors through external directives. Whereas the vitality of other-directed participants dropped significantly from pre- to postexperiment, self-directed participants maintained same levels of vitality. In the second experiment, participants were asked to solve puzzles in two conditions: in the task-involving condition participants were told to solve the puzzles without any emphasis on evaluation, while in the ego-involving condition performance was emphasized, for example, by stating that the puzzles are used as a measure of intelligence in many places. The rationale was that emphasizing performance would make the participants feel more controlled and less self-determined (Ryan, 1982). A manipulation check showed that this indeed was the case, and results showed more positive change in vitality in the task-involving condition relative to the ego-involving condition. In a third study, participants were asked to imagine their reactions to success in a class they had either taken voluntarily or in one they were required to take and rate the expected feelings, including vitality. Again, vitality was higher in the voluntary group. Interestingly, in all three studies the post-study levels of happiness of the participants did not differ between the autonomous and controlled group. In other words, the data demonstrated the distinctiveness of vitality from happiness, showing that although success on a task might engender happiness (which happened in all three experiments), it was success with a more internal locus of causality that leads to greater vitality.

Diverse studies have been corroborating these findings. Rouse, Ntoumanis, and Duda (2013) showed that while a cognitively demanding task decreased vitality for people low in autonomous motivation (as compared to a control group with less demanding task), levels of vitality were maintained for participants high in autonomous motivation. Thoman, Smith, and Silvia (2011) found that engaging in an interesting task (which suggests greater autonomy) replenished more resources than a positive or a neutral task, even though the interesting task was more complex and required more effort than the other tasks. In field research, Gagne, Ryan, and Bargmann (2003) measured elite level female gymnasts' vitality both before and after practice. It turned out that intrinsic motivation predicted increased subjective vitality after practice. Even though practices were physically demanding, the energetic activation and vitality of the athletes was enhanced when they were intrinsically motivated. Kasser and Ryan (1999) showed that residents of a nursing care environment for older adults who reported more autonomous regulation of daily activities had more vitality. Perceived nursing care staff autonomy support was also strongly associated with vitality. Studies in the domain of work (Baard, Deci, & Ryan, 2004), teaching (Núñez, Fernández, León, & Grijalvo, 2015), and friendship (Deci, Guardia, Moller, Scheiner, & Ryan, 2006), have all similarly found that people report greater vitality in the presence of

autonomy support. These and other diverse studies support SDT's view that autonomous forms of self-regulation are markedly less depleting than external- or self-controlling regulations.

Beyond the issue of autonomous and controlled forms of regulation, SDT suggests that energy fluctuations are predicted by physical supports such as food intake or resting (eg, Visser, Hirsch, Brown, Ryan, & Moynihan, 2015), but also by psychological factors—in particular the satisfaction or frustration of basic psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2008). When people engage in activities that satisfy these psychological needs, they show less depletion, and may experience increased vitality or energy available to the self.

INTEGRATING THE EGO-DEPLETION MODEL AND SELF-DETERMINATION THEORY'S MODEL OF VITALITY

The different and yet potentially complementary theoretical assumptions and predictions made by SDT and the regulatory strength model are illustrated by two early studies on choice and ego depletion. The first was by Baumeister, Bratslavsky, Muraven, and Tice (1998), who hypothesized that the process of making a choice would be depleting, relative to not making a choice, as the former involved cognitive effort. In contrast, SDT would suggest that a meaningful choice would facilitate autonomous self-regulation and would be less depleting than no choice. Nonetheless results from Baumeister et al. (1998, Study 2) initially supported their hypothesis. In the study, participants were told they would have to tape an argument for one side of a controversial issue, and they were asked to decide which side of the debate they would like to defend. However, the experimenter then told each person in the "high-choice" condition that enough participants had already chosen a specified side of the argument, so it would be very helpful if the participant would choose the other side, adding, however, that it really was "up to them to decide." This "high-choice" condition was compared with a "no-choice" condition in which participants were simply assigned one of the two sides of the issue. Before any speeches were taped, all participants were given an unsolvable puzzle task and ego depletion was assessed by how long time participants persisted with the puzzle. Results showed that high-choice participants persisted for a shorter period of time compared to no-choice participants, suggesting that choice had depleted their energy.

Coming from the SDT lens, however, a different interpretation of these results seemed plausible. In this "high-choice" condition, instead of participants experiencing a meaningful choice to select the side they wanted, they might have felt controlled in a subtle way. They were first told they

1. MODERATORS OF EGO CONTROL

had choice, but then softly pressured to pick a specific option, as it would “help the study a great deal” (Baumeister et al., 1998, p. 1257). The likelihood that participants did not experience choice, was also indicated by the fact that all of them, without exception, agreed to take the side that the experimenter suggested. But even more specifically, a prior experiment testing SDT by Pittman, Davey, Alafat, Wetherill, and Kramer (1980) had used just such a manipulation as a *controlling condition*, which they showed undermined an internal perceived locus of causality for the task, and subsequent intrinsic motivation. Moreover, a large number of studies have shown that making a meaningful choice should enhance autonomous motivation (see Patall, Cooper, & Robinson, 2008) and energy for tasks (Meng & Ma, 2015). Therefore it seemed that while true and meaningful choice should be less ego depleting, pressured choice (such as this “high-choice” manipulation of Baumeister et al. 1998) would be experienced as controlling and be ego depleting.

To test this, Moller, Deci, and Ryan (2006) conducted an experiment using methods that paralleled those used by Baumeister et al. (1998, Study 2). However, in the new experiment there were now three conditions. In a “true-choice” condition, participants were told about the two sides of a controversial issue, and were free to choose whichever side they wanted, without pressure from the experimenter. The “compelled-choice” condition was identical to the “high-choice” condition of Baumeister et al. (1998), that is, participants were told that they were free to make the choice, but also that it would be very helpful if they chose a specific side. In a third, “no-choice” condition, participants were simply assigned to one side. Results of this study were in line with Baumeister et al. (1998) results insofar that people in the “compelled-choice” condition again showed more ego depletion as compared to the “no-choice” participants. However, participants in the “true-choice” condition persisted significantly longer than participants in the “compelled-choice” participants, showing that it was not choice itself, but the controlled motivation that was ego depleting.

Other research has further connected the strength model and research on vitality. In one experiment, Muraven et al. (2008) asked participants to complete a brief, potentially depleting exercise (retyping a paragraph but omitting es and spaces). However, participants in the controlling condition had to do this in more pressuring conditions, where they were reminded about the time pressure and the demand to do well on the task. Subsequently, all participants had to engage in another task (hitting a key when certain numbers appeared on screen) that measured their ability to concentrate. The results showed that those in the pressuring condition performed worse on this task, missing more targets. In addition, this relation was mediated by subjective vitality: feeling pressure to exert self-control led to lower levels of subjective vitality, which in turn were related to poorer self-control performance. In another experiment, Muraven et al. (2008)

also showed that subjective vitality as measured with the SVS mediated the link between more or less autonomy-supportive experimental condition and depletion outcomes in subsequent tasks. These results directly linked subjective vitality and the behavioral measure of ego depletion: People in autonomy-supportive environments experience more vitality, and therefore exhibit less depletion. In yet another relevant paper, [Muraven, Rosman, and Gagné \(2007\)](#) reasoned that performance-contingent rewards to exert self-control might undermine autonomous motivation (a well-documented effect within SDT, see [Deci, Koestner, & Ryan, 1999](#)), resulting in depletion. They indeed found this effect, manifest as poorer performance during a subsequent task. Finally, [Muraven \(2008\)](#), rather than manipulating people's sense of autonomy, simply placed a bowl of cookies in front of them and asked them to complete a questionnaire that measured the relative autonomy of their reasons for not eating the cookies. Results showed that more autonomous reasons to regulate behavior as regards the cookies predicted better performance on a subsequent task than more controlled reasons for abstaining.

In a particularly interesting and potentially important study, [Kazén et al. \(2015\)](#) gave participants either self-motivating or self-controlling instructions to perform a cognitively demanding version of the Stroop task, and then measured both their performance on a second task, and their blood glucose levels. Basing their hypotheses on both *personality systems interaction* (PSI; [Kuhl, 2000](#)) as well as SDT, they predicted that whereas self-controlled actions would deplete energy, autonomously motivated actions would invigorate. Furthermore based on [Beedie and Lane's \(2012\)](#) resource allocation model of self-control, they suggested that blood glucose levels would follow the same patterns: Instead of being simply depleted by mental effort as suggested by [Gailliot and Baumeister \(2007\)](#), the redirection of glucose to brain would be governed by an appraisal of the importance of the situation, such that in personally relevant situations blood glucose levels would be maintained or even increased. Results showed that, consistent with the ego-depletion model, blood glucose levels of the self-control group did indeed drop during the experiment. However, the self-motivating group did not only perform better on the subsequent task compared to the self-control group, they showed a *rise* in their blood glucose levels. The researchers noted that such increments in blood glucose after performing tasks requiring executive control "are *not* expected by the strength model of ego depletion," but are congruent with both PSI and SDT ([Kazén et al., 2015](#)). This research thus provides evidence that performing tasks with autonomous regulation might not only maintain one's levels of energy, but could even increase them.

Together these studies demonstrate how subjective vitality and behavioral assessments of ego depletion are tapping into the same phenomenon ([Ryan & Deci, 2008](#)). Both depletion and invigoration effects seem to be

mediated by changes in subjective sense of vitality, and both reflect the sense of energy available to the self. More particularly, while self-control leads to depletion, autonomy-supportive contexts, and autonomous reasons for regulation lead to less depletion and in some cases even increased energy. Naturally sense of autonomy and control vary in degrees, and a singular situation can involve both factors that enhance autonomy and factors that suppress it, so how depleting the regulation of any given behavior would be is a relative issue. Nevertheless the suggestion that some psychological factors can maintain and even enhance our sense of vitality, leads us to ask what factors could have such positive effect on human sense of energy. We have already seen that autonomous forms of regulation have such positive effects, but also other factors can be important. It is to these factors that we turn next.

4cc4f50d026844082d1d4012f82e2f99
ebruary

PSYCHOLOGICAL SOURCES OF VITALITY

In their early studies on vitality, [Ryan and Frederick \(1997\)](#) showed that vitality was associated with physical factors. Physical activity, especially when autonomous, can enhance vitality. In contrast, when physically fatigued or ill, or when experiencing uncontrollable pain, people experience a lower sense of subjective vitality. Clearly there are many physical influences on available energy, including diet, exercise and health status. However, [Ryan and Frederick \(1997\)](#) also investigated psychological factors connected to vitality, showing that it was positively connected to self-actualization, self-determination, self-motivation, and varied indicators of mental health. Based on SDT, they suggested that the basic psychological needs for autonomy, competence, and relatedness provide important nutriment for the self ([Deci & Ryan, 2000](#)), and thus that satisfactions of these basic needs should lead to maintained or enhanced vitality. They found preliminary support for this notion in several studies, and since then a number of researchers have examined this relation directly. It is such psychological factors on which we focus in this review (see also Chapter 12).

4cc4f50d026844082d1d4012f82e2f99
ebruary

Basic Psychological Needs and Vitality

Among the most potent psychological factors impacting vitality and depletion are basic psychological need satisfactions and frustrations. Based on SDT, a number of studies have looked at daily fluctuations in people's sense of need satisfaction and vitality. For example, [Reis, Sheldon, Gable, Roscoe, and Ryan \(2000\)](#) showed that daily vitality was higher on days when psychological needs for autonomy, competence, and relatedness were satisfied and that each of these three needs had an independent

4cc4f50d026844082d1d4012f82e2f99
ebruary

1. MODERATORS OF EGO CONTROL

influence on vitality. These results have been corroborated by similar findings in other experienced sampling studies (Martela & Ryan, *in press*; Sheldon, Ryan, & Reis, 1996).

In contexts of physical activity, many studies have shown links between psychological need satisfactions and vitality indicators, independent of level of activity. In their study of elite gymnasts, Gagne et al. (2003) showed that satisfaction of all three needs during practice separately predicted positive pre- to postpractice changes in vitality. Vlachopoulos and Karavani (2009) subsequently examined predictors of vitality in a sample of Greek exercise participants. They reported a robust main effect between the experience of coaches autonomy support and the athlete's vitality, as well as a positive relation between vitality and all three psychological need satisfactions. In a mediation analysis, they found that the positive relations of autonomy support and vitality were most strongly mediated by *competence satisfaction*, which makes sense in this domain of activity where psychological needs for competence are so salient (see also Quested & Duda, 2010). Finally, Reinboth and Duda (2006) followed university athletes in the UK, assessing the coaching climate, basic need satisfactions, and both subjective vitality and physical symptoms. In line with their SDT-based hypothesis, an increase in perceptions of a task-involving climate positively predicted an increased satisfaction of the needs for autonomy, competence, and relatedness. In turn, changes in the satisfaction of the needs for autonomy and relatedness emerged as significant predictors of changes in subjective vitality.

The study of vitality and need satisfaction in organizational settings has been another active area of research (see Spreitzer, Sutcliffe, Dutton, Sonenshein, & Grant, 2005). In varied work contexts, all three needs have been found to be positively associated with vigor and negatively associated with exhaustion (Van den Broeck, Vansteenkiste, Witte, Soenens, & Lens, 2010), and combined need satisfaction was found to mediate the relationship between job resources, job demands, and employees' exhaustion and vigor (Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). In fact, Ryan, Bernstein, and Brown (2010) reported an experience sampling study of American workers and found that people reported lower vitality when in the work contexts as compared to their nonwork contexts. Further fluctuations in vitality were mediated by changes in autonomy and relatedness, which for most workers were needs not well satisfied in the workplace. Vitality for most of those full time employees rose on weekends, an effect accounted for by both increased choice of activities and greater relatedness satisfactions.

Insofar as work involves effortful regulation of behavior and cognition, how people conserve and regenerate energy surrounding work has also been a focus of research. For example, when workers engage in autonomous activities or autonomous forms of social relations during lunch

1. MODERATORS OF EGO CONTROL

breaks, recovery and revitalization are enhanced (eg, Trougakos, Hideg, Cheng, & Beal, 2013). In addition, workers who experience more autonomy and social support at work are more likely to employ strategies that effectively maintain energy across the day (Kinnunen, Feldt, de Bloom, & Korpela, 2015).

The management climate of workplaces in fact predicts vitality and well-being, and this relationship is strongly mediated by employees' basic psychological need satisfactions and frustrations in the workplace (Deci & Ryan, 2014; Schultz, Ryan, Niemeic, Legate, & Williams, 2015). For example, Graves and Luciano (2013), in a study of leadership communication and work climates, found that satisfaction of autonomy and competence needs on the job was associated with greater subjective vitality and organizational commitment. Quinn and Dutton (2005) argued that high-quality interpersonal connections at work engender a feeling of vitality, and a sense of eagerness and capability to act. Drawing on SDT, they proposed that energy and vitality are enhanced when people interpret interpersonal interactions at work as increasing their autonomy, competence, or relatedness. Kark and Carmeli (2009) similarly suggested that a sense of *psychological safety* is at the core of such high-quality connections. The climate of safety they describe is one of autonomy and relatedness supports—one where people feel safe to speak up, report mistakes and errors, and take risks without fearing a loss of status, or of feeling humiliated or rejected. Accordingly, Kark and Carmeli found that feelings of psychological safety directly affected employees' subjective vitality. Subjective vitality, in turn, partially mediated the relation between psychological safety and greater involvement in creative work. Together, such results suggest that the three basic needs for autonomy, competence, and relatedness, when satisfied, can be an important source of vitality for people, within and between tasks at work. These psychological need satisfactions can *engender* energy and, in interaction with physical influences on the individual, determine the overall energy available to the self.

Nature and Vitality

Human beings evolved in natural environments, and pervasive exposure to human-made and highly artifact-laden environments is, in evolutionary terms, a very recent phenomenon. Nature, in fact, still represents an important source of recreation, as people actively seek encounters with outdoor nature. Many people seem to think that natural environments can replenish their sense of vigor and vitality. It is possible that natural settings allow people to be more open and relaxed instead of engaging in effortful and directed attention. These everyday experiences led Ryan et al. (2010) to examine whether there is some specific connection between nature and vitality in the sense that nature would provide or catalyze positive energy.

Some data already existed to support this possibility (see, eg, Kaplan & Kaplan, 1989). For example, Greenway (1995, p. 128), reported that 90% of participants in an outdoor experience described “an increased sense of aliveness, well-being, and energy.” To test this connection more directly, Ryan, Bernstein, and Brown (2010) and Ryan et al. (2010) conducted five studies utilizing survey, experimental, and diary methods that all assessed the effects of being outdoors or around natural elements on subjective vitality. In a vignette study where participants had to rate how they would feel in various scenarios, they showed that people expected to experience more vitality when outdoors, even when effects for physical activity and social interactions were accounted for. In the second study, participants walked the same distance either indoors or outdoors, and the latter led to greater pre–post change in vitality. Third study asked participants to look at photographic scenes of either natural or built environments, and imagine themselves in these scenes. Results showed that exposure to nature scenes enhanced subjective vitality from pre-to-post exposure, while pictures of built environment did not have this effect. Finally, a diary methodology was used in studies 4 and 5 to examine within-person variations in vitality as a function of being outdoors, controlling for physical and social interactions. The results showed that being outdoors was associated with greater vitality, and furthermore, this relation was mediated by the presence of natural elements. This means that the more participants were exposed to natural surroundings while being outdoors, the greater the positive effect on vitality. In other studies Weinstein, Przybylski, and Ryan (2009) showed that exposure to nature not only increases our sense of vitality, it also makes us more prosocial, more valuing of intrinsic goals, and increases our sense of autonomy and relatedness to nature. Together, these studies utilizing multiple methods thus found a reliable association between exposure to outdoor natural environments and enhanced vitality. This is a conclusion that should be taken seriously in a time when longer working hours and increased “screen time” in front of TV’s and computers (Rigby & Ryan, 2011) increasingly separate people from nature.

Mindful Attention to Present

Another potential source of vitality is *mindfulness*, conceptualized as an open and receptive awareness and attention to present moment (Brown & Ryan, 2003). As vitality is understood to be calm and positive energy instead of tense and negative energy (Ryan & Frederick, 1997; Thayer, 2001), it is suggested that mindfulness might help people to calm and thus better tap into their sources of positive energy. Furthermore, mindful attention makes one more aware of various dimensions of experience—potentially also one’s intrinsic needs—and could thus lead to behavior that is more autonomously regulated and thus enhancing of vitality (Brown, Ryan, & Creswell, 2007). Indeed, Brown and Ryan (2003) showed that

subjectively evaluated mindful attention was positively associated with vitality, and [Fayad and Kazarian \(2013\)](#) similarly showed using a Lebanese sample that vitality was associated with experiential self-knowledge, a form of awareness close to mindfulness. Another study examined older adults and found that this positive relation between mindfulness and vitality was partially mediated by the enhanced sleep quality of persons higher in mindfulness ([Visser et al., 2015](#)). As with attention in nature, mindful attention is open and receptive, without the constraints or inhibitions required for more controlled forms of cognition and directed awareness ([Deci, Ryan, Schultz, & Niemiec, 2015](#)), which may in part explain its positive relations to vitality.

Benevolence and Vitality

Finally, we suggest that people feel more energy and vitality when they engage in eudaimonic activities such as benevolent and prosocial acts. In a series of experiments on helping, [Weinstein and Ryan \(2010\)](#) demonstrated that when persons helped others for autonomous rather than controlled reasons they showed enhanced vitality, and this effect was mediated by the three basic psychological needs. Similarly, [Deci et al. \(2006\)](#) found evidence that giving autonomy support to best friends was associated with enhanced vitality not only for the receiver, but also for the giver of support. In a study of Finnish employees, [de Bloom, Kinnunen, and Korpela \(2015\)](#) found that helping a coworker was associated with increased vigor. [Martela and Ryan \(in press\)](#), in turn, directly assessed the sense of beneficence—the feeling that one is having a positive impact in the lives of others—and found out that this sense of beneficence was associated with vitality in both cross-sectional and daily diary settings. Although a large part of this effect was mediated by SDT's three basic psychological needs, there also was independent effect of beneficence on vitality. In a further experimental study, [Martela and Ryan \(2016\)](#) asked participants to play a simple computer game that either had or did not have a prosocial impact, and found out that participants who were able to contribute through their gameplay experienced an increased sense of vitality, an effect that was mediated by sense of beneficence and the satisfaction of autonomy, competence, and relatedness.

CONCLUSION

Vitality and ego depletion are two concepts representing states of energy available to the self, with depletion referring to a state where energy available to the self is low, and vitality a state when that energy is high. Importantly, these two concepts seem to be directly linked. In one set

of studies, vitality mediated the effects of engaging in a more or less strenuous experimental condition on subsequent task performance, a standard measure of ego depletion (Muraven et al., 2008). It is also crucial to distinguish between self-regulation and self-control. Whereas self-regulation refers to the management of one's actions to be in line with one's intentions and goals, not all self-regulation is controlling (Baumeister, Vohs, & Tice, 2007; Ryan & Deci, 2008). SDT highlights that behavior can also be autonomously motivated, such as when the person feels positively and wholeheartedly motivated to act toward a goal (Deci & Ryan, 2000). In contrast to self-control, autonomous self-regulation does not represent forcing behavior to align with expectations, but rather the individual is volitionally and willingly engaged, leading to less ego depletion. When autonomous, motivation for activities is high, as evidenced by both self report and electrophysiological data (Meng & Ma, 2015), and some evidence even suggests increases in blood glucose as well as subjective vitality when people act autonomously (eg, Kazén et al., 2015). Even engaging in physically exhausting activities can be experienced as energizing when autonomy is high (Gagne et al., 2003). In addition we saw evidence that events that satisfy basic psychological needs for autonomy, competence, and relatedness also can enhance vitality, as these invigorate the sense of self. Additionally, exposure to nature, mindful attention to the present, and benevolent acts can similarly yield positive, energizing effects.

Our intent on this review is to trigger more engagement between research on self-regulation, self-control, and ego depletion on the one hand and self-determination, autonomous regulation, and vitality on the other hand. We believe that combining these two approaches can lead to a more complete understanding of both what drains and what maintains and enhances the energy that is available to, and can be harnessed by, the self. Such studies have implications both for the understanding of recovery and the replenishment of energetic resources depleted during work or stress, as well as our understanding of the processes that support human well-being and health more generally.

References

- Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: a motivational basis of performance and well-being in two work settings. *Journal of Applied Social Psychology*, 34, 2045–2068.
- Barrett, J., Della-Maggiore, V., Chouinard, P. A., & Paus, T. (2004). Mechanisms of action underlying the effect of repetitive transcranial magnetic stimulation on mood: behavioral and brain imaging studies. *Neuropsychopharmacology: Official Publication of the American College of Neuropsychopharmacology*, 29(6), 1172–1189.
- 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(5), 1252–1265.
- 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., & Vohs, K. D. (2007). Self-regulation, ego depletion, and motivation. *Social and Personality Psychology Compass*, *1*, 115–128.
- Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*, 351–355.
- Beedie, C. J., & Lane, A. M. (2012). The role of glucose in self-control: another look at the evidence and an alternative conceptualization. *Personality and Social Psychology Review*, *16*, 143–153.
- Benyamini, Y., Idler, E. L., Leventhal, H., & Leventhal, E. A. (2000). Positive affect and function as influences on self-assessments of health expanding our view beyond illness and disability. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *55*(2), P107–P116.
- de Bloom, J., Kinnunen, U., & Korpela, K. (2015). Recovery processes during and after work: associations with health, work engagement, and job performance. *Journal of Occupational and Environmental Medicine*, *57*(7), 732–742.
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822–848.
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, *18*(4), 211–237.
- de Charms, R. (1968). *Personal causation*. New York: Academic Press.
- Cohen, S., Alper, C. M., Doyle, W. J., Treanor, J. J., & Turner, R. B. (2006). Positive emotional style predicts resistance to illness after experimental exposure to rhinovirus or influenza A virus. *Psychosomatic Medicine*, *68*(6), 809–815.
- Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, *125*, 627–668.
- Deci, E. L., La Guardia, J. G., Moller, A. C., Scheiner, M. J., & Ryan, R. M. (2006). On the benefits of giving as well as receiving autonomy support: mutuality in close friendships. *Personality & Social Psychology Bulletin*, *32*(3), 313–327.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268.
- Deci, E. L., & Ryan, R. M. (2014). The importance of universal psychological needs for understanding motivation in the workplace. In M. Gagne (Ed.), *The Oxford handbook of work engagement, motivation, and self-determination theory* (pp. 13–32). New York, NY: Oxford University Press.
- Deci, E. L., Ryan, R. M., Schultz, P. P., & Niemiec, C. P. (2015). Being aware and functioning fully: mindfulness and interest-taking within self-determination theory. In K. W. Brown, R. M. Ryan, & J. D. Creswell (Eds.), *Handbook of mindfulness* (pp. 112–129). New York, NY: Guilford Press.
- Fayad, Y. I., & Kazarian, S. S. (2013). Subjective vitality of Lebanese adults in Lebanon: validation of the Arabic version of the subjective vitality scale. *Social Indicators Research*, *114*, 465–478.
- Freud, S. (1923). *The ego and the id*. New York: W.W. Norton.
- Gagne, M., Ryan, R. M., & Bargmann, K. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of Applied Sport Psychology*, *15*, 372–390.
- Gailliot, M. T., & Baumeister, R. F. (2007). The physiology of willpower: linking blood glucose to self-control. *Personality and Social Psychology Review*, *11*, 303–327.
- Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., ... Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy source: willpower is more than a metaphor. *Journal of Personality and Social Psychology*, *92*, 325–336.

1. MODERATORS OF EGO CONTROL

- Graves, L. M., & Luciano, M. M. (2013). Self-determination at work: understanding the role of leader-member exchange. *Motivation and Emotion, 37*, 518–536.
- Greenway, R. (1995). The wilderness effect and ecopsychology. In T. Roszak, M. E. Gomes, & A. D. Kanner (Eds.), *Ecopsychology: Restoring the Earth, healing the mind* (pp. 122–135). San Francisco, CA: Sierra Club Books.
- Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: a meta-analysis. *Psychological Bulletin, 136*, 495–525.
- Hirsch, J. K., Molnar, D., Chang, E. C., & Sirois, F. M. (2014). Future orientation and health quality of life in primary care. *Quality of Life Research, 24*, 1653–1659.
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature – A psychological perspective*. Cambridge: Cambridge University Press.
- Kark, R., & Carmeli, A. (2009). Alive and creating: the mediating role of vitality and aliveness in the relationship between psychological safety and creative work involvement. *Journal of Organizational Behavior, 30*, 785–804.
- Kasser, V. G., & Ryan, R. M. (1999). The relation of psychological needs for autonomy and relatedness to vitality, well-being, and mortality in a nursing home. *Journal of Applied Social Psychology, 29*, 935–954.
- Kazén, M., Kuhl, J., & Leicht, E.-M. (2015). When the going gets tough...: self-motivation is associated with invigoration and fun. *Psychological Research, 79*(6), 1064–1076.
- Kinnunen, U., Feldt, T., de Bloom, J., & Korpela, K. (2015). Patterns of daily energy management at work: relations to employee well-being and job characteristics. *International Archives of Occupational and Environmental Health, 88*(8), 1077–1086.
- Kuhl, J. (2000). A functional-design approach to motivation and self-regulation: the dynamics of personality systems and interactions. In M. Boekaerts, & P. R. Pintrich (Eds.), *Handbook of self-regulation* (pp. 111–169). San Diego, Ca: Academic Press.
- Martela, F., & Ryan, R. M. The benefits of benevolence: basic psychological needs, beneficence and the enhancement of well-being. *Journal of Personality*, (in press).
- Martela, F., & Ryan, R. M. (2016). Prosocial behavior increases well-being and vitality even without contact with the beneficiary: causal and behavioral evidence. *Motivation and Emotion, 40*(3), 351–357.
- McNair, D. M., Lorr, M., & Droppleman, L. F. (1971). *Profile of mood states*. San Diego, CA: Educational and Industrial Testing Service.
- Meng, L., & Ma, Q. (2015). Live as we choose: the role of autonomy support in facilitating intrinsic motivation. *International Journal of Psychophysiology, 98*(3), 441–447.
- Moller, A. C., Deci, E. L., & Ryan, R. M. (2006). Choice and ego-depletion: the moderating role of autonomy. *Personality & Social Psychology Bulletin, 32*(8), 1024–1036.
- Muraven, M. (2008). Autonomous self-control is less depleting. *Journal of Research in Personality, 42*(3), 763–770.
- Muraven, M., Gagné, M., & Rosman, H. (2008). Helpful self-control: autonomy support, vitality, and depletion. *Journal of Experimental Social Psychology, 44*(3), 573–585.
- Muraven, M., Rosman, H., & Gagné, M. (2007). Lack of autonomy and self-control: performance contingent rewards lead to greater depletion. *Motivation and Emotion, 31*, 322–330.
- Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: regulatory depletion patterns. *Journal of Personality and Social Psychology, 74*(3), 774–789.
- Natapoff, J. N. (1978). Children's views of health: a developmental study. *American Journal of Public Health, 68*, 995–1000.
- Nix, G. A., Ryan, R. M., Manly, J. B., & Deci, E. L. (1999). Revitalization through self-regulation: the effects of autonomous and controlled motivation on happiness and vitality. *Journal of Experimental Social Psychology, 35*(3), 266–284.
- Nowlis, V., & Green, R. F. (1964). *Factor analytic studies of mood*. Technical Report. Office of Naval Research. Contract No. Nonr-668(12).

1. MODERATORS OF EGO CONTROL

- Núñez, J. L., Fernández, C., León, J., & Grijalvo, F. (2015). The relationship between teachers' autonomy support and students' autonomy and vitality. *Teachers and Teaching, 21*, 191–202.
- Patall, E. A., Cooper, H., & Robinson, J. C. (2008). The effects of choice on intrinsic motivation and related outcomes: a meta-analysis of research findings. *Psychological Bulletin, 134*, 270–300.
- Penninx, B. W., Guralnik, J. M., Bandeen-Roche, K., Kasper, J. D., Simonsick, E. M., Ferrucci, L., & Fried, L. P. (2000). The protective effect of emotional vitality on adverse health outcomes in disabled older women. *Journal of the American Geriatrics Society, 48*, 1359–1366.
- Pittman, T. S., Davey, M. E., Alafat, K. A., Wetherill, K. V., & Kramer, N. A. (1980). Informational versus controlling verbal rewards. *Personality & Social Psychology Bulletin, 6*, 228–233.
- Polk, D. E., Cohen, S., Doyle, W. J., Skoner, D. P., & Kirschbaum, C. (2005). State and trait affect as predictors of salivary cortisol in healthy adults. *Psychoneuroendocrinology, 30*, 261–272.
- Purcell, A. T. (1982). The structure of activation and emotion. *Multivariate Behavioral Research, 17*(2), 221–251.
- Quested, E., & Duda, J. L. (2010). Exploring the social-environmental determinants of well- and ill-being in dancers: a test of basic needs theory. *Journal of Sport & Exercise Psychology, 32*(1), 39–60.
- Quinn, R. W., & Dutton, J. E. (2005). Coordination as energy-in-conversation. *Academy of Management Review, 30*, 36–57.
- Reinboth, M., & Duda, J. L. (2006). Perceived motivational climate, need satisfaction and indices of well-being in team sports: a longitudinal perspective. *Psychology of Sport and Exercise, 7*, 269–286.
- Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: the role of autonomy, competence, and relatedness. *Personality & Social Psychology Bulletin, 26*(4), 419–435.
- de Ridder, D. T., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control a meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review, 16*, 76–99.
- Rigby, S., & Ryan, R. M. (2011). *Glued to games: How video games draw us in and hold us spellbound*. Santa Barbara, CA: Praeger.
- Rouse, P. C., Ntoumanis, N., & Duda, J. L. (2013). Effects of motivation and depletion on the ability to resist the temptation to avoid physical activity. *International Journal of Sport and Exercise Psychology, 11*(1), 39–56.
- Rozanski, A., Blumenthal, J. A., Davidson, K. W., Saab, P. G., & Kubzansky, L. (2005). The epidemiology, pathophysiology, and management of psychosocial risk factors in cardiac practice: the emerging field of behavioral cardiology. *Journal of the American College of Cardiology, 45*(5), 637–651.
- Ryan, R. M. (1982). Control and information in the intrapersonal sphere: an extension of cognitive evaluation theory. *Journal of Personality and Social Psychology, 43*(3), 450–461.
- Ryan, R. M., Bernstein, J. H., & Brown, K. W. (2010). Weekends, work, and well-being: psychological need satisfactions and day of the week effects on mood, vitality, and physical symptoms. *Journal of Social and Clinical Psychology, 29*, 95–122. <http://dx.doi.org/10.1521/jscp.2010.29.1.95>.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78.
- Ryan, R. M., & Deci, E. L. (2008). From ego depletion to vitality: theory and findings concerning the facilitation of energy available to the self. *Social and Personality Psychology Compass, 2*(2), 702–717.

1. MODERATORS OF EGO CONTROL

- Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: subjective vitality as a dynamic reflection of well-being. *Journal of Personality, 65*(3), 529–565.
- Ryan, R. M., Weinstein, N., Bernstein, J., Brown, K. W., Mistretta, L., & Gagne, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology, 30*, 159–168.
- Schultz, P., Ryan, R. M., Niemeic, C., Legate, N., & Williams, G. C. (2015). Mindfulness, work climate, and psychological need satisfaction in employee well-being. *Mindfulness, 6*(5), 971–985.
- Selye, H. (1956). *The stress of life*. New York: McGraw-Hill.
- Sheldon, K. M., Ryan, R. M., & Reis, H. T. (1996). What makes for a good day? Competence and autonomy in the day and in the person. *Personality & Social Psychology Bulletin, 22*, 1270–1279.
- Spreitzer, G., Sutcliffe, K., Dutton, J., Sonenshein, S., & Grant, A. M. (2005). A socially embedded model of thriving at work. *Organization Science, 16*, 537–549.
- Thayer, R. E. (1987). Energy, tiredness, and tension effects of a sugar snack versus moderate exercise. *Journal of Personality and Social Psychology, 52*(1), 119–125.
- Thayer, R. E. (1996). *The origin of everyday moods*. New York: Oxford University Press.
- Thayer, R. E. (2001). *Calm energy*. New York: Oxford University Press.
- Thoman, D. B., Smith, J. L., & Silvia, P. J. (2011). The resource replenishment function of interest. *Social Psychological and Personality Science, 2*(6), 592–599.
- Tice, D. M., Baumeister, R. F., Shmueli, D., & Muraven, M. (2007). Restoring the self: positive affect helps improve self-regulation following ego depletion. *Journal of Experimental Social Psychology, 43*, 379–384.
- Tremblay, M. A., Blanchard, C. M., Pelletier, L. G., & Vallerand, R. J. (2006). A dual route in explaining health outcomes in natural disaster. *Journal of Applied Social Psychology, 36*, 1502–1522.
- Trougakos, J., Hideg, I., Cheng, B., & Beal, D. (2013). Lunch breaks unpacked: the role of autonomy as a moderator of recovery during lunch. *Academy of Management Journal, 57*, 405–421.
- Vallerand, R. J. (2015). *The psychology of passion*. New York, NY: Oxford.
- Van den Broeck, A., Vansteenkiste, M., De Witte, H., & Lens, W. (2008). Explaining the relationships between job characteristics, burnout, and engagement: the role of basic psychological need satisfaction. *Work & Stress, 22*(3), 277–294.
- Van den Broeck, A., Vansteenkiste, M., Witte, H., Soenens, B., & Lens, W. (2010). Capturing autonomy, competence, and relatedness at work: construction and initial validation of the work-related basic need satisfaction scale. *Journal of Occupational and Organizational Psychology, 83*, 981–1002.
- Visser, P. L., Hirsch, J. K., Brown, K. W., Ryan, R., & Moynihan, J. A. (2015). Components of sleep quality as mediators of the relation between mindfulness and subjective vitality among older adults. *Mindfulness, 6*(4), 723–731.
- Vlachopoulos, S. P., & Karavani, E. (2009). Psychological need and subjective vitality in exercise: a cross-gender situational test of the needs universality hypothesis. *Hellenic Journal of Psychology, 6*, 207–222.
- Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: a resource-depletion approach. *Psychological Science, 11*(3), 249–254.
- Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2009). Can nature make us more caring? Effects of immersion in nature on intrinsic aspirations and generosity. *Personality & Social Psychology Bulletin, 35*(10), 1315–1329.
- Weinstein, N., & Ryan, R. M. (2010). When helping helps: autonomous motivation for pro-social behavior and its influence on well-being for the helper and recipient. *Journal of Personality and Social Psychology, 98*(2), 222–244.
- Yik, M., Russell, J., & Feldman Barrett, L. (1999). Structure of self-reported current affect: integration and beyond. *Journal of Personality and Social Psychology, 77*(3), 600–619.

1. MODERATORS OF EGO CONTROL

4cc4f50d026844082d1d4012f82e2f99
ebrary

This page intentionally left blank

4cc4f50d026844082d1d4012f82e2f99
ebrary

4cc4f50d026844082d1d4012f82e2f99
ebrary

4cc4f50d026844082d1d4012f82e2f99
ebrary

What Does Ego-Depletion Research Reveal About Self-Control? A Conceptual Analysis

J.J. Carnevale¹, K. Fujita²

¹Purchase College SUNY, Purchase, NY, United States; ²The Ohio State University, Columbus, OH, United States

Although researchers have studied self-control—the ability to regulate one’s thoughts, feelings, and behavior to secure future benefits—for decades, interest in the topic has surged in recent years (eg, [Baumeister & Heatherton, 1996](#); [Baumeister & Vohs, 2004](#); [Metcalfe & Mischel, 1999](#); [Mischel, Shoda, & Rodriguez, 1989](#)). Much of this surge in interest can be attributed to research on ego depletion—the apparent diminished capacity or willingness to exert self-control following a previous self-control act ([Muraven & Baumeister, 2000](#)). In one of the earliest studies to document this effect, research participants who resisted the impulse to eat chocolates and instead ate radishes persisted less on a difficult cognitive task (ie, solving unsolvable anagrams) than did participants who ate chocolates instead of radishes or skipped the food task ([Baumeister, Bratslavsky, Muraven, & Tice, 1998](#)). This shocking finding (and similar others), along with the implication that self-control may be a limited resource, has spawned a voluminous body of empirical research (eg, [Hagger, Wood, Stiff, & Chatzisarantis, 2010](#)).

In this chapter, we provide a conceptual analysis of self-control and its relationship to ego depletion. We do not cast doubt on the existence of ego depletion as a phenomenon (cf. [Carter, Kofler, Forster, & McCullough, 2015](#)), but argue that conceptual confusion about the terms self-control and ego depletion leads many to draw erroneous and unwarranted conclusions. Specifically, whether self-control is a necessary and sufficient condition for producing ego depletion warrants conceptual (and empirical)