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On Energy and Self-Regulation: A Test of the Self-Regulatory Strength Model and Self-Determination Theory

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ABSTRACT

Self-regulation is important for successful functioning. The Self-Regulatory Strength Model (SRSM) proposes that all acts of self-regulation draw on a common and limited pool of self-regulatory energy, leading to self-regulatory failure if it is depleted. In contrast, Self-Determination Theory (SDT) proposes that people can regulate themselves for different reasons, with different consequences for both energy and success. More specifically, intrinsic motivation and autonomous extrinsic motivations for regulation are hypothesized to result in maintenance or increase of energy and successful self-regulation. Only controlled regulation is postulated to be associated with feeling drained. This thesis tests these competing views in a series of five studies (total N=1316). Using survey and laboratory methodologies, results revealed that self-regulation is not depleting to all participants. Participants regulate themselves for different reasons, and these motivational orientations are associated with different consequences for vitality and self-regulation. Intrinsic motivation was found to be associated with an increase in energy, while autonomous extrinsic motivation was associated with maintaining one's energy. Only controlled motivation was associated with a decrease in energy. In addition, intrinsic and autonomous motivations were directly associated with successful self-regulation on all measures: self-relevant activities; schoolwork and exercise; frustrating laboratory tasks and a global measure of success. These findings suggest that the processes proposed by the SRSM may be more closely associated with a controlled form of motivation for an activity. In other words, it is not the self-regulation of an activity itself that depletes energy; rather it is the way an activity is regulated that makes it draining. This suggests that fostering intrinsic motivation and internalization of extrinsic motivation should lead to an increase in vitality and success at self-regulation. In contrast, pressuring people to perform behaviors depletes their energy and indirectly leads to failure at self-regulation.

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Statement of the Problem

Self-regulation can be defined as systematic efforts to direct thoughts, feelings, and actions, toward the attainment of one's goals (Zimmerman, 2000). It is thus involved in making choices and decisions, taking responsibility, making and carrying out plans, and initiating and inhibiting behaviour, among others, and has been described as vitally important for success and happiness in humans (Tice, Bratlavsky, & Baumeister, 2001).

However, individuals do not always succeed at this self-regulation. These failures have emerged as a central factor in myriad problems facing individuals and society today, such as the many health problems related to poor diet and lack of exercise; school dropout or underachievement and debt and bankruptcy (see Baumeister, Heatherton & Tice, 1994, for a review). Therefore, a greater understanding of how, why and when self-regulatory problems occur is highly desirable not only from a theoretical standpoint, but also from a practical one.

This program of research proposes to examine two contemporary conceptions of self-regulation: the Self-Regulatory Strength Model (or the Limited Resource Model) (SRSM; Baumeister, Muraven, & Tice, 2000; Muraven and Baumeister, 2000; Muraven, Baumeister, & Tice, 1999) and Self-Determination Theory (SDT; Deci & Ryan, 1985; 2000; Ryan and Deci, 2000) and their respective positions on the role played by vitality or energy to explain self-regulation success and failure.

The Self-Regulatory Strength Model proposes that self-regulation is a limited resource similar to physical strength. Thus, when an individual engages in a self-regulatory activity, they deplete their energy, and are therefore more likely to fail at subsequent self-regulation.

In contrast to SRSM's one-dimensional approach, SDT proposes that activities can be regulated in many different ways, which differ in the extent to which they are autonomous (self-driven) versus controlled (externally driven). The more autonomous forms of regulation should meet with more vitality and effective functioning than the controlled types of regulation, according to this theory.

In this thesis, the contributions of SRSM and SDT to success and failure at self-regulation, as well as one's feeling of energy, are examined in a series of studies. This thesis comprises seven chapters. Chapter 1 presents the Strength Model of Self-Regulation and Self-Determination Theory in more detail. It particularly emphasises their stances with respect to the self's energy, as well as success and failure at self-regulation. It also underlines where they converge and where they diverge in their explanations of these phenomena, and outlines the primary hypotheses of the studies that follow. The following five chapters each describe a study designed to test those hypotheses. Chapter 2 presents the first study. The goal of this study was to examine whether perceptions of what is energizing and draining are related to the activity itself, or rather to one's motivations for engaging in these activities. Chapter 3 examines whether two specific activities described as self-regulation in the SRSM context are draining to all participants, and whether fluctuations in energy are related to intrinsic, autonomous extrinsic and controlled motivations for the activity. The third and fourth studies, outlined in Chapters 4 and 5, test the competing hypotheses of SRSM and SDT in a laboratory context. Thus, in study three, we examined whether participants reported less energy after the laboratory self-regulation task than before. We then examined whether autonomous extrinsic motivations would be associated with maintenance of energy, and only controlled motivation associated with a decrease in

energy after the task, as well as whether these motivations would be associated with varying levels of success above and beyond energy before the task. Study four used a similar design, this time examining whether participants reported varying levels of intrinsic motivation for the task, and whether this motivation was associated with higher energy after the task as well as better performance. Study five examines whether a similar pattern of results will extend to a more global level in people's lives: thus whether intrinsic and autonomous motivations maintain or increase energy and success, and controlled motivations decrease them. Finally, in Chapter 7, the results of all three studies are compared and discussed. Chapter 7 addresses the limitations of the present research, suggests avenues for future research, and outlines theoretical and practical implications of the results of these studies.

Overall, these studies try to answer the following basic questions: Does all self-regulation result in a depleted failure? Or do people in fact self-regulate for different reasons, and are these motivations associated with different levels of energy and success? More specifically, are intrinsic and autonomous extrinsic motivations positively associated with energy and success, and controlled motivations with depletion and failure?

Self-Regulation

"Without self-regulation, I cannot be, do, or get what I want... With it, I can make ideas reality. I have power over myself." (Sniezek, J., 1999, p.217).

Self-regulation can be defined as systematic efforts to direct thoughts, feelings, and actions, toward the attainment of one's goals (Zimmerman, 2000). It is thus involved in making choices and decisions, taking responsibility, making and carrying out plans, and initiating and inhibiting behaviour, among others, and has been described as vitally important for success and happiness in humans (Tice, Bratlavsky, & Baumeister, 2001).

The study of self-regulation is not new, but is now more center stage than ever. Mischel and Ayduk (2004) remarked that it is difficult to find a conference in social, personality or developmental psychology in which self-regulation and self-control are not major agenda items.

This proliferation of research is not surprising given its implications not only for theory, but also for a wide range of applied outcomes. Individuals do not always succeed in self-regulation. These failures have emerged as a central factor in myriad problems facing individuals and society (Baumeister et al., 1994). For example, obesity and many other health problems stem from failure to exercise and/or to choose healthy foods over unhealthy foods. Underachievement in school and work is related to a lack of regulation to make oneself study or work. A failure to control one's use of money is related to the staggering amount of debt, or even bankruptcy, assumed by many North Americans.

Therefore, a greater understanding of how, why and when self-regulatory problems occur is highly desirable not only from a theoretical standpoint, but also from a practical one.

This program of research proposes to examine two contemporary approaches to self-regulation, the Self-Regulatory Strength Model (or the Limited Resource Model) (SRSM; Baumeister, et al., 1994; Baumeister, Bratlavsky, Muraven, & Tice, 1998; Baumeister, et al., 2000; Ciarocco, Sommer, & Baumeister, 2001; Muraven and Baumeister, 2000; Muraven, Baumeister, & Tice, 1999; Tice, et al.) and Self-Determination Theory (SDT; Deci & Ryan, 1985; 2000; Ryan and Deci, 2000). These approaches were selected because not only are they prominent, but they propose very different mechanisms for explaining energy levels and success and failure at self-regulation. These mechanisms have implications for the ways that success could be improved and failure avoided. The approaches are described in more detail below.

The Self-Regulatory Strength Model

In a review of the literature on self-regulation, Baumeister and colleagues (1994) observed that individuals generally start with the intention of being successful at self-regulation. That is, they want to meet their goals, achieve behaviours or emotional states that they consider to be important, adapt successfully to their environment, and so on. Basing themselves on Carver and Scheier's (1982; 1998) TOTE model, they held that there were three basic ingredients to successful self-regulation: standards, monitoring and self-regulatory strength. More recently, they stated that motivation must be considered as a fourth ingredient (Baumeister & Vohs, 2007). We will briefly describe each of the ingredients below, with a particular emphasis on self-regulatory strength, which has been the primary focus of this line of research.

Four ingredients of self-regulation

The first component, according to this view, is a standard or goal. The very idea of regulation is to bring oneself into line with some standard, which must be clear and well-defined in order to be effective. Second, one must know where one stands in relation to the goal, achieved through monitoring. Monitoring is assumed to happen according to a feedback-loop (Carver & Scheier, 1982; 1998), wherein the person performs a test by comparing the self to the standard. If the self (or aspect of the self) does not meet the standard, then self-regulation requires initiating some operation to direct the self toward the goal. This operation, according to Baumeister and colleagues, requires the third ingredient, self-regulatory strength. They noted that this "operate" phase had received the least attention, and focused their research on self-regulatory strength, which will be described more fully below. Finally, more recently they stated that a motivation to regulate the self is also required, because even if the other three ingredients were present, a person may fail due to not caring about reaching the goal (Baumeister & Vohs, 2007). Baumeister and Vohs (2007) suggested that some of each ingredient is necessary for effective self-regulation, but that the four can compensate or substitute for each other to some degree.

Self-regulatory strength

Baumeister and colleagues (1994) noted that people are not always able to accomplish everything they set out for, or hoped to achieve, even if they have a perfectly good idea of what those goals are, and what needs to be done in order to reach them. They proposed that a principal reason for this could be that self-regulation requires effort, and people may simply lack the resources to self-regulate effectively. In this view, self-regulation operates according to a strength model, like a muscle (Gailliot & Baumeister,

2007). That is, all manner of active self-regulation and executive functioning place demands on a limited self-regulatory resource. Individuals may lack the strength to regulate themselves because their pool of this resource is shallow: they are chronically weak. They may also lack the strength to regulate themselves because demands on their self-regulatory resources have temporarily depleted their resource. The claim is that individuals can prevent the depletion and self-regulatory failures by conserving their energy, sleeping, consuming glucose or building up their strength through exercise.

Chronic self-regulatory strength. The chronic level of self-regulatory strength corresponds to the trait level. At this level, the interest is in individual differences in self-regulatory abilities. This has been operationalized in the form of a self-control scale (Tangney, Baumeister, & Boone, 2004). Sample items include: "I do things that are bad for me, if they are fun"(reverse-scored); "I am lazy"(reverse-scored); and "I am able to work effectively toward long-term goals".

The first publication with this scale showed that higher scores on this scale (reflective of higher self-control) were related to higher GPA, lower self-reported symptoms of eating disorders, problem drinking and psychopathology, and more secure attachment and relationships (Tangney et al., 2004). A more recent article linked trait self-control to the ability to more successfully withhold blinking for a two-minute period in one sample, and to more persistence in a cold-pressor task, in which participants are asked to keep their non-dominant hand in near-freezing water for as long as they can (Schmeichel & Zell, 2007). Thus, there is some evidence that people with higher self-control self-regulate more effectively, or according to the strength model, some people have more success at self-regulation than others because they are stronger.

Temporary self-regulatory strength: "Ego-depletion". Temporary problems with self-regulatory strength have been the focus of the most attention. In its authors' words, the strength model postulates that "the ability to regulate responses actively (that is, to "operate" so as to move the self closer to a desired state) relies on a limited self-regulatory resource. When regulatory resources have been depleted, self-regulation failure is more likely." (Schmeichel & Baumeister, 2004, p.85). The model is also explicit that there is one (and only one) common source of energy from which all forms of self-regulation and executive function draw. Baumeister and colleagues coined the term *ego depletion* to refer to this "temporary reduction in the self's capacity or willingness to engage in volitional action (including controlling the environment, controlling oneself, making choices, and initiating action), caused by prior exercise of volition" (Baumeister et al., 1998, p. 1253).

The idea that all self-regulation draws on a common source of energy that can be depleted has been tested in an impressive quantity and variety of laboratory experiments (for a review, see Schmeichel & Baumeister, 2004). The dependent variables and experimental manipulations have been varied, but the studies generally follow the same methodology: participants are asked to engage in two tasks. The first is the experimental manipulation: in one condition (the "ego-depletion" condition) the task is designed to require self-regulation, while in the control condition it is not. The second task is the main dependent variable: another task designed to require self-regulation. In each case, those who were in the ego-depletion condition for the first task self-regulate less effectively in the second task than do those who were in the control condition. For example, in one test of their hypothesis, experimenters baked chocolate cookies in the lab, and then told ego-depletion condition participants that they had to eat radishes instead of the tempting cookies and candies placed

near them. One control group was allowed to eat the cookies, while for the other there were no cookies or radishes in sight. Those who had been forbidden to eat the cookies then quit faster on subsequent unsolvable figure tracing puzzles. The authors concluded that resisting temptation in the first task depleted the participants' self-regulatory energy, which meant that they then didn't have the energy to persist in the face of frustrating failures in the second task (Baumeister, et al., 1998). In another example, ego-depletion condition participants were asked to control their emotions while watching a sad movie, while those in the control condition were told to watch the movie naturally. Participants were then given a handgrip device and asked to squeeze it for as long as they could. Those who had previously been instructed to control their emotions released the handgrip significantly sooner than those without those instructions (Muraven, Tice & Baumeister, 1998). Other tasks that have been used as experimental manipulations include thought suppression, the Stroop test, and asking participants to make a series of choices amongst similar products (ex. Snickers bar or Twix bar). Examples of dependent variables have included: persistence on frustrating anagrams; controlling emotional expression; stopping an unpleasantly boring situation and drinking a bad-tasting liquid (Baumeister, et al., 1998; Baumeister, et al, 2000; Muraven et al., 1998).

Avoiding self-*regulatory failure in the strength model.* If all self-regulation requires energy, and this energy is finite, how does one prevent self-regulatory failure? The Self-Regulatory Strength Model's suggestions on this front are very much in line with their view of self-regulation as a muscle. In short, they suggest that individuals ought to judiciously manage their energy and that sleep will replenish it. Further, they suggest that although exercise of the self-regulatory "muscle" will deplete it temporarily, over the long run it should strengthen it (Baumeister et al., 1994). Finally, more recently they have suggested

that the muscle analogy is more than an analogy: that glucose also replenishes self-regulatory energies.

There has been less empirical work on these questions. Schmeichel and Baumeister (2004) state that circumstantial evidence speaks to the idea that sleep replenishes self-regulatory resources, but to our knowledge, that idea has not been tested. The idea that exercise of the self-regulation "muscle" should make it stronger over time was tested in one study in which some participants practiced various self-regulatory behaviors over a two-week period, including practicing good posture, regulating their mood or keeping a detailed food diary. A control group was not asked to perform any self-regulatory practice activities during the two week period. In the two-week follow-up, they found that those in the four self-regulatory practice conditions showed less fatigue following a depletion manipulation than did the control group (Muraven, et al., 1998). However, these results seemed to be due to the fact that the control group had suffered a marked decline in their self-regulatory performance. In addition, although the two food diary groups performed the same practice exercises, one showed the largest increase in self-regulatory performance of all groups, while the other showed a decline in performance. It is difficult to explain why the same exercise resulted in an increase in one randomly assigned group of students and a decrease in the other, raising further questions about the exercises.

Recently, Baumeister and colleagues (Gaillot et al., 2007) have conducted a number of studies aimed at demonstrating that self-regulating consumes glucose, and that reduced glucose stores are associated with reduced laboratory self-regulatory performance. This runs counter to a claim in one of their initial studies, in which they explicitly stated that the performance effects are not due to having eaten chocolate (glucose); (Baumeister, et al,

1998).

The conservation hypothesis was tested in a series of studies by Muraven and colleagues (2006). These studies involved three tasks. The first involved manipulations similar to those in the original studies, where some participants were in a condition designed to deplete them of their self-regulatory resources and others were in a control condition. The expectations regarding the third task were also manipulated: some were led to believe that the third task would require self-control, whereas others were led to believe that it would not. They found that participants in the ego-depletion condition who believed that they would have to self-regulate in a third task performed worse on the second task than all other groups (i.e. those who were not depleted, and those who were depleted but expected an easy third task). The authors thus concluded that depleted participants were conserving their energy for the expected upcoming self-regulatory task. Another study asked student participants about their beliefs about self-control, and found that participants believed that exercising self-control consumed energy, more so than feeling that self-control is a state of mind. However, in another study in the same article, they told one group of depleted participants that contrary to popular belief, it wasn't true that they had to rest after an effortful task, and compared their performance on a second task to that of another depletion group and a control group. The group whose naïve depletion theory had been debunked performed better in the second task than did either of the other groups (Martjin, Tenbült, Merckelbach, Dreezens & de Vries, 2002).

Assessment of support for the strength model of self-regulation

Overall, therefore, in support of the strength model, Baumeister and colleagues have provided good evidence that following instructions to suppress thoughts or emotions, or

follow similar such rules in one laboratory task results in poorer performance in a subsequent laboratory self-regulatory task. There is also evidence that participants modulated their effort on a second task according to their expectations about an upcoming third task, and that laboratory tasks affect and are affected by glucose levels. There is weak support for the ideas that either sleep or exercise replenishes that energy. They argue convincingly that this pattern of results is not consistent with skill or schema models of self-regulation, which would result in no effect or an improvement in subsequent self-regulation (Baumeister et al., 1998), nor is it consistent with a learned helplessness scenario because even when people succeed in the first self-regulatory task they fail at the second task (Muraven & Baumeister, 2000).

However, it is less clear how these results may relate to motivation. Baumeister and Vohs (2007) argue that much of self-regulation exists to thwart motivation, such as stopping impulses. They also state that motivation can overcome depletion, citing an article by Muraven and Slessavera (2003). In this article, three studies examined the effect of motivation on self-regulation by adding two extra conditions to the traditional ego-depletion manipulations. In one study, they told the "high motivation" group of participants that the study of the second task would be used to help people suffering from Alzheimer's, while simply asking the other group to do their best. In another, they offered either relatively large or very small amounts of money for performance, and in a third, they told some participants that practice would improve their performance, and others that practice was unlikely to do any good. In each case, participants' motivation for the second task completely erased the effect of ego depletion.

As Baumeister and Vohs (2007) acknowledge, it is tempting to interpret Muraven

and Slessareva's (2003) findings as indicating that ego depletion is essentially a state of motivation. We note that the conservation findings could also be explained under this optic: if performance on the second task is related to expectations about the third, it appears that there is a willful choice to hold back, which cannot be fully explained by a state of depletion. Further, the dependent variable in most of the studies, persistence or quality of performance on a laboratory task, are also classic dependent measures of motivation. Baumeister and colleagues suggest that it would be a "misinterpretation" to explain depletion as a state of motivation however, reminding us that although physically tired people may generally perform worse than others, they can overcome the effect of tiredness if sufficiently motivated. And of course, the fact that "motivation can overcome the effect of tiredness does not mean that tiredness is nothing more than a lack of motivation" (Baumeister & Vohs, 2007, p.10).

The role of energy. What direct evidence do we have that the effects are due to energy? In studies of the strength model, energy is not usually directly measured, but inferred from the poor performance of the participants in the experimental depletion condition relative to the control condition. Thus, in many instances, the dependent variable (eg. persistence) is viewed as both the measure of self-regulatory success and evidence of levels of energy. In a few cases, the authors measure energy levels, with inconsistent results. For example, in studies 1 and 4 of one article, the authors report that depletion condition participants felt more tired at the end of the study than did control participants, saying that this results "suggest that participants in the ego-depletion condition indeed used more regulatory strength than participants in the no-depletion condition" (Baumeister et al, 1998, p.1260). On the other hand, elsewhere they report that the depletion manipulation does not

result in more fatigue and lethargy, and conclude that the adverse impact of the depletion manipulation was not due to greater fatigue than the control condition (Schmeichel, Vohs & Baumeister, 2003). Another study found a marginal correlation between tiredness after the manipulation and performance in the second task (Study 1, Muraven, Tice & Baumeister, 1998).

Thus, it is not entirely clear that the performance effects are due to a reduction in energy per se. Is one's energy truly depleted by all self-regulation? Does self-regulatory success depend on this energy?

A prominent theory of human motivation provides a different view of self-regulation, including a theoretical basis for both motivation and energy and the relationship between the two, as outlined below.

Self-Determination Theory

While SRSM uses a muscle analogy, Self-Determination Theory's metaphor is that of the entire living entity. Thus, while the Strength Model deals only with the energy required to achieve goals, SDT also has room for the other ingredients of self-regulation, such as the selection of goals themselves, the consequences of their content (Kasser & Ryan, 1993;1996), and the role of mindfulness (Brown and Ryan, 2003). However, the principal differences of interest for this research are with regard to their different conceptualizations of energy and success at self-regulation.

SDT is a theory on human motivation that proposes that individuals can regulate themselves in many different ways. SDT's focus is on the extent to which these regulations are self-determined - that is, the degree to which people endorse their actions at the highest level of reflection and engage in the actions with a full sense of choice. According to SDT,

the regulations underlying human behaviour fall along a continuum of self-determination (see Figure 1). Broadly speaking, the more self-determined a regulation for a behavior, the more positive the consequences, including higher vitality and more successful self-regulation, as outlined below.

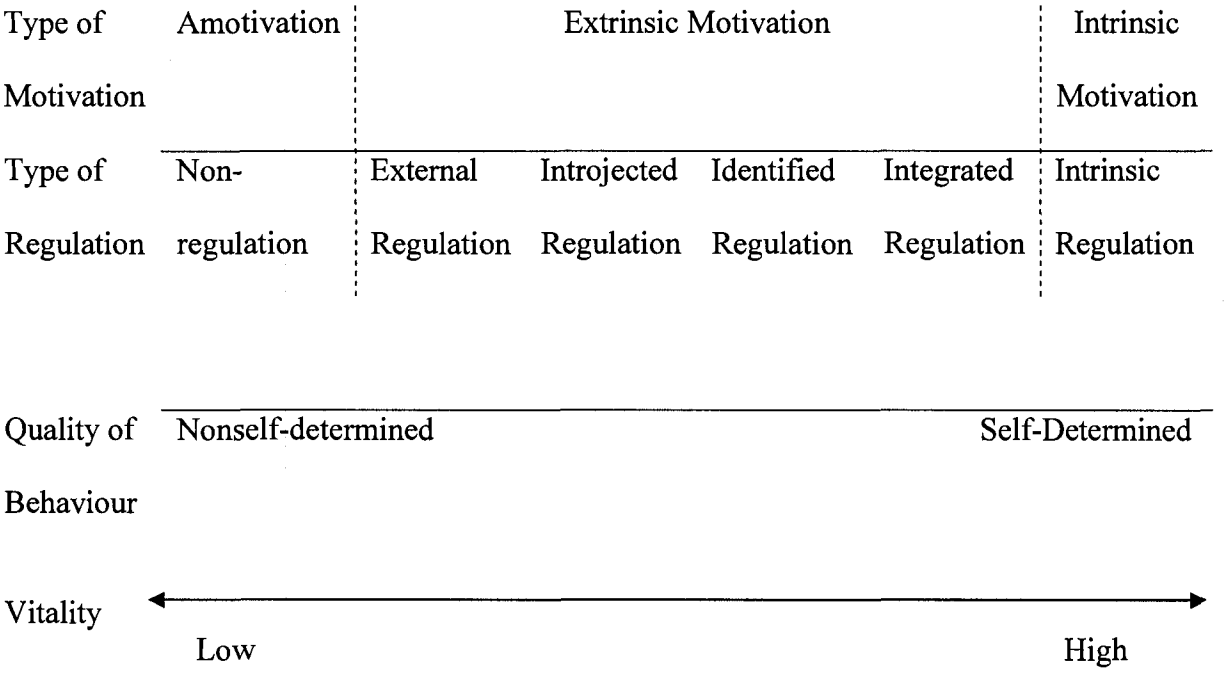

Figure 1. The self-determination continuum, with types of motivation, types of regulation and vitality.

The self-determination continuum

According to SDT, intrinsic motivation represents the highest level of self-determination. When intrinsically motivated, people engage in activities freely, out of interest and enjoyment. Intrinsically motivated behaviours are those whose motivation is based on the inherent satisfaction of their performance itself. Thus, the motivation in this case is not dependent on separable contingencies or reinforcements. At the opposite end of the self-determination continuum, amotivation arises when individuals do not perceive a relationship between their actions and the outcomes that follow these actions. Amotivation is a feeling of alienation and lack of control similar to learned helplessness (Abramson, Seligman & Teasdale, 1978). This state is thus one of complete lack of self-determination.

Lying between intrinsic motivation and amotivation on the self-determination continuum is extrinsic motivation. Extrinsically-motivated behaviours are instrumental: they are performed not for the pleasure of the activity itself, but for some separable outcome.

Extrinsically-motivated behaviours have often been contrasted with intrinsically-motivated behaviours, and have been characterised as being non-autonomous, or non-self-determined (de Charms, 1968). However, Self-Determination Theory notes that not all instrumental behaviours are brought about by sources of control residing outside the person. Indeed, just as one might perform an activity because they were told to, one might freely undertake a behaviour that will bring about a desired outcome, out of personal choice. Self-Determination Theory proposes four types of extrinsic regulation, which vary in the extent to which they are self-determined (see Figure 1). From the least to the most self-determined, they are: extrinsic motivation by external regulation; extrinsic motivation by introjected regulation; extrinsic motivation by identified regulation and extrinsic motivation by

integrated regulation. External regulation represents the prototype of extrinsically motivated behaviors and refers to behaviors that are controlled by external sources, such as rewards or constraints imposed by another person (Deci & Ryan, 1985). With introjected regulation, the formerly external source of motivation has been internalised such that its actual presence is no longer needed to initiate a behavior. Instead, these behaviors are reinforced through internal pressures such as guilt, anxiety or emotions related to self-esteem (Ryan & Connell, 1989). Identified regulation is defined performing a behavior because it is congruent with one's values and goals (Deci & Ryan, 1985). The behavior is still performed for extrinsic reasons (e.g., to achieve personal goals), but it is internally regulated and self-determined. Integrated regulation refers to behavior that is performed not only because an individual values its significance, but also because it is consistent with other self-schemas she or he possesses; it is consistent with his or her self-identity (Deci & Ryan, 1985). This type of motivation is the most self-determined among the forms of extrinsic motivation. Each of these is extrinsic in that it is performed not for the pleasure of the activity itself, but for some separable outcome. However, they differ in the extent to which they are self-determined. The more self-determined forms of regulation are called *autonomous* (intrinsic, integrated and identified), while the less self-determined ones are called *controlled* (introjected, external and amotivated). In short, autonomous regulation pertains to behaviors that are valued, important or interesting, while controlled regulation involves feeling pressured or coerced into action.

Basic psychological needs

SDT assumes that people are naturally inclined to internalize the regulation of activities that are not intrinsically interesting, but that are useful for effective functioning or

prompted by an external source (Deci & Ryan, 1985). To the extent that occurs, individuals are autonomous when performing the extrinsically motivated behaviour. According to SDT, this internalization is promoted by fulfillment of three basic psychological needs: autonomy, competence and relatedness. Autonomy is not to be confused with independence, but rather refers to being the perceived origin or source of one's own behaviour (deCharms, 1968; Deci & Ryan, 1985). Competence is not an attained skill or capability, but rather a felt sense of confidence and effectance in one's interactions with the physical and social environment (Deci & Ryan, 2002). Finally, relatedness refers to "feeling connected to others, to caring for and being cared for by those others, to having a sense of belongingness both with other individuals and with one's community" (Deci & Ryan, 2002, p.7). Environments that satisfy these needs are predicted to support internalization and healthy functioning, whereas thwarting of these needs leads to negative consequences. One of the positive consequences of needs fulfillment is higher subjective vitality, as described below.

Vitality and successful self-regulation as consequences of needs fulfillment and self-determined motivation

The authors of Self-Determination Theory suggested its link to vitality, defined as one's conscious experience of possessing energy and aliveness (Ryan & Frederick, 1997; Nix, Ryan, Manly & Deci, 1999). This concept seems similar to the energy proposed by the Self-Regulatory Strength Model. Indeed, the authors even relate it to feeling drained in their introduction of the concept: "People regularly speak of being particularly alive or invigorated in certain circumstances or following certain events, whereas in other contexts they can feel "dead" or *drained*" (Ryan & Frederick, 1997, p. 530; emphasis added).

Self-Determination Theory has explored factors associated with the maintenance and enhancement of energy as well as those that deplete it. SDT theorizes that contexts that support the psychological needs for autonomy, competence and relatedness provide nutriments to the self, and should thus enhance subjective vitality. In contrast, contexts associated with feeling controlled, incompetent or unloved should diminish vitality (Ryan & Frederick, 1997). In addition, drawing on the frameworks of organismic psychology, Ryan and Frederick (1997, p.6) stated that "intrinsically motivated activity should be accompanied by feelings of vitality, in that such activity represents a spontaneous expression of the organizational tendency of life". Further, they state that more generally, vitality corresponds to the experience of oneself as a potential "origin" (deCharms, 1968) of action. As such, autonomous self-regulation should maintain or enhance vitality because it is experienced as flowing from and expressing one's self and entails little conflict, whereas controlled forms of regulation should reduce it, as they are experienced as demands to think, feel or behave in specified ways (Nix et al., 1999).

Needs fulfillment and autonomous forms of motivation are also hypothesized to contribute directly to more successful self-regulation, as compared to conditions that don't support (or actively thwart) those needs. Thus, SDT explicitly and independently measures energy and self-regulation, as well as their antecedents. A review of the studies of needs fulfillment on vitality and self-regulation is presented first, followed by a review of those measuring regulatory styles, vitality and self-regulation.

Needs fulfillment, vitality and successful self-regulation.

In terms of empirical work, the contention that needs fulfillment increases vitality has been supported in several studies. For example, Sheldon, Ryan, and Reis (1996) examined

fluctuations in psychological need satisfaction and subjective vitality in a 2-week diary study of college students. They found that trait measures of autonomy and competence were associated with subjective vitality averaged across 14 days. In addition, controlling for trait autonomy and competence, gender, the previous day's well-being, and a number of other potential confounding influences, fluctuations in vitality were significantly related to changes in autonomy and competence. A subsequent study by Reis, Sheldon, Gable, Roscoe, and Ryan (2000) found that autonomy was associated with greater vitality at a between-person level, while all three needs satisfaction predicted vitality at a within-person level. Yet another daily diary, this time with a sample of elite gymnasts, also showed that daily changes in vitality from pre- to post-practice were associated with fulfilment of relatedness, competence and autonomy (Gagne, Ryan, & Bargmann, 2003). In an experimental study, all participants completed the same card sorting task, but some were allowed to direct their own behaviour, whereas others were yoked to what the previous participant had done. Feelings of vitality dropped only among those in the autonomy-reduction condition (Nix, et al., 1999).

Other studies have linked needs fulfillment and successful self-regulation directly, without measuring vitality. In a recent article, Moller, Deci and Ryan (2006) reported on a series of three studies designed to counter the SRSM contention that "all acts of volition" are depleting (Baumeister et al, 1998, p.1253). In all three studies, they offered participants in one condition a true choice among activities, and yoked participants in another condition to the choice of those in the first condition. In this second condition, they followed Baumeister and colleagues' (1998) "high choice" script, initially telling participants that the decision was entirely up to them, but then saying that it would help the study a great deal if they chose one activity over the other because there were already enough participants in one of

the groups. In each case, they found that participants in the true choice (i.e. autonomy-support) condition performed better on a subsequent laboratory self-regulation task than did those in the "controlled choice" or autonomy thwarting condition. Thus, in this view, the condition that Baumeister and colleagues called depleting because of the high choice involved would instead be viewed as an autonomy-thwarting or controlling manipulation. Although the controlling choice condition resulted in poorer performance, the true choice condition resulted in the best self-regulation. Although it has not been tested, it appears that many of SRSM's ego-depletion manipulations may actually be autonomy-thwarting, as they involve not only telling the participants which task to do, but also how to do it (e.g. cross out the letter "e" in this text, but only according to these rules; watch this video but direct your attention only to one place, etc).

There is a large tradition in SDT research of studies showing adverse effects (including on performance and persistence) of controlling manipulations or interpersonal contexts. One example of this is the effect of rewards, which SDT suggests can thwart autonomy because they are seen as controllers of behavior (Deci, Koestner, & Ryan, 1999). Well over a hundred experiments have been conducted to test this hypothesis, most of which first manipulate the provision of rewards (with the experimental condition receiving a reward for performing a laboratory task and a control group not receiving a reward for performing that same task), and then measure time spent on that task once the reward is removed. This free-choice persistence following a manipulation is thus similar to the design used to test SRSM. A meta-analysis of 128 experiments showed that tangible rewards had a significant negative effect on the time spent on laboratory tasks (Deci et al., 1999). It is important to note, however, that these experiments were tested in order to examine the

effects of rewards on intrinsic motivation. The tasks used were thus generally selected to be interesting to most participants. Thus, it is not clear whether they would apply to the type of laboratory tasks that SRSM defines as self-regulation.

In addition, other controlling contexts, including deadlines (Amabile, DeJong, & Lepper, 1976) and surveillance (Plant & Ryan, 1985) have also been shown to reduce performance. In more applied settings, perceived autonomy support has been linked to positive consequences such as better grades and bar exam results among law students (Sheldon & Kreiger, 2007), more secure attachment and dyadic adjustment in friendships (Deci, La Guardia, Moller, Scheiner, & Ryan, 2006); better lipid changes and reduced depression in diabetics over 12 months (Williams, Lynch & Glasgow, 2007); greater cessation among smokers (Williams, McGregor, Sharp, Levesque, Kouides, Ryan, Deci, 2006); and more in-depth processing, performance and persistence (Vansteenkiste, Simons, Lens, Sheldon, Deci, 2004).

Although not designed for this purpose, another series of experimental studies suggests that thwarting the need for relatedness also negatively affects self-regulation. More specifically, studies that manipulated social exclusion found that participants who were excluded suffered reduced performance on laboratory self-regulatory tasks such as solving frustrating puzzles, or consuming a vinegar drink as compared to control group participants (Baumeister, Dewall, Ciarocco, & Twenge, 2005). Thus, an effect that is explained as being due to depleted energy in other studies is attributed to social exclusion in this case.

Autonomous and controlled regulations, vitality and self-regulation

A few studies have examined whether autonomous regulations enhance vitality and/or whether controlled regulations decrease it. One study found that controlled

regulations in 44 pain clinic participants were negatively associated with vitality, while autonomous regulations were unrelated to vitality. In contrast, among 58 weight loss program participants, autonomous regulations for adherence were positively associated with vitality, while controlled regulations were unrelated in one sample (Ryan & Frederick, 1997). Introjected regulation was negatively associated with vitality in a different study of weight loss participants (Edmunds, Ntoumanis & Duda, 2007) . Another study asked 141 college students to imagine taking a course either for autonomous reasons (not required, but intriguing) or for controlled reasons (required, but of no interest), and then asked them to imagine how they would feel upon hearing that they had done very well on a midterm exam in that class. Participants in the autonomous motivation condition checked marginally more adjectives indicating vitality than those in the required condition. Finally, when the responses of 50 nursing home residents to questions about why they performed various activities were coded on a scale of 1 (external regulation) to 5 (intrinsic regulation), this measure of self-determined regulation correlated positively with vitality (Grow-Kasser & Ryan, 1999).

More studies have directly linked autonomous and controlled motivations to successful self-regulation in a variety of domains. For example, students' autonomous motivation has been found to predict both intentions to remain in school among junior high school students (Blanchard et al., 1996) as well as actual persistence at school (less dropout) among high school students (Vallerand & Bissonette, 1992). Autonomous motivations for engaging in sport led to enhanced persistence among competitive swimmers over a 22-month period (e.g., Pelletier, Fortier, Vallerand, & Brière, 2001). Autonomous motivation has also been found to promote other self-regulatory activities such as more control over

prejudice (Legault, Green-Demers, Grant, & Chung, 2007), better productivity at work (e.g., Fernet, Guay, & Senecal, 2004), and better grades (e.g., Black & Deci, 2000). Other research has found that more autonomous motivation is associated with the performance of healthier behaviors both for oneself (e.g., Pelletier, Dion, Slovenic-D'Angelo, & Reid, 2004), and one's world (Green-Demers et al., 1997). Autonomous motivation is also related to higher levels of psychological well-being (e.g., Ryan, Rigby, & King, 1993), among other positive outcomes.

Assessment of SDT research on vitality and successful self-regulation

Thus, within SDT, both vitality and successful self-regulation have been directly measured as consequences of needs fulfillment and autonomous motivations. There is strong support for the positive effects of needs fulfillment on both vitality and successful self-regulation. There is also good support for the positive relationships between autonomous forms of motivation and successful self-regulation in a variety of domains. However, the effects of the types of motivation on vitality are less clear. In particular, the few studies that examined the relationship between autonomous motivation and vitality collapsed intrinsic motivation and autonomous extrinsic motivations, thus leaving uncertainty as to whether the effect applies to both intrinsic and autonomous extrinsic motivations. Given that the theory is clear in stating that intrinsic motivation should increase vitality, while autonomous external motivations may either maintain or increase it, it seems important to distinguish the two.

Comparing the Self-Regulatory Strength Model and Self-Determination Theory

The Self-Regulatory Strength Model and Self-Determination Theory have some commonalities, and some points on which they diverge. Both approaches converge on the

idea that there is a sort of "energy of the self", although one formulates it in the negative and the other in the positive (depletion or vitality). Both have also successfully manipulated participants' performance and persistence in the laboratory. However, they differ in the proposed mechanisms underlying this energy and success and failure at self-regulation. In a series of studies, this thesis will attempt to answer the following questions that arise from differences in predictions between SRSM and SDT.

What is depleting?

SRSM states that all manner of self-regulation is depleting. Thus, within this framework, an activity that requires self-regulation is depleting, whereas an activity that does not require self-regulation is not depleting. This was operationalised by categorising activities as requiring self-regulation (and therefore used in the depletion condition) or as not requiring self-regulation (and therefore used in the control condition). Unfortunately, it is not altogether clear what constitutes a self-regulatory activity within this framework. The definition of self-regulation provided by the authors of SRSM is quite broad: "self-regulation refers to the exercise of control over oneself, especially with regard to bringing the self into line with preferred standards" (Vohs & Baumeister, 2004, p. 2). They mention things like obesity and bankruptcy as examples of self-regulatory failures. However, in setting up their experiments, they seem to take a narrower perspective, primarily limiting self-regulatory tasks to those that require inhibiting an impulse. Further, in some instances they cite a higher self-reported difficulty in the depletion condition as demonstrating that it required more self-regulation (DeWall, Baumeister, Stillman, & Gailliot, 2007; Gailliot, & Baumeister, 2007; Gailliot, Schmeichel, & Baumeister, 2006; Vohs, & Schmeichel, 2003), while in others they maintain that the difference between the two was unrelated to difficulty, but rather related to

amount of self-control required (Muraven & Slessareva, 2003; Schmeichel, Vohs, & Baumeister, 2003).

In contrast, within SDT, in order to know whether a given task was depleting, one would have to determine or manipulate one's motivation or needs fulfillment for that task. If a person's regulation for the task was controlled (such as done to obtain a reward or avoid a punishment, or because one would feel guilty otherwise), the task would be draining. If the same task was performed for intrinsic (because they think it's fun) or autonomous extrinsic (because it is important and/or fits with how they choose to live their life), it would not be draining and could even be energizing.

Can self-regulation be energizing?

SRSM does not indicate an explicit theoretical source of the self's energy. It views all self-regulation as draining, and proposes that individuals should conserve their energy or manage it judiciously, and that rest, glucose, or exercise (over the long run) will replenish it. On the other hand, SDT's organismic view holds that self-regulation itself can be energizing, if it is done for intrinsic or autonomous extrinsic reasons. Thus, engaging in an activity because it is fun or valued, for example, could restore the self's energy.

What predicts successful self-regulation?

SRSM suggests that people fail because they lack the energy to self-regulate effectively. Thus, SRSM presents a unidimensional view of self-regulation in which self-regulation can create its own vicious circle. According to this view, all manner of self-regulation depletes the very energy that is required for self-regulation. Thus, unless an individual conserves this energy, sleeps or perhaps consumes glucose, they are bound to fail at self-regulation. SDT proposes a multidimensional view of self-regulation. This theory

proposes that one's form of motivation is primarily responsible for one's success level, in addition to their energy as outlined above: intrinsic and autonomous extrinsic motivations are associated with success, while controlled motivations are not.

Goals of the Thesis

The primary goal of this thesis will thus be to test the competing viewpoints on these three questions. Each of these three questions will be examined in each of the five studies. Does all self-regulation result in a depleted failure? Or do people in fact self-regulate for different reasons, and are these motivations associated with different levels of energy and success? More specifically, are intrinsic and autonomous extrinsic motivations positively associated with energy and success, and controlled motivations with depletion and failure? These questions will be examined in five studies.

In the first study, we ask participants to name personal activities that they find energizing and draining, as well as their motivation for these activities and their perceptions of success. We examine the content of these activities to determine whether certain activities can be classified as draining to all and others as energizing to all, as would be suggested by the SRSM contention that all self-regulation is draining. We then examine the relationships between their motivations for the activities and their classification as either draining or energizing in order to determine whether energizing activities are performed for intrinsic and autonomous motivations, while draining activities are performed for controlled motivations. Finally, we examine whether participants report lower levels of success in draining versus energizing activities, and whether the different types of motivation are differentially associated with this success.

In the second study, we tested similar questions, this time controlling for the self-

regulatory activities by asking participants about their levels of energy before and after performing activities provided as examples of self-regulation in the SRSM context. We also asked participants about their motivations for each of these activities, and examined whether augmentation and maintenance of energy was associated with intrinsic and autonomous motivations, and depletion of energy associated with controlled motivation. Finally, we examined whether participants motivations for engaging in the activity contributed to success above and beyond depletion before the activity.

In the third study, we extended this logic to the laboratory, examining whether a laboratory task used in SRSM studies is draining to all participants, as well as whether participants report different motivations for self-regulation, corresponding to the extrinsic subtypes proposed by SDT. We then examined whether autonomous extrinsic motivations were associated with maintenance of energy, and controlled motivation with a decrease in energy after the task, as well as whether these motivations would be associated with varying levels of success above and beyond energy before the task.

Study four also examined energy before and after a laboratory self-regulation task, this time examining whether participants reported varying levels of intrinsic motivation for the task, and whether this motivation can actually revitalise participants in addition to being associated with better performance.

Finally, study five summed up these same questions in a single model and examined whether they extended to a trait-like or general level in addition to the situational or contextual levels presented above.

In each case, it is hypothesised that not all self-regulation is draining. More specifically, it is hypothesised that participants will regulate themselves for different

motivations, in accordance with the subtypes proposed by SDT, and that only the controlled motivations will be associated with feeling drained. In contrast, intrinsic motivation will be associated with feeling energized instead of drained, and autonomous external motivations will result in maintenance of energy. Finally, it is hypothesized that intrinsic and autonomous extrinsic motivations will be associated with more self-regulatory success.

CHAPTER TWO

STUDY 1

One of the biggest differences between SRSM and SDT is their conceptualisation of what is depleting. Implicit in SRSM's methodology is the idea that activities are either inherently depleting (because they require self-regulation) or not depleting (because they do not require self-regulation). In contrast, SDT would suggest that activities themselves cannot be classified as draining or energizing because these characteristics are related to one's motivations for engaging in the activity, or to the needs satisfaction associated with the activity. This study aimed to test these competing views by directly asking participants to name an activity they found draining and an activity they found energizing, as well as why they engage in those activities and how much success they have at those activities.

In accordance with SDT, it is hypothesized that the activities named will not fall neatly into one or the other category, that is, in some cases, the same activity will be identified as draining by some people and energizing by others. Draining activities will be performed for more controlled reasons, and energizing activities will be performed for more autonomous reasons. In accordance with SRSM, it is hypothesised that participants will report less success at activities they find draining than those they find energizing. Finally, again in accordance with SDT, autonomous regulation will be associated with perceived success in both draining and energizing activities.

Method

Participants and procedure

A total of 260 introductory psychology students participated in this study in return

for course credit. The mean age was 21 years (standard deviation = 3.95) , with a range from 17-55; 74% were female. Participation involved completing a questionnaire. Participants were assured that participation was voluntary, anonymous and confidential.

Measures

Participants were asked to name one activity they found draining and one activity they found energizing. In addition, for each activity, they were asked to rate how successful they felt at the activity on a 7-point Likert-type scale ranging from 1 (not at all successful) to 7 (extremely successful). Finally, self-determined motivation for the activities was measured according to the procedure used by Sheldon, Ryan, & Reis (1996). Participants rated the extent to which a list of items corresponded to their reasons for engaging in each activity on a 7-point Likert-type scale ranging from 1 (not at all) to 7 (extremely). The reasons corresponded to SDT's motivational subtypes of intrinsic motivation ("You did it purely for the interest and enjoyment of doing it"), identified regulation ("Interesting or not, you felt that it expressed your values", introjected regulation ("You made yourself do it, to avoid anxiety or guilt") and external regulation ("Something about your external situation forced you to do it"). All measures are presented in Appendix A.

Results

Analyses on all activities

What activities were listed as draining and energizing? Participants listed a large number of activities in both categories. Some activities were listed more often in the draining category, such as those relating to school and work, while others were listed more often in the energizing category, such as sports. However, many activities appeared in both lists, that is, they were listed as draining by one person (or more) and energizing by another. These

activities are listed in Table 1. Only activities for which identical or almost identical words were used were included in this list (ex. Weightlifting or lifting weights). In addition to these identical activities, other similar activities appeared in both lists, but were not included, as they appeared as more specific in one category than the other, such as "my criminology studies"/ "my studies"; "oversleeping" / "sleep"; "talking to my sister" / "being with family" / "family interaction"; "finishing an exam" / "exams".

The overlap between the two categories means that activities are not inherently draining or energizing.

Table 1

Activities that were listed as both draining and energizing (Study 1)

Arguments
Basketball
Biking
Eating
Going to the gym / Gym
Hockey
Jogging
Kickboxing
Lifting weights / Weightlifting
Reading
Rock climbing
Running
Sex
Shopping
Sports
Swimming
Training
Work
Working with children/kids
Writing

Self-determination and energy. The means and standard deviations of each of the motivational subtypes are presented for draining and energizing activities in Table 2. Participants most strongly agreed that they engaged in draining activities for external regulation reasons, then introjected, identified and intrinsic. For activities listed as energizing, almost the reverse pattern was found, with participants most strongly endorsing intrinsic reasons, followed by identified, and then external and introjected.

We were interested both in whether these means differed across draining and energizing activities, and whether they differed within each type of activity. First, we conducted paired sample t-tests to examine whether the autonomous motivations were lower for draining activities than for energizing activities and whether the opposite was true for controlled motivations. Draining activities were engaged in for significantly less intrinsic and identified motivations than were energizing activities: intrinsic $t(259) = 25.02, p<.01$; identified $t(259) = 5.31, p<.01$, while the introjected and external reasons for performing draining activities were higher than those for performing energizing activities: introjected $t(259) = -8.92, p<.01$; extrinsic $t(259) = -15.70, p<.01$.

Next, within each category, we examined with linear contrasts in repeated measures ANOVA whether the motivations followed the expected linear trend. More specifically, it was expected that draining activities would be engaged in primarily for the least self-determined reason (extrinsic motivation) and that endorsement of the progressively more self-determined motivations would decrease from there, whereas the opposite trend was expected for energizing activities. Results confirmed the linear trend: draining $F(1, 257) = 151.34, p<.01, \eta^2=.37$; energizing $F(1, 257) = 448.66, p<.01, \eta^2=.64$.

Table 2.

Mean (and standard deviation) motivations for draining and energizing activities (Study 1)

	Draining	Energizing
Intrinsic*	2.94 (1.79)	6.05 (1.08)
Identified*	3.52 (1.86)	4.26 (1.82)
Introjected*	4.01 (2.09)	2.62 (1.70)
External*	5.32 (1.76)	2.90 (1.81)

* $p<.05$

Self-determination and success. As seen in Table 3, intrinsic and identified motivations were positively correlated with success for both draining and energizing activities. Introjected regulation was negatively associated with success for energizing activities, but was unrelated to success for draining activities. Regulating oneself for external reasons was not associated with success for either type of activity.

Energy and success. Participants reported being less successful at draining activities (M=4.58) than at energizing activities (M=5.62), $t(259)= 9.05$, $p<.01$.

Table 3

Correlations between motivational subtypes and success at draining and energizing activities (Study 1)

	Draining	Energizing
Intrinsic	.24**	.25**
Identified	.23**	.19**
Introjected	-.004	-.24**
External	-.02	-.11

Note. ** $p < .01$

Analyses on specific activities

In addition to examining the information collapsed across activity, we were interested in determining whether the same pattern would be repeated within specific activities. In order to provide the most stringent test, we chose two very different activities for which the exact same word appeared in the energizing column for some, and the draining column for others: reading and running.

Reading success: draining vs energizing. Twelve people listed reading: 7 listed it as draining, while 5 listed it as energizing. Those who listed reading as a draining activity reported less success at that activity than did those who listed reading as energizing (M=4.00; SD= 1.73; and M=6.25; SD=0.50, respectively), as determined by an independent samples t-test: $t(7.56)= 3.21, p<.05, \eta^2= .41$.

Motivation for reading. Of interest here was whether participants' motivation for reading was systematically related to whether they found it draining or energizing. As seen in Figure 2, those who spontaneously listed reading as draining reported very low levels of intrinsic motivation for reading and very high levels of extrinsic regulations for reading, with identified and introjected regulations falling in order in between. The opposite was true for those who spontaneously listed reading as energizing: they reported very high levels of intrinsic motivation for reading, followed by identified regulation, and low levels of introjected and external regulations. The linear contrast of the reading motivation by reading category (draining or energizing) was significant $F(1, 10) = 27.40, p<.01, \eta^2= .73$.

Motivation and reading success. As seen in Table 4, intrinsic motivation and identified regulation were positively correlated with reading success, while introjected and

external regulation were negatively correlated with reading success.[1]

[1] These correlations are not statistically significant. However, correlations are a measure of effect size, which many argue is a better measure of importance than is statistical significance, which is highly dependent on sample size. Cohen (1988, 1992) gives the rules of thumb: correlations of 0.1 can be considered small, .03 medium, and 0.5 large.

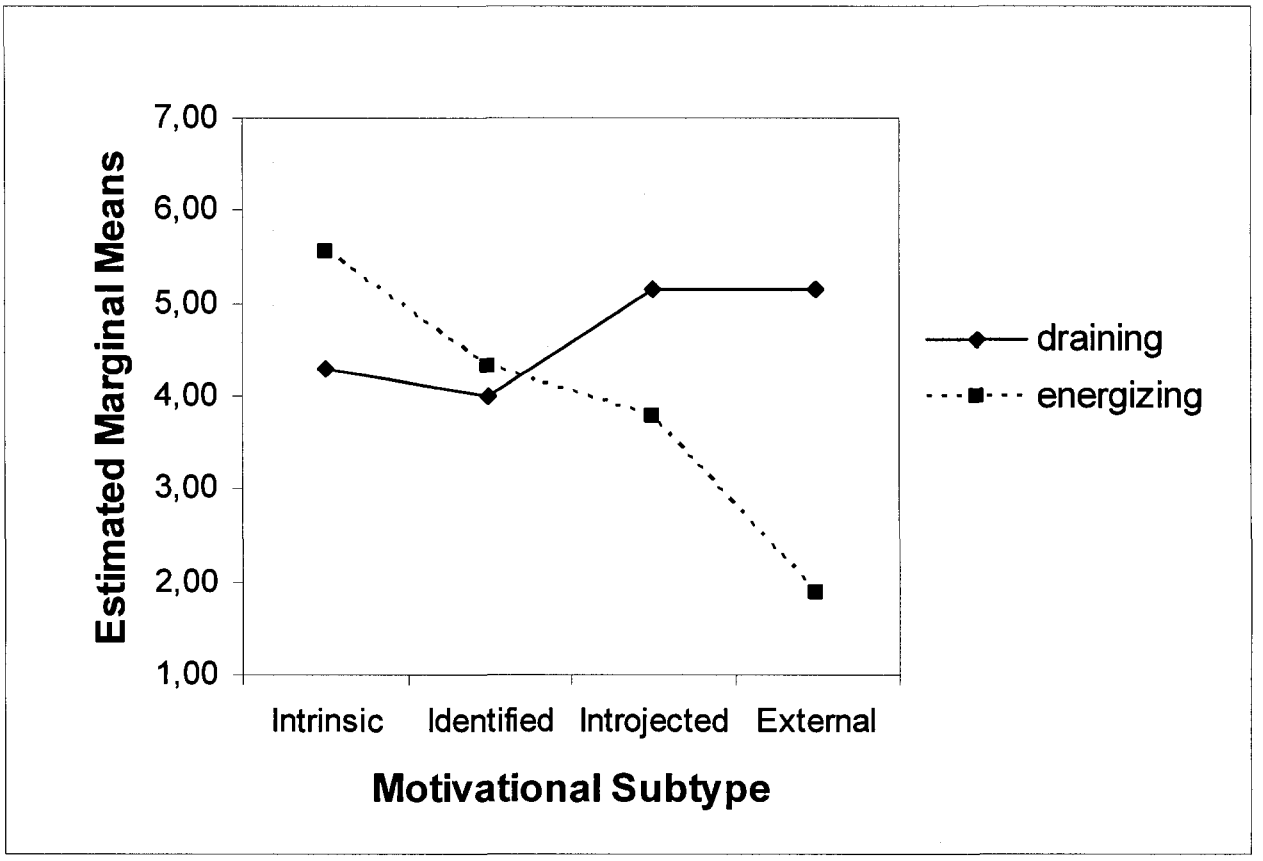

Figure 2. Motivations for reading as a function of whether reading was listed as draining or energizing (Study 1)

Table 4

Correlations between motivational subtypes and self-regulatory success. (Study 1)

	Success	Intrinsic	Identified	Introjected	External
Success	1	.40	.21	-.22	-.22
Intrinsic Motivation	.39	1	.69	-.39	-.85
Identified Regulation	.21	.71	1	.02	-.51
Introjected Regulation	-.39	-.13	.02	1	.36
External Regulation	-.53	-.22	.10	.70	1

Note. Correlations for reading are presented above the diagonal, and those for running below the diagonal

Running success. Seven participants listed running as draining, while another 9 listed running as energizing. The success at running of those who listed running as draining (M=4.29) was lower than that of those who listed running as energizing (M= 5.67), as determined by an independent samples t-test: $t(14)= 2.33, p<.05, \eta^2= .28$.

Motivation for running. Again, the interaction between motivation and category (draining vs energizing) was tested. The linear contrast of the interaction between form of motivation and category was significant $F(1, 13) = 31.22, p<.01, \eta^2= .71$. Figure 3 illustrates this interaction, which repeats the same pattern between types of motivation and classification of an activity as energizing versus draining.

Motivation and running success. As seen in Table 4, intrinsic motivation and identified regulation were positively correlated with running success, while introjected and external regulation were negatively correlated with running success.

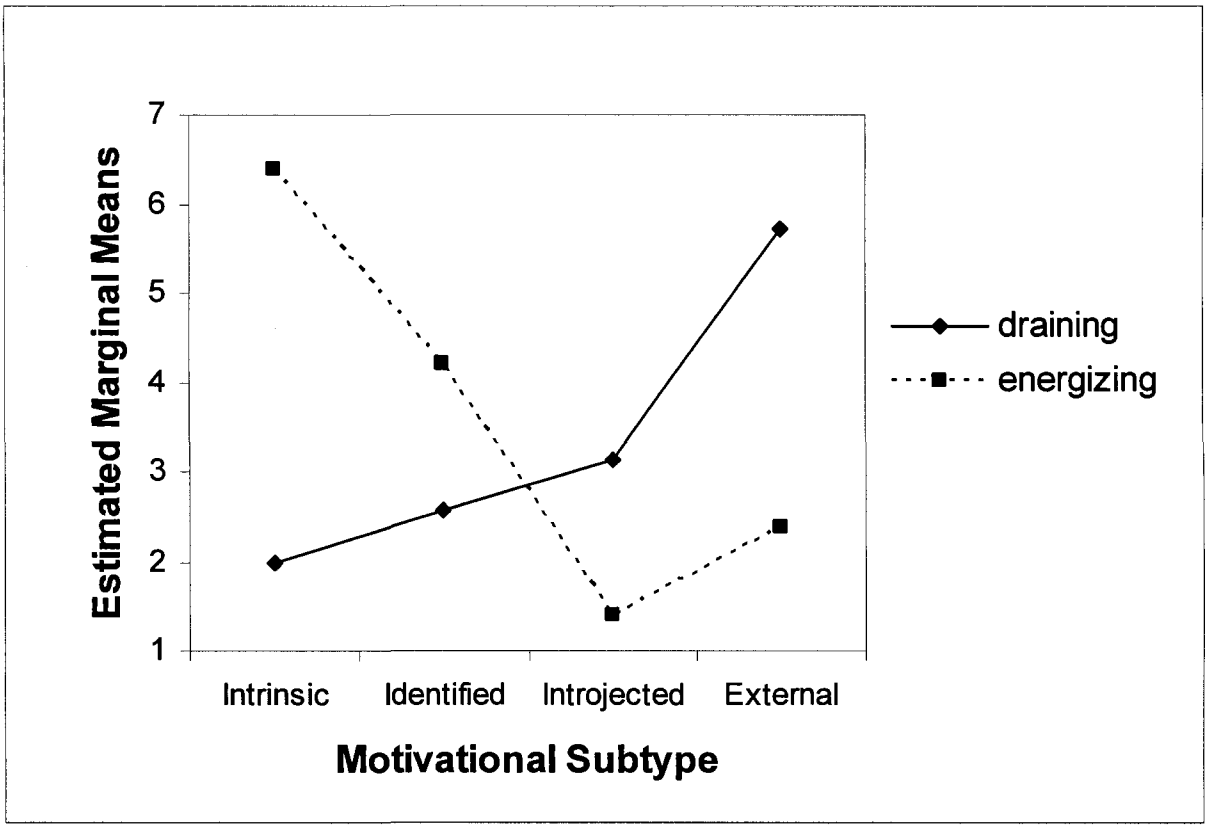

Figure 3. Motivations for running as a function of whether running was listed as draining or energizing (Study 1)

Discussion

The primary goal of this study was to test the competing hypotheses of SRSM and SDT in regards to what people find depleting or energizing. SRSM suggests that some activities are draining because they require self-regulation, while SDT suggests that it is one's motivation for the activity that determines whether it is energizing or draining. Results revealed that many of the same activities were spontaneously named as draining by some and energizing by others. The overlap between the draining and energizing lists provides initial support for the idea that the performance of certain activities is not in and of itself draining or energizing.

Although activities themselves did not seem to be inherently draining or energizing, there were significant differences in participants' motivations for engaging in energizing versus draining activities. More specifically, participants were more controlled in their motivation for draining activities, and autonomous in their regulation of energizing activities. This result came through not only across all activities, but also when comparing among those who had specifically listed reading or running as either draining or energizing. The results support SDT's conception of what drains and revitalizes people's energy.

In terms of success and failure at self-regulation, participants reported less success at draining activities than at energizing activities, in support of SRSM. In support of SDT, success for both draining and energizing activities was related to an individual's motivational orientation. More specifically, performing activities for controlled reasons was not associated with success, whereas intrinsic and autonomous extrinsic motivations were associated with more success.

This study had some limitations however. In particular, although having participants

provide their own activities provides high ecological validity, it meant that there was very little control over the activities. Comparisons among the same activities (reading and running) were limited by small sample sizes. In addition, although this study met its goal of determining whether the same activity can seem draining to one person and energizing to the next, the dichotomous design of the study precluded examination of the possibility of linear relationships among energy, motivation and success. The next study aimed to address these limitations by asking all participants to respond to questions about their energy, motivation and success relating two specific self-regulatory activities.

CHAPTER THREE

STUDY TWO

Study one showed that the same activity can seem draining to one person and energizing to another, and that this perception is related to their motivation for engaging in the activity. Study two had a similar goal, and aimed to build upon the results in study one in several ways. First, from a methodological perspective, it provides a more precise control over the activities. In order to accomplish this, we asked participants questions on two activities that are listed as examples of self-regulation in the SRSM literature, and that are relevant to students: schoolwork and exercise (Baumeister & Vohs, 2004; Baumeister et al, 1994) instead of asking them to generate their own draining and energizing activities. Second, it again examined the contention that self-regulation can be energizing instead of depleting, this time by asking participants about their energy levels before and after performing these self-regulatory activities. Third, it examined whether people engage in these self-regulatory activities for different reasons, consistent with Self-Determination Theory, and whether energy levels after self-regulation and self-regulatory success are predicted by these forms of motivation for the activity, as well as energy before self-regulation (i.e. situational strength).

It is hypothesized that self-regulation of schoolwork and exercise will be draining to some and energizing to others. It is further hypothesized that energy after self-regulation will be associated with one's motivation for the activity, as well as energy before the activity. More specifically, it is hypothesized that only controlled forms of motivation will result in a reduction of energy, while intrinsic motivation will increase it, and autonomous motivation will either increase or maintain it. It is also hypothesized, in accordance with SRSM, that

depletion before the activity will decrease self-regulatory success. Further, it is hypothesized that above and beyond these two factors, autonomous motivation will increase self-regulatory success while controlled motivation will decrease it.

Method

Participants and procedure

A total of 386 female and 189 male undergraduate psychology students participated in this study in return for course credit. Their age ranged from 16 to 53 years, with a mean of 19.25 and a standard deviation of 2.81. Participation consisted of completing the questionnaire, which they were assured was completely voluntary, and would remain confidential.

Measures

The measures of success and motivation were the same as those used in study 1, this time asked in relation to schoolwork and exercise. Self-reported energy was measured using a measure adapted from Muraven and colleagues (1998). More specifically, participants were asked to rate to what extent they felt drained before and after doing their schoolwork and exercising on a seven-point Likert-type scale, ranging from 1 "not at all drained" to 7 "extremely drained". Measures are listed in Appendix 2.

Results

Preliminary analyses

Missing data. Preliminary analyses revealed that three cases (1.4%) had some data missing. They were imputed using expectation maximization in SPSS.

Outliers. One case was identified as univariate outlier, as it exhibited a standardized score of 3.54, greater than the accepted value of ± 3.29. A total of 9 cases (1.7%) presented significant Mahalanobis' distance (χ^2(df=12) > 32.91, p<.001). These cases were deleted, resulting in a final sample size of 516.

Normality. The descriptive statistics of all variables involved in the study were first examined. The means, standard deviations, kurtosis and skewness values are shown in Table 5. Mean and standard deviation values revealed that the variables displayed acceptable dispersion. Skewness values ranged from –0.53 to .30, while kurtosis values ranged from -.69 to .13. From a multivariate perspective, the distribution of standardized residuals also appeared normal.

Linearity and homoscedasticity. A random selection of bivariate scatterplots were examined, and no departures from linearity were encountered, nor was there any evidence of homoscedasticity. In addition, as previously mentioned, the distribution of the standardized multivariate residuals appeared normal.

Absence of multicollinearity. The correlation matrix between all possible pairs of variables revealed no correlations higher than .90, thus indicating no multicollinearity in the data (Tabachnick & Fidell, 1996). Correlations are shown in Table 6.

Table 5

Descriptive statistics (Study 2)

	Mean	SD	Skewness	Kurtosis
Schoolwork				
Intrinsic motivation	3.36	1.59	.20	-.68
Autonomous extrinsic motivation	5.13	1.31	-.52	-.04
Controlled extrinsic motivation	5.03	1.236	-.39	.09
Success	4.87	1.21	-.32	.13
Drained time 1	3.50	1.61	.16	-.69
Drained time 2	4.05	1.62	-.03	-.59
Exercise				
Intrinsic motivation	4.94	1.53	-.53	-.20
Autonomous extrinsic motivation	4.74	1.38	-.33	-.19
Controlled extrinsic motivation	3.88	1.35	-.03	-.35
Success	4.58	1.38	-.26	-.14
Drained time 1	3.00	1.46	.30	-.56
Drained time 2	3.65	1.70	.09	-.81

Table 6

Correlations between all variables. (Study 2)

Variable	1	2	3	4	5
1. Intrinsic Motivation	-	.42	-.01	-.14	-.16
2. Autonomous Motivation	.63	-	.28	-.10	.04
3. Controlled Motivation	.07	.36	-	.19	.22
4. Drained Time 1	-.11	.01	.27	-	.31
5. Drained Time 2	.01	.07	.19	.23	-
6. Success at self-regulation	.56	.49	.13	-.05	.05

Note. Correlations for schoolwork are presented above the diagonal, and those for exercise below the diagonal

Main analyses

Differences in depletion before and after self-regulating. In order to determine whether participants felt depleted after regulating schoolwork and exercise, we subtracted their depletion before self-regulating from their depletion afterwards for each of the two activities. Frequencies of these changes scores reveal that just under half of participants report a depletion effect of participation, while approximately one quarter each report no change or increased energy (see Tables 7 and 8).

Table 7

Change in energy after schoolwork (drained time 2 – drained time 1; Study 2)

Energy change score	Frequency	Cumulative Percent
-5.00	1	.2
-4.00	12	2.5
-3.00	11	4.7
-2.00	43	13.0
-1.55	2	13.2
-1.47	1	13.4
-1.10	1	13.6
-1.00	55	24.2
-.10	1	24.4
.00	142	51.9
1.00	104	72.1
1.13	1	72.3
1.35	1	72.5
1.41	1	72.7
1.71	1	72.9
1.80	1	73.1
2.00	68	86.2
3.00	39	93.8
3.16	1	94.0
4.00	15	96.9
5.00	9	98.6
6.00	7	100.0

Table 8

Change in energy after exercise (drained time 2 – drained time 1; Study 2)

Energy change scores	Frequency	Cumulative Percent
-5.00	2	.4
-4.00	3	1.0
-3.00	23	5.4
-2.00	31	11.4
-1.00	75	26.0
-.69	1	26.2
-.15	1	26.4
.00	136	52.7
.31	1	52.9
.37	1	53.1
.98	1	53.3
1.00	77	68.2
1.47	1	68.4
1.94	1	68.6
2.00	68	81.8
3.00	49	91.3
4.00	26	96.3
4.25	1	96.5
5.00	14	99.2
6.00	4	100.0

Depletion and motivation. In order to determine whether motivation for an activity was related to whether it was energizing or draining, we conducted linear regressions, entering depletion before the activity and intrinsic and autonomous and controlled extrinsic motivations in the prediction of energy after the activity. Analyses were performed using SPSS regression. The intercept, unstandardized regression coefficients (*B*), the standardized regression coefficients (β), confidence intervals, R^2 and adjusted R^2 for schoolwork and exercise are shown in tables 9 and 10 respectively.

School work. The regression equation including depletion before school work and intrinsic, autonomous and controlled motivations for school work in the prediction of depletion after school work was significantly different from zero, $F(4, 511) = 21.12$, $p<.05$. Depletion before school work and controlled motivation both positively contributed to depletion after school work, while intrinsic motivation for school work negatively predicted depletion.

Exercise. The regression equation including depletion before exercise and the three motivations for exercise in the prediction of depletion after exercise was significantly different from zero, $F(4, 511) = 9.54$, $p<.05$. Depletion before exercise and controlled motivation positively contributed to depletion after exercise.

Table 9

Summary of multiple regression analysis for variables predicting depletion after schoolwork (N=516; Study 2)

Variable	B	SE B	Beta	95% C.I.[a]
Intercept	2.12*	.37		
Depleted1	.27*	.04	.27*	.19/.36
Intrinsic motivation	-.16*	.05	-.15*	-.25/.-.07
Autonomous regulation	.11	.06	.09	-.01/.23
Controlled regulation	.19*	.06	.14*	.08/.30

a. 95% CI = 95% confidence interval

Note. R^2= .14; Adjusted R^2= .14.

* p<.05

Table 10

Summary of multiple regression analysis for variables predicting depletion after exercise (N=516; Study 2)

Variable	*B*	*SE B*	Beta	95% C.I.[a]
Intercept	2.21	.34		
Depleted1	.22*	.05	.19*	.12 /.33
Intrinsic motivation	.01	.06	.01	-.12 /.13
Autonomous regulation	.02	.07	.01	-.13 /.16
Controlled regulation	.17*	.06	.13*	.05 /.29

a. 95% CI = 95% confidence interval

Note. R^2= .07; Adjusted R^2= .06.

* p<.05

Motivation, energy and success

The next step was to determine whether success in each context was a function of situational energy levels and their motivation for the activity. Multiple regressions were performed in order to determine whether depletion before performance and intrinsic, autonomous and controlled motivations predicted success. Analyses were performed using SPSS regression. The intercept, unstandardized regression coefficients (*B*), the standardized regression coefficients (β), confidence intervals, R^2 and adjusted R^2 for schoolwork are shown in Table 11, while those for exercise are shown in Table 12.

School work. The regression equation including depletion, intrinsic motivation and autonomous and controlled extrinsic motivations in the prediction of success was significantly different from zero, $F(4, 511) = 35.84$, $p<.05$. The regression coefficients for depletion, intrinsic motivation and autonomous extrinsic motivations differed significantly from zero.

Exercise. The regression equation including depletion, intrinsic motivation and autonomous and controlled extrinsic motivations in the prediction of success was significantly different from zero, $F(4, 511) = 68.83$, $p<.05$. The regression coefficients for intrinsic motivation and autonomous extrinsic motivations differed significantly from zero.

Table 11

Summary of multiple regression analysis for variables predicting successful self-regulation of schoolwork (N=516; Study 2)

Variable	*B*	*SE B*	Beta	95% C.I.[a]
Intercept	3.48*	.26		
Depleted1	-.14*	.03	-.18*	-.20 /-.08
Intrinsic motivation	.11*	.03	.15*	.05 / .18
Autonomous regulation	.30*	.04	.33*	.22/.39
Controlled regulation	-.01	.04	-.01	-.09/.07

a. 95% CI = 95% confidence interval

Note. R^2= .22; Adjusted R^2= .21.

* p<.05

Table 12

Summary of multiple regression analysis for variables predicting successful self-regulation of exercise (N=516; Study 2)

Variable	B	SE B	Beta	95% C.I.[a]
Intercept	1.60*	.23		
Depleted1	-.01	.04	-.01	-.08 /.06
Intrinsic motivation	.38*	.04	.43*	.30 / .47
Autonomous regulation	.22*	.05	.22*	.12 /.31
Controlled regulation	.03	.04	.02	-.06 /.11

a. 95% CI = 95% confidence interval

Note. R^2= .35; Adjusted R^2= .34

* p<.05

Discussion

These results again showed that the same activities can seem draining to some and energizing to others. More specifically, while many participants felt drained after doing schoolwork or exercising, others felt no change in energy levels, or felt energized. Participants' depletion levels after participation were affected by their motivation for engaging in the activity, in addition to their depletion before self-regulating. More specifically, engaging in schoolwork and exercise for controlled reasons was associated with more depletion. Self-regulating for autonomous extrinsic reasons did not affect energy levels, while intrinsic motivation had no effect for exercise, but decreased the depleting effect of regulating schoolwork. Thus, in support of SDT, only regulation for controlled reasons led to depletion.

In addition, motivation was associated with success at regulating both school work and exercise. More specifically, intrinsic and autonomous extrinsic motivations were positively related to success at both of these activities, in support of SDT. In partial support of SRSM, depletion before schoolwork was negatively related to success at schoolwork. Depletion was unrelated to exercise success.

An important limitation of studies 1 and 2 is that the measures of self-regulatory success were ad hoc and self-report. In addition, although the activities are cited as examples of self-regulation within the SRSM framework, it is less clear that they would meet the stricter definition presented in their operationalization of the concept in laboratory studies. Thus, the goal of the next study is to examine whether motivation moderates the depletion effect of a difficult self-regulation task in the laboratory.

CHAPTER FOUR

STUDY THREE

Studies one and two showed that the same activities can seem draining to one person and energizing to another, and that this perception is related to their motivation for engaging in the activity. More specifically, while SRSM suggests that all self-regulation is depleting, SDT suggests that only self-regulating for controlled reasons is depleting, and that individuals can also regulate themselves for more autonomous reasons, which will not be depleting. This study aimed to examine whether the same pattern of results would hold true when dealing with a laboratory task defined as requiring self-regulation by the stricter of SRSM's definitions. It thus provides a stricter control over the activity itself, as well as providing a behavioural measure of self-regulatory success.

It is hypothesized that some participants will report feeling depleted by the self-regulatory task, while others will not. It is further hypothesized that participants will self-regulate on the dependent variable for a variety of reasons, reflecting the varying levels of integration of extrinsic motivation postulated by SDT. Only controlled forms of motivation for the task will be related to depletion, while autonomous extrinsic will not be. Finally, participants who self-regulate for more autonomous reasons will have more self-regulatory success.

Method

Participants

Sixty (51 women and 9 men) University of Ottawa undergraduate students participated in the study in return for course credit. Their average age was 19.72 years, with a standard deviation of .75 years.

Procedure

The experiment essentially mimicked the dependent variable component of tests of self-regulatory success in the SRSM framework (Muraven et al, 1998), with the addition of SDT variables. Upon arrival at the laboratory, participants completed a short questionnaire assessing their current energy levels. The experimenter then gave the participants a sheet of anagrams, explaining that the purpose of the exercise was to see how people use letters to form words. She explained how to solve them, and gave the following instructions "This is not a test. Work on them for as long as you want, and when you want to stop, just press this button on the walkie-talkie". The experimenter then left the room, and immediately started a stopwatch in order to time how long participants worked on the anagrams. When the walkie-talkie rang, the experimenter stopped the stopwatch and re-entered the room. If participants hadn't summoned the experimenter by pressing the button on the walkie-talkie after 24 minutes had passed, the experimenter stopped them at 24 minutes, and indicated this as their time. The experimenter then distributed a short questionnaire including questions on energy and their motivation for working on the anagrams. The questionnaire took approximately 5 minutes, after which the experimenter debriefed and thanked the participants.

Measures

Motivation. The four types of extrinsic motivation were measured with an adapted version of *Situational Motivation Scale* (SIMS; Guay, Vallerand & Blanchard, 2000). Participants responded to the question: "Why did you persist at the anagrams?" by indicating their level of agreement with each statement on a nine-point Likert-type scale, with higher numbers reflecting higher agreement. Items from each of the subscales are summed to provide a total score for that subscale. Further, integrated and identified motivation are

summed to provide a measure of autonomous extrinsic motivation (α=.68), and the introjected and external subscales are summed to provide a measure of controlled extrinsic motivation (α=.78).

Measure of depletion. Self-reported energy was measured using a measure adapted from Muraven and colleagues (1998). More specifically, participants were asked to rate to what extent they felt drained, tired and energized (reverse-scored) on a nine-point Likert-type scale. These items were summed to create a total score, with higher numbers reflecting higher perceived depletion. Cronbach's alpha for depletion before the task was .78, and for depletion after the task .71.

Measure of self-regulatory success. The measure of self-regulatory success, persistence on frustrating anagrams, was one used in tests of SRSM (Muraven, Tice & Baumeister, 1998). They suggest that: "persistence required the person to override an easy, appealing response (i.e., quitting) and hence constituted self-regulation" (Muraven et al, 1998, p. 779). Persistence was measured in seconds by a stopwatch.

Results

Preliminary Analyses

Outliers. One case was identified as a multivariate outlier, as it exhibited a significant Mahalanobis distance (χ^2(df=5) > 20.52; Tabachnick & Fidell, 1996). This case was deleted, resulting in a final sample size of 59.

Normality. The descriptive statistics of all variables involved in the study were first examined. The means, standard deviations, kurtosis and skewness values are shown in Table 13. Mean and standard deviation values revealed that the variables displayed

acceptable dispersion. Skewness values ranged from –0.29 to .34, while kurtosis values ranged from -1.62 to -.02[2]. From a multivariate perspective, the distribution of standardized residuals also appeared normal.

Linearity and homoscedasticity. A random selection of bivariate scatterplots were examined, and no departures from linearity were encountered, nor was there any evidence of homoscedasticity. In addition, as previously mentioned, the distribution of the standardized multivariate residuals appeared normal.

Absence of multicollinearity. The correlation matrix between all possible pairs of variables revealed no correlations higher than .90, thus indicating no multicollinearity in the data (Tabachnick & Fidell, 1996). The correlations are displayed in Table 14.

[2] The kurtosis value of -1.62 was not significantly different from 0, using an alpha of .001 (z=2.64; Tabachnick & Fidell, 1996).

Table 13

Descriptive statistics (Study 3)

	Mean	SD	Skewness	Kurtosis
Motivation				
Integrated	5.48	1.99	.06	-.62
Identified	4.79	1.62	-.14	-.47
Introjected	4.45	1.88	.34	-.44
External	4.83	1.98	-.03	-.68
Autonomous External	5.14	1.52	-.04	-.26
Controlled	4.64	1.62	.30	-.02
Drained time 1	3.64	1.31	.31	-.27
Drained time 2	4.33	1.44	.09	-.11
Success at self-regulation (persistence in seconds)	910.71	400.20	-.29	-1.62

Table 14

Correlations between all variables (Study 3)

Variable	1	2	3	4	5
1. Autonomous Motivation	-	.18	-.11	-.15	.38*
2. Controlled Motivation		-	.20	.30*	.13
3. Drained Time 1			-	.43*	-.13
4. Drained Time 2				-	.06
5. Success at self-regulation					-

* $p<.05$

Main analyses

Is there a depleting effect of self-regulation? Of interest here was whether participants were depleted by the self-regulation task. We thus subtracted depletion before the task from depletion after the task. As can be seen in Table 15, the majority of participants (54.2%) did report feeling more drained after performing the laboratory task than they had before the task. Some participants (18.6%) reported feeling less depleted after the task, while 27.1% reported no change in energy levels.

Do individuals have different motivations for self-regulation? As can be seen in Table 13, respondents reported performing the self-regulatory task for a variety of reasons, consistent with the varying levels of integration of extrinsic motivation postulated by Self-Determination Theory. Integrated regulation was the most highly endorsed, followed by external, identified and introjected regulations.

Table 15

Change in energy (post self-regulation – pre self-regulation) (Study 3)

Energy change score	Frequency	Cumulative Percent
-3,00	1	1,7
-1,50	1	3,4
-1,00	5	11,9
-,50	4	18,6
,00	16	45,8
,50	9	61,0
1,00	7	72,9
1,50	3	78,0
2,00	6	88,1
2,50	3	93,2
3,50	3	98,3
6,50	1	100,0

How does motivation relate to depletion levels? A regression predicting depletion after the task from depletion before the task and autonomous and controlled motivation revealed main effects for time 1 depletion and controlled motivation. Together, these variables explained 21% of the variance in depletion after the task. Regulation for autonomous reasons was not associated with depletion. Regression results are summarized in Table 16.

Relative to participants one standard deviation or more below the mean on depletion before the task, participants one standard deviation above the mean or more were more depleted after the task (estimated low depletion M= 3.55; estimated high depletion M=4.69). Relative to participants one standard deviation or more below the mean on controlled motivation, participants one standard deviation above the mean or more were more depleted after the task (estimated low controlled motivation M= 3.55; estimated high controlled motivation M=5.54).

How do motivation and depletion relate to performance? A regression predicting self-regulatory performance from autonomous and controlled motivations and depletion before the task revealed that autonomous motivation significantly affected time spent on the frustrating anagrams, explaining 11% of the variance. Regression results are summarized in Table 17.

Participants one standard deviation above the mean or more on autonomous motivation persisted longer at the anagrams than did those one standard deviation or more below the mean (estimated low autonomous motivation persistence M= 720.30.26; estimated high autonomous motivation persistence M=1108.78).

Table 16

Summary of multiple regression analysis for variables predicting depletion after self-regulation (N=59; Study 3)

Variable	B	SE B	Beta	95% C.I.[a]
Intercept	0.22	.17		
Depleted1	.40*	.13	.36*	.13 /.67
Autonomous regulation	-.15	.11	.25	-.37/.08
Controlled regulation	.23*	.11	.25*	.01/.44

a. 95% CI = 95% confidence interval

Note. R^2= .25; Adjusted R^2= .21.

* p<.05

Table 17

Summary of multiple regression analysis for variables predicting successful self-regulation (N=59; Study 3)

Variable	*B*	*SE B*	Beta	95% C.I.[a]
Intercept	916.21*	49.17		
Depleted1	-32.19	39.04	-.11	-110.44 /44.05
Autonomous regulation	91.55*	33.36	.35*	24.70/158.39
Controlled regulation	21.60	31.73	.09	-42.00/85.19

a. 95% CI = 95% confidence interval

Note. R^2= .16; Adjusted R^2= .11.

* p<.05

Discussion

This study showed that self-regulation of a laboratory task was not draining by definition: it was draining for some and not for others. In addition, although the same self-regulation task was presented in the same way to all participants, participants approached it differently. More specifically, participants reported engaging in the self-regulation task for a number of reasons, consistent with the varying levels of integration of extrinsic motivation proposed by SDT. Thus, self-regulation appears to be a multi-dimensional concept. Approaching the task with autonomous motives was not associated with depletion. However, performing the task for controlling reasons was associated with depletion. These findings suggest that the processes proposed by the SRSM may be more closely associated with a controlled form of motivation for an activity. In other words, it is not the self-regulation of an activity itself that depletes energy; rather it is the controlled regulation that makes an activity draining.

In addition to buffering energy loss through performance of a difficult task, autonomous motivations were also associated with more self-regulatory success, as measured through persistence at the anagrams. Controlled motivations were not related to success. Feeling depleted was negatively correlated with success, but not significantly so in the regression.

This study thus demonstrated that self-determination for regulation of a difficult task moderates its depleting effect. However, it doesn't explain why some were actually energized through regulation. The next study aims to examine whether intrinsic motivation can explain this effect.

CHAPTER FIVE

STUDY FOUR

Studies one through three showed that the same activity can seem draining to one person and energizing to another. Study three showed that being autonomously motivated for a task can counter the depleting effect of self-regulation, while controlled motivation contributes to it. However, it did not explain why some are actually energized through self-regulation. SDT proposes that because intrinsic motivation is experienced as expressing the organizational tendency of life, it should increase vitality (Ryan, 1995). Results from studies one and two support this contention. This study aims to examine whether the same result will hold true with an objective measure of self-regulatory success that was specifically designed to require overriding an easy, appealing response.

It is hypothesized that some participants will report feeling depleted by the self-regulatory task, while others will not. It is further hypothesized that some participants will report low levels of intrinsic motivation for the task, while others will report high levels of intrinsic motivation for the same task. Finally, participants who are intrinsically motivated will have more energy after self-regulation, and more self-regulatory success.

Method

Participants

Fifty-nine (51 women and 8 men) University of Ottawa undergraduate students participated in the study. Their ages ranged from 18 to 30, with a mean of 21.3 years and a standard deviation of 1.57.

Procedure

The procedure used in this study was exactly the same as that used in study 3, with the

exception of the measures of motivation.

Measures

Measure of intrinsic motivation. Intrinsic motivation was measured using three items from the intrinsic motivation inventory (McAuley, Duncan, and Tammen, 1989; Ryan, 1982; Ryan, Mims & Koestner, 1983; Plant & Ryan, 1985; Ryan, Connell, & Plant, 1990; Ryan, Koestner & Deci, 1991): "This activity was fun to do." ; "I would describe this activity as very interesting."; and, "I thought this activity was quite enjoyable.". Participants indicated their level of agreement with each statement on a nine-point Likert-type scale. Cronbach's alpha for the three items was .81.

Mesures of depletion and self-regulatory success. Measures of depletion and self-regulatory success were the same as those used in study 3.

Results

Preliminary Analyses

Outliers. No cases were identified as univariate or multivariate outliers, as none exhibited a standardized score greater than the accepted value of ± 3.29, or a significant Mahalanobis distance (χ^2(df=4) < 18.47, *ns*; Tabachnick & Fidell, 1996).

Normality. The descriptive statistics of all variables involved in the study were first examined. The means, standard deviations, kurtosis and skewness values are shown in Table 18. Mean and standard deviation values revealed that the variables displayed acceptable dispersion. Skewness values ranged from –1.03 to .11, while kurtosis values ranged from -1.13 to -.18. From a multivariate perspective, the distribution of standardized residuals also appeared normal.

Linearity and homoscedasticity. A random selection of bivariate scatterplots were examined, and no departures from linearity were encountered, nor was there any evidence of homoscedasticity. In addition, as previously mentioned, the distribution of the standardized multivariate residuals appeared normal.

Absence of multicollinearity. The correlation matrix between all possible pairs of variables reveals no correlations higher than .90, thus indicating no multicollinearity in the data (Tabachnick & Fidell, 1996). Correlations are displayed in Table 19.

Table 18

Descriptive statistics (Study 4)

	Mean	SD	Skewness	Kurtosis
Intrinsic Motivation	4.03	2.12	.09	-1.13
Drained time 1	4.57	1.85	.11	-.98
Drained time 2	5.15	1.72	-.02	-.19
Success (persistence in seconds)	1069.29	306.42	-1.03	-.18

Table 19

Correlations between all variables (Study 4)

Variable	1	2	3	4
1. Intrinsic Motivation	-	-.33*	-.47*	.35*
2. Drained Time 1		-	.71*	-.16
3. Drained Time 2			-	-.18
4. Success at self-regulation				-

* = $p. < .05$

Main analyses

Is there a depleting effect of self-regulation? Of interest here was whether participants were depleted by the self-regulation task. We thus subtracted depletion before the task from depletion after the task. As can be seen in Table 20, the majority of participants (61%) did report feeling more drained after performing the laboratory task than they had before the task. A substantial minority (30.5%) of participants reported feeling less depleted after the task, while 8.5% reported no change in energy levels.

Can self-regulation be intrinsically motivated? As can be seen in Table 21, while a majority of respondents (59%) reported levels of intrinsic motivation for the difficult anagrams at or below the mid-point of the scale, responses spanned almost the entire range of the scale (actual maximum of 8 out of a theoretical maximum of 9). Thus, the same task that was described as self-regulatory because it required persisting in the face of frustrating failure (Muraven et al, 1998) is not at all enjoyed by some, and enjoyed a lot by others.

Table 20

Changes in energy levels (post self-regulation – pre self-regulation; Study 4)

Energy change score	Frequency	Cumulative Percent
-2,67	1	1,7
-2,33	1	3,4
-1,33	1	5,1
-1,00	2	8,5
-,67	4	15,3
-,33	9	30,5
,00	5	39,0
,33	13	61,0
,67	3	66,1
1,00	3	71,2
1,33	3	76,3
1,67	1	78,0
2,00	6	88,1
2,33	2	91,5
2,67	3	96,6
4,00	1	98,3
4,67	1	100,0

Table 21

Frequencies of intrinsic motivation for unsolvable anagrams (Study 4)

Level of Intrinsic Motivation	Frequency	Cumulative Percent
1,00	7	11,9
1,50	6	22,0
2,00	4	28,8
2,50	2	32,2
3,00	4	39,0
3,50	4	45,8
4,00	3	50,8
4,50	5	59,3
5,00	2	62,7
5,50	9	78,0
6,00	6	88,1
7,00	2	91,5
7,50	3	96,6
8,00	2	100,0

How does motivation relate to depletion levels? A regression predicting depletion after the task from depletion before the task and intrinsic motivation revealed main effects for time 1 depletion and intrinsic motivation. Together, these variables explained 55% of the variance in depletion after the task. Relative to participants one standard deviation or more below the mean on depletion before the task, participants one standard deviation above the mean or more were more depleted after the task (estimated low time 1 depletion M= 3.79 ; estimated high time 1 depletion M= 6.88). Relative to participants one standard deviation or more below the mean on intrinsic motivation, participants one standard deviation above the mean or more were less depleted after the task (estimated low intrinsic motivation depletion M= 4.48; estimated high intrinsic motivation depletion M=6.54). Regression results are summarized in Table 22.

How do motivation and depletion relate to performance? A regression predicting self-regulatory performance from intrinsic motivation and depletion revealed that intrinsic motivation significantly affected time spent on the frustrating anagrams, explaining 9% of the variance. Regression results are summarized in Table 23.

Relative to participants one standard deviation or more below the mean on intrinsic motivation, participants one standard deviation above the mean or more persisted longer at the anagrams (estimated low intrinsic motivation persistence M= 863.92; estimated high intrinsic motivation persistence M=1189.21).

Table 22

Summary of multiple regression analysis for variables predicting depletion after self-regulation (N=59; Study 4)

Variable	B	SE B	Beta	95% C.I.[a]
Intercept	3,48E-005	.15		
Depleted1	.58*	.09	.63*	.41 /.76
Intrinsic Motivation	-.21*	.08	-.26*	-.36/-.06

a. 95% CI = 95% confidence interval

Note. R^2= .57; Adjusted R^2= .55.

* p<.05

Table 23

Summary of multiple regression analysis for variables predicting successful self-regulation (N=59; Study 4)

Variable	*B*	*SE B*	Beta	95% C.I.[a]
Intercept	1069.29*	38.04		
Depleted1	-7.82	22.02	-.05	-51.92 /36.29
Intrinsic Motivation	47.88*	19.22	.33*	9.39/86.37

a. 95% CI = 95% confidence interval

Note. R^2= .12; Adjusted R^2= .09.

* p<.05

Discussion

This study again showed that self-regulation of a laboratory task was not draining by definition: it was draining for some and not for others. In addition, although the same self-regulation task was presented in the same way to all participants, some found it interesting and fun, whereas others did not. These levels of intrinsic motivation were negatively related to feelings of depletion after the task, supporting SDT's contention that regulation can be invigorating instead of depleting if it is intrinsically motivated.

In addition, intrinsic motivation was positively related to self-regulatory success. The positive relationship between intrinsic motivation and persistence resembles that of decades of research on the construct, suggesting that the self-regulatory tasks designed in the SRSM framework are not immune to these effects. Thus, just as intrinsic motivation has been positively related to persistence and free-choice performance with laboratory tasks designed to be interesting (Deci et al, 1999), and in many life contexts (Deci & Ryan, in press), it is positively related to persistence at the frustrating laboratory self-regulation task.

This raises the question of why some participants spontaneously approached the same task with more intrinsic motivation than others. Future research may examine whether individuals apply specific strategies increase their intrinsic motivation, and thus reap its benefits (Green-Demers, 1999). In addition, the hierarchical model of intrinsic and extrinsic motivation (Vallerand, 1997) suggests that there are both top-down and bottom-up effects of motivation. It would be interesting to test whether a trait-level motivational orientation predisposes individuals to respond to a situation with a certain motivational approach.

Overall, this study shows that regulation can be energizing instead of depleting, if done for intrinsic reasons. Intrinsic motivation is also associated with higher success. Thus, instead of sleeping or otherwise conserving energy, people may seek to replenish themselves by engaging in intrinsically-motivated self-regulation.

The next study examines whether one's trait-level motivational orientation relates to one's overall energy levels and self-regulatory success.

CHAPTER SIX

STUDY FIVE

Studies one through four showed that one's form of regulation for an activity affected feelings of energy and success at various activities, both in controlled laboratory settings and in different contexts in participants' daily lives. The goal of this study was to test these ideas together in one model, and determine whether this pattern of results exists at a more general or trait level as well. More specifically, it aims to examine whether ones general motivational approach affects overall energy levels and success. In addition, it aims to provide a more psychometrically rigorous test of these questions.

To sum up, both Self-Determination Theory and results of studies one through four suggest that it is important to distinguish between intrinsic motivation and extrinsic motivation when looking at consequences for both energy and success or failure at self-regulation. More specifically, intrinsic motivation is hypothesized to increase both energy and success. In addition, in examining extrinsic motivations for regulation, it is important to distinguish between autonomous and controlled regulations. Autonomous forms of regulation, such as those performed because an activity is deemed important or coherent with one's values, are expected to be associated with a maintenance or increase in energy, and an increase in self-regulatory success. On the other hand, with controlled motivation for regulation, such as those performed to gain a reward or avoid guilt, SDT and SRSM finally converge. This form of regulation is hypothesized to decrease self-regulatory energies. Finally, in accordance with SRSM, vitality is hypothesized to increase self-regulatory success.

Method

Participants and procedure

A total of 432 participants, including 340 women and 86 men, completed a questionnaire for the purposes of this study. The age ranged from 18 to 75, with an average age of 25.7 years and a standard deviation of 9.53 years. They were assured that participation was entirely voluntary, and that the data would remain confidential and anonymous.

Measures

The Global Motivation Scale (GMS; Pelletier et al, 2008; Sharp, Pelletier, Blanchard & Levesque 2003). This scale is composed of 18 items designed to measure individuals' global self-regulatory styles, in line with Self-Determination Theory (Deci & Ryan, 1985; 2000). Participants responded to the statement: "In general, I do things..." on a 7 point Likert scale, ranging from 1 (Does not correspond at all) to 7 (Corresponds completely). Three subscales measure autonomous self-regulatory styles: intrinsic motivation (IM; e.g. Because I like making interesting discoveries); extrinsic motivation by integrated regulation (INTEG; e.g. Because they reflect what I value most in life) and extrinsic motivation by identified regulation (IDEN; e.g. Because I choose them as a means to attain my objectives). Three subscales measured controlled self-regulatory styles: introjected regulation (INTRO; e.g. Because otherwise I would feel guilty for not doing them), externally regulated (ER; e.g. In order to attain prestige), and amotivation (AMO; e.g. Even though I believe they are not worth the trouble).

Sharp, Pelletier, Blanchard and Levesque (2003) reported results from five studies that supported the validity of the Global Motivation Scale. Results of confirmatory factor

analyses from both American and Canadian samples supported the factor structure of the scale, revealed satisfactory internal consistency and supported the self-determination continuum. The construct validity of the scale was substantiated further in the third and fourth studies. Correlations among the subscales revealed a simplex pattern confirming the self-determination continuum and the subscales of the GMS were related to antecedents of motivation (attachment styles, perceptions of autonomy support and competence) and consequences of motivation (such as psychological well-being) in a manner predicted by SDT. In the fifth study, the GMS was administered in two occasions (six weeks interval) and revealed adequate test-retest reliability.

For the purpose of structural equation modeling, autonomous extrinsic indicators were computed by pairing one item from each of the autonomous extrinsic subscales SDR_j = ($INTEG_j$+$IDEN_j$). Cronbach's alpha for all autonomous items was .86, and for the three indicators was .86. Again, for the purposes of SEM, one item from each controlled subscale was used in each controlled self-regulatory style indicator $NSDR_j$ = ($INTRO_j$+ER). Cronbach's alpha for all controlled items was .79, and for the three indicators was .84. Each intrinsic item served as an indicator for the intrinsic motivation construct. Cronbach's alpha for the three intrinsic motivation items was .70.

Vitality/depletion (adapted from Ryan & Frederick, 1997). This scale is composed of 9 items: 7 from Ryan and Frederick's original Vitality Scale measuring subjective feelings of energy and vitality (e.g. I feel alive and vital), and 2 additional reverse-scored items measuring subjective feelings of depletion (e.g. I feel depleted of energy). Participants rated the extent to which each statement is true for them on a 7-point Likert scale. Negative items were recoded to form positive ones, and positive and negative valence items were

counterbalanced in order to create three parcels as indicators for the purposes of SEM (Little, Cunningham, Shahar & Widaman, 2002). The Cronbach alpha coefficient for the overall scale is .80, and for the three indicators is .79.

Self-regulatory success was measured by asking participants to rate their perceived success at ten self-regulatory activities, on a 7 point Likert scale (e.g. control my emotions; respect my budget; pay attention to what I eat). These activities were randomly parceled into three indicators for the purposes of SEM. The Cronbach alpha for the ten items is .68, and for the 3 indicators is .72.

Results

Statistical Analyses

Tests of the hypothesised model were conducted and will be presented in three stages. First, preliminary analyses were conducted in order to screen for missing data, outliers and to test for adherence to the basic assumptions of the multivariate analyses to be conducted. Second, the measurement model was examined using confirmatory factor analyses. Third, the hypothesised structure between the latent constructs was tested.

Preliminary Analyses

Missing data and outliers. Preliminary analyses revealed that three cases had some data missing. An examination of the pattern of this missing data in SPSS seemed to indicate that it was missing at random. The cases were thus imputed with expectation maximisation. A total of ten cases presented significant Mahalanobis' distance ($\chi^2(df=15) > 37.70, p<.001$), some of which were also univariate outliers, as they exhibited a standardized score greater than the accepted value of ± 3.29 (Tabachnick & Fidell, 1996). These cases were deleted, resulting in a final data size of 422.

Sample size. Structural equation modeling is a statistical procedure designed for large samples. A minimum of 10 cases per variable (with no less than two hundred cases overall) is generally deemed to be the minimum number of participants required to obtain a stable solution (Hair, Anderson, Tatham & Black, 1998). The present sample size of 422 is thus considered adequate.

Normality. The descriptive statistics of all variables involved in the study were first examined. The means, standard deviations, kurtosis and skewness values are shown in Table 24. Mean and standard deviation values revealed that the variables displayed acceptable dispersion. Skewness values ranged from –0.51 to .19, while kurtosis values ranged from -.52 to .87. From a multivariate perspective, the distribution of standardized residuals also appeared normal.

Linearity and homoscedasticity. A random selection of bivariate scatterplots were examined, and no departures from linearity were encountered, nor was there any evidence of homoscedasticity. In addition, as previously mentioned, the distribution of the standardized multivariate residuals appeared normal.

Absence of multicollinearity. The correlation matrix between all possible pairs of variables revealed no correlations higher than .90, thus indicating no multicollinearity in the data (Tabachnick & Fidell, 1996).

Table 24

Descriptive statistics and factor loadings (Study 5)

Variable	Mean	SD	Skewness	Kurtosis	Factor Loading
Intrinsic Motivation					
IM1	5,13	1,28	-,44	-,38	,79
IM2	5,38	1,14	-,49	-,11	,80
IM3	5,11	1,21	-,48	-,18	,46
Autonomous Regulation					
SDR1	5,15	,98	-,25	,00	,72
SDR2	5,21	,94	-,21	-,21	,85
SDR3	5,33	,93	-,35	-,07	,81
Controlled Regulation					
NSDR1	3,64	1,22	,19	-,28	,77
NSDR2	4,02	1,20	-,30	-,04	,81
NSDR3	3,66	1,27	,05	-,33	,81
Vitality					
VIT1	4,39	1,10	-,08	-,25	,71
VIT2	4,65	1,23	-,46	-,27	,79
VIT3	4,42	1,155	-,31	-,40	,73
Success					
SUC1	4,91	,86	-,47	,87	,75
SUC2	4,68	,96	-,01	-,52	,63
SUC3	5,06	,95	-,51	,14	,65

Table 25

Correlations between all latent variables (Study 5)

Variable	1	2	3	4	5
1. Intrinsic Motivation	-	.62	-.06	.33	.44
2. Autonomous Motivation		-	.04	.25	.43
3. Controlled Motivation			-	-.41	-.19
4. Vitality				-	.46
5. Success at self-regulation					-

Structural equation modeling

Structural equation modeling was conducted with version 6.0 of the AMOS statistical program. Before proceeding to the results, the choices relating to the estimation procedure, the matrix type and the model fit assessment are presented.

Estimation procedure. Maximum likelihood (ML) was the estimation procedure of choice for these analyses due to its statistical properties. This method permits an estimation of the parameters that are most likely to have produced the correlation matrix (Pedhazur & Schmelkin, 1992). The ML fit function is scale invariant and scale free, and its parameters are unbiased, consistent and asymptotically efficient. It allows a test of statistical significance because the distribution of estimated parameters is normal.

Matrix type. The covariance matrix, as opposed to the correlation matrix, was analyzed in this study because it has been demonstrated that analysis of a correlation matrix for structural equation modeling procedures can lead to important problems such as incorrect standard errors, which in turn can lead to inaccurate fit indices (Cudeck, 1989).

Assessment of model fit. Many different indicators of overall model fit are currently available. Several are reported in this paper: (a) the chi-square likelihood ratio, (b) the root mean square error of approximation and its confidence interval and, (c) the comparative fit index. In addition to these indicators of overall model fit, the z-values will be examined in order to determine the statistical significance of the individual parameters, and all of these will be interpreted within the context of an essential criteria: the substantive meaningfulness of the model.

The chi-square likelihood ratio. The χ^2 value is a statistical measure of overall fit that measures the closeness of fit between the sample covariance matrix and the fitted

covariance matrix. It is therefore desirable to obtain a value that is not statistically significant, suggesting that the sample covariance matrix does not differ from the predicted one. However, it is well known that the chi-square is sensitive to sample size, and given that CFA is based in large-sample theory, results typically show a significant difference. For this reason, the chi-square likelihood ratio is more useful in practice when regarded as a measure of fit than as a test statistic (Jöreskog & Sörbom, 1993), and it has become customary to evaluate a model on practical indices of fit.

The root-mean-square error of approximation (RMSEA; Steiger, 1990). The RMSEA is a measure of absolute model fit, which reflects the size of the residuals that result when using the model to predict the data, adjusting for model complexity. It essentially measures the discrepancy per degree of freedom, with the value representing the goodness-of-fit that could be expected if the model were estimated in the population (as opposed to the sample). Smaller values thus indicate better fit: an RMSEA of .05 or lower is thought to indicate "close fit", whereas a value between .05 and .08 represents "reasonably close fit" (Brown & Cudeck, 1989). An RMSEA above .10 represents an unacceptable model.

The comparative fit index (CFI; Bentler, 1990). The CFI is a practical measure of relative fit based on the chi-square statistic. The value indicates how much better the proposed model's chi-square fits the data as compared to that of a "null" model's, which assumes that sampling error alone explains the covariation among observed measures. CFI values range between 0 and 1. Values above .95 are generally considered as indicative of good fit (Hu & Bentler, 1999).

Testing the measurement model

The first step of structural equation modelling was to assess the measurement model using confirmatory factor analysis (CFA). This step allows for the detection and correction of any measurement problem with the potential to interfere with the assessment of the structural model.

Each indicator was hypothesised to display a significant and substantial loading on its target factor, and zero loading on the other factors. Second, the error variance associated with each indicator was hypothesised to be small, yet significant, and its uniqueness component to be uncorrelated with that of any other indicator. For identification purposes, the loadings between the first indicator of each latent variable and its target factor were fixed to 1.0. No constraints were imposed on the structural parameters, allowing the latent factors to correlate freely during assessment of the measurement model. This allows the assessment of interfactor correlations and reduces the potential for interpretational confounding between factors. The results supported the hypotheses: ($\chi^2_{(80, N=422)} = 146.64, p<.01$; CFI= .97; RMSEA=.04; confidence interval of RMSEA= 0.033, 0.056). All estimated parameters were within an acceptable range.

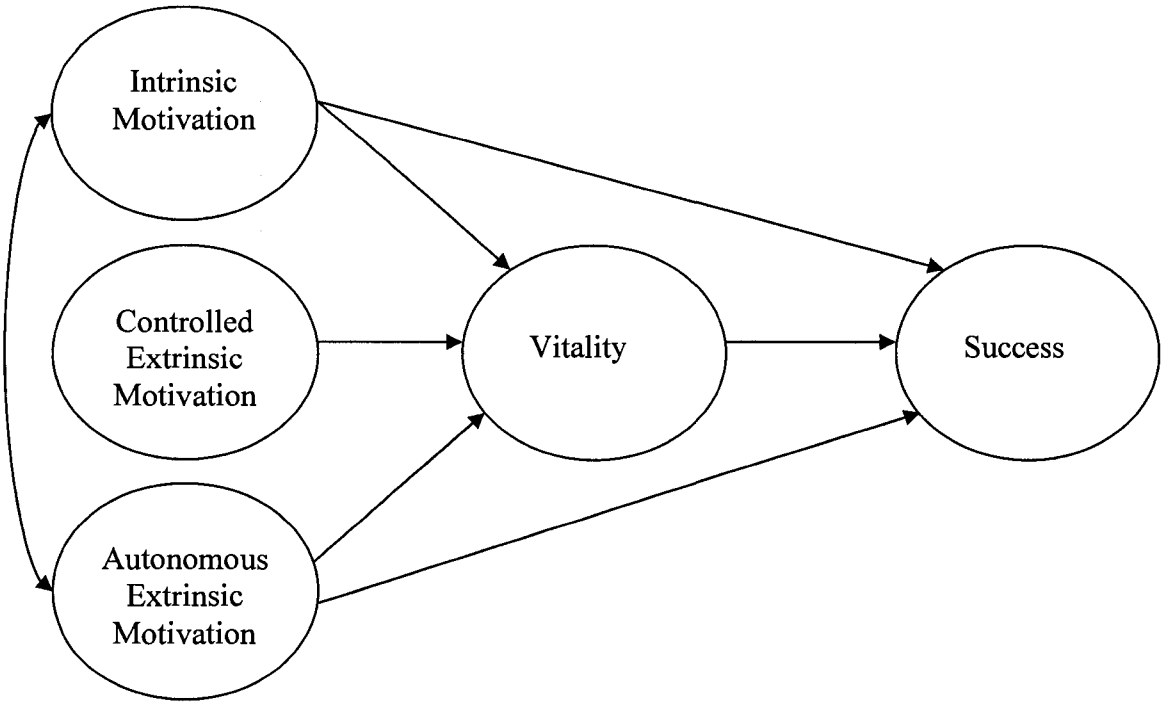

Figure 4. Hypothesized model (Study 5)

Testing the hypothesised model

The hypothesized model is presented in Figure 4. The measurement model was specified in accordance with the results reported in the previous section. The statistical hypotheses corresponding to the structural portion of the model are described below. First, the regressions of intrinsic motivation on vitality and success were hypothesized to be substantial, positive and significant. The regression of autonomous regulation on vitality was expected to be small and positive, while its regression on success was expected to be substantial, positive and significant. In addition, the regression coefficient of controlled regulation on vitality was hypothesized to be substantial, negative and significant. The regression coefficient of vitality on success was hypothesized to be substantial, positive and significant. Intrinsic motivation was expected to be correlated with autonomous extrinsic motivations, as they are both autonomous forms of motivation. Finally, the disturbance terms representing the error of prediction of the regression equations were hypothesized to be significant, and the covariance between these residuals was hypothesized to be zero.

Results revealed that the hypothesized model displayed a good fit to the data ($\chi^2_{(83, N=422)} = 150.80, p<.01$; CFI= .97; RMSEA=.04; RMSEA confidence interval = .033, .055). All but one of the hypothesized parameters were significant and of the expected direction. Vitality was positively predicted by intrinsic motivation and negatively predicted by controlled self-regulation ($R^2 = .27, p<.01$). The parameter between autonomous extrinsic motivation and vitality was of the expected direction, but non-significant. Success at self-regulation was positively predicted by intrinsic motivation, autonomous extrinsic motivation and vitality ($R^2 = .34, p<.01$). The Lagrange Multiplier test indicated that correlating some errors could result in a decrease of the chi-square. However, given that the fit was already

satisfactory, no posthoc model fitting was conducted. Results of the structural model are depicted in Figure 7, and factor loadings are shown in Table 24.

This model was compared to two alternative models: one in which there were no relationships between the motivation variables and vitality or success (and thus most similar to the model proposed by SRSM) and one in which there were no relationships between vitality and motivation or success, but instead a direct negative relationship between controlled motivation and success (and thus most similar to previous SDT research). These models are depicted in Figures 5 and 6 respectively. As shown in Table 26, these models explained less variance, and proved to be poorer fits to the data than the hypothesized model.

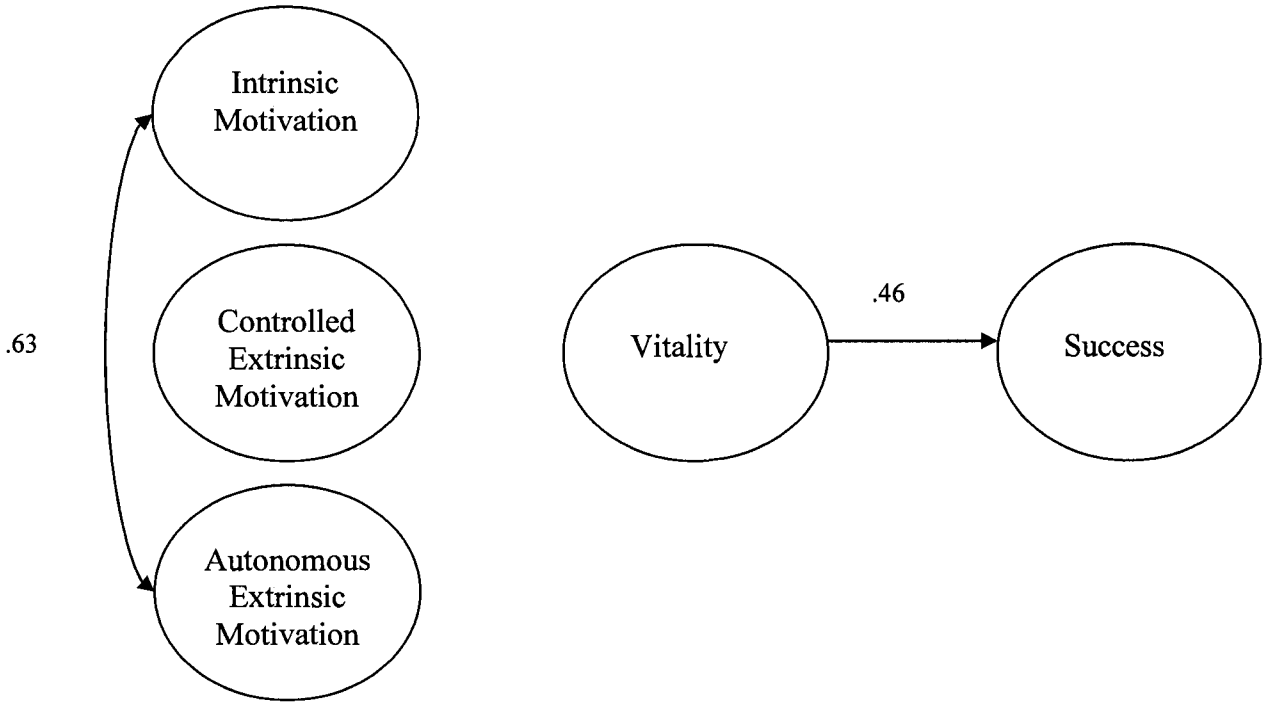

Figure 5. Alternative model (Study 5)

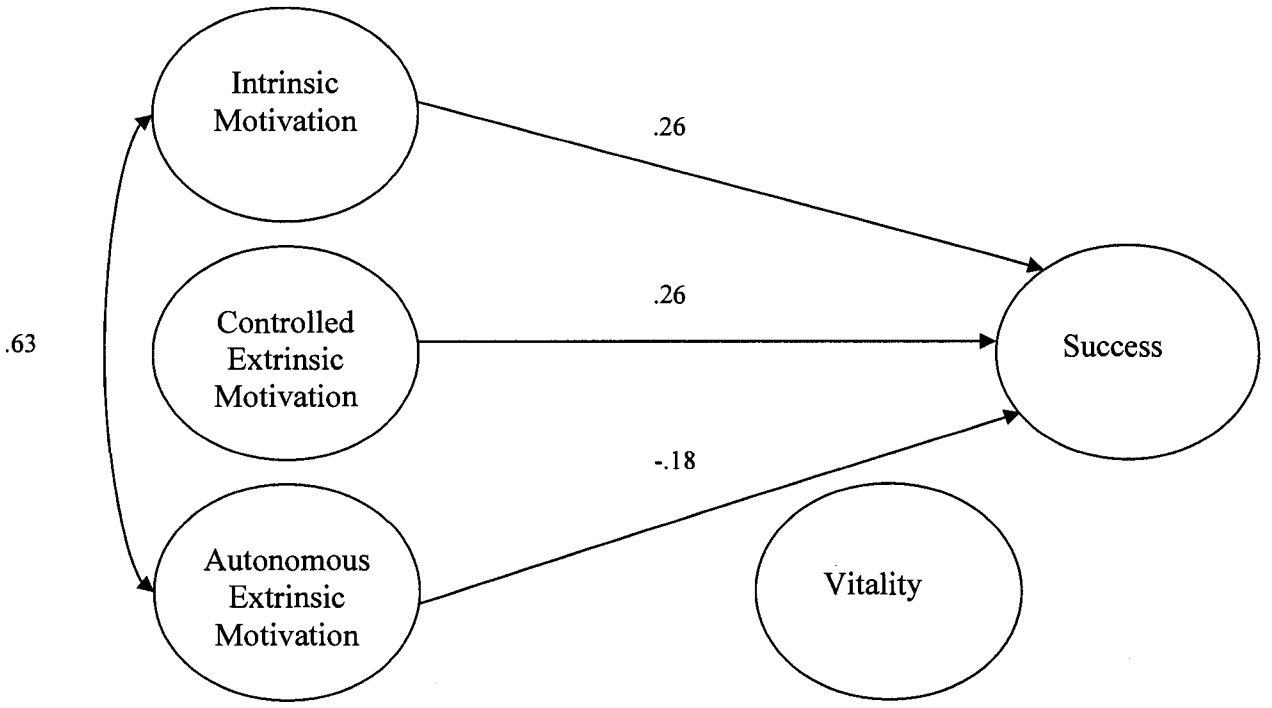

Figure 6. Alternative Model (Study5)

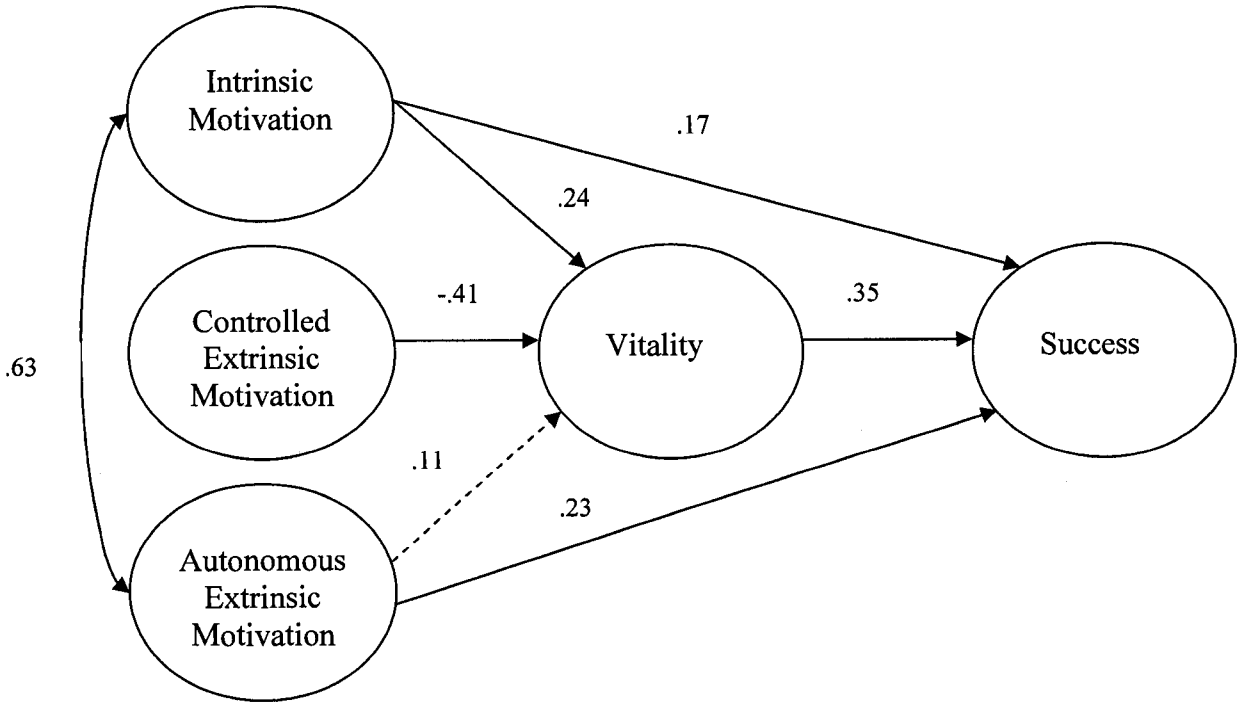

Figure 7. Final model (Study 5)

Table 26

Model comparison table (Study 5)

Model	R^2	$\chi 2$ *(df)*	CFI	RMSEA	$\Delta\chi 2$
1. Hypothesized Model (Figure 4)	.34	150.80 (83)*	.97	.04	
2. Alternative Model (Figure 5)	.21	280.61 (88)*	.91	.07	129.81*
3. Alternative Model (Figure 6)	.26	258,11 (86)*	.92	.07	107.31*

* $p<.05$

Discussion

This study aimed to determine whether different self-regulatory styles led to differing levels of vitality as well as to varying levels of success at self-regulation at a global level. The results overall corroborated the hypotheses, in support of Self-Determination Theory. Structural equation modeling results demonstrated that a general tendency to approach activities with intrinsic motivation is related to having more energy in life and more success overall. In terms of extrinsic motivations, autonomous regulation is related with more success, while controlled regulation is related to success only indirectly through a negative relationship with vitality. Finally, a general feeling of vitality was associated with self-regulatory success. Thus, these relationships extend to the global or trait-like level as well as the situational or contextual level as seen in studies one through four.

The model including the above-mentioned relationships explained more variance and fit the data better than models that did not include links between motivation and vitality or success (and thus resembled the self-regulatory strength model) or the links between vitality and motivation or success (and thus resembled previous SDT research). Thus, although the correlational design does not permit us to infer causality, this study provides additional support for the idea that the presence of both motivation and vitality better explains self-regulatory success than does either concept alone.

CHAPTER SEVEN

GENERAL DISCUSSION

Summary of Findings

Every day, we face countless opportunities or demands to regulate ourselves, be it controlling our behavior, thoughts or feelings, to align them with our goals or societal standards. For example, we may decide to work or study when play would be more fun, or feel the need to hold our tongue when irritated by an obnoxious stranger in the supermarket. We meet these situations with varying levels of success, and feel more or less drained by these attempts. The study of success and failure at self-regulation is thus an important topic in psychology.

One approach that has received a lot of attention has maintained that self-regulation operates like a muscle (SRSM; Schmeichel & Baumeister, 2004). According to this model, it takes energy to regulate ourselves. This energy is postulated to be finite, so we put ourselves at risk for future failure when we self-regulate, because in so doing we are temporarily depleting the limited energy that is required for self-regulation.

Another prominent approach posits that we regulate ourselves for different reasons, with very different consequences (SDT; Deci & Ryan, 1985; 2000). Some of these regulations are perceived as being determined by the self (such as regulating oneself because it is important or fun), while others are perceived as coming from outside the self (such as regulating oneself to gain a reward or avoid feeling guilty). According to this theory, regulating oneself for nonself-determined or controlled motivations is draining, and likely to lead to failure, just as posited by SRSM. However, this theory also postulates that regulating

oneself for self-determined or autonomous reasons will maintain or increase feelings of energy and success.

The goals of this thesis were to test the competing views of the Strength Model of Self-Regulation and Self-Determination Theory in regards to their conceptualizations of the energy available to the self and success and failure at self-regulation. More specifically, this thesis aimed to explore three questions.

What is depleting?

SRSM states that all manner of self-regulation is depleting. Thus, within this framework, any activity that requires self-regulation is depleting. This was operationalised in SRSM by categorising activities as requiring self-regulation (and therefore considered depleting) or as not requiring self-regulation (and therefore not depleting).

In contrast, SDT states that there are several possible motivations for regulating oneself, and that only the motivations that are perceived as being external to the self are draining. These motivations are called controlled, and include behaviors that are controlled by external sources, such as rewards or constraints imposed by another person, or those that are reinforced through internal pressures such as guilt, anxiety or emotions related to self-esteem. The motivations are hypothesized to be draining because they are perceived as demands to think, feel and behave in specific ways, and may involve internal conflict. However, SDT suggests that people could also regulate themselves for more autonomous or intrinsic reasons and that regulation for these more internalized reasons would not be depleting. In fact, they could be energizing, which leads us to the next question.

Can self-regulation be energizing?

SRSM views all self-regulation as depleting. Consistent with its view of self-

regulation as a muscle, it proposes that individuals should conserve their energy or manage it judiciously, and that rest, glucose or exercise (over the long run) will replenish it.

On the other hand, SDT's organismic view holds that self-regulation itself can be energizing, if it is done for intrinsic reasons. Intrinsically motivated behaviours, or those based on the inherent satisfaction of their performance itself, are hypothesized to increase vitality because they represent a spontaneous expression of the organizational tendency of life. SDT further suggests that autonomous extrinsic motivations will either maintain or increase energy. This is because autonomous motivations, which are performed because they are congruent with ones values or goals, or consistent with one's self-identity, are experienced as flowing from and expressing one's self and entail little conflict. Thus, according to SDT regulating an activity because it is fun or valued, for example, could be energizing.

What predicts successful self-regulation?

The answer to the third question is closely related to the answers to the first two questions. SRSM suggests that people fail because they lack the energy to self-regulate effectively. Thus, SRSM presents a unidimensional view of self-regulation in which all self-regulation depletes the very energy that is required for self-regulation. Thus, unless an individual conserves this energy, sleeps or perhaps consumes glucose, they are bound to fail at self-regulation.

On the other hand, SDT proposes a multidimensional view of self-regulation. This theory proposes that one's form of motivation is primarily responsible for one's success level, in addition to their energy as outlined above: intrinsic and autonomous extrinsic motivations are associated with success, while controlled motivations are not.

Five studies were designed to answer these questions. The specific goals and results of each of these studies are summarized below.

Study 1

Study 1 aimed to provide a first test of these questions by examining whether individuals' perceptions of what is draining and energizing were related to the activities themselves, or rather one's motivations for engaging in these activities. In support of SDT, the same activities were named as draining by some and energizing by others. Draining activities were performed for more controlled motivations, and energizing activities were performed for more autonomous and intrinsic motivations, both when examining activities overall, as well as more specifically among those who had listed reading and running. Individuals were more successful at energizing activities than draining activities, and intrinsic and autonomous motivations were associated with more success.

Study 2

Study 2 examined whether schoolwork and exercise, two self-regulatory activities pertinent to students, were draining to all participants. It also looked at whether energy after performing these activities as well as success at these activities were related to motivation for engaging in the activities. Results revealed that just under half of participants felt depleted by regulating these activities, while the others maintained or increased their energy through self regulation. In examining which factors were related to feeling depleted, both depletion before the activities and controlled motivation for the activities were positively related to depletion afterwards. Autonomous motivation for regulating the activities was unrelated to depletion, suggesting that regulating oneself for autonomous reasons is not draining. Further, intrinsic motivation was found to be negatively related to depletion after

regulating schoolwork, suggesting that intrinsic motivation may be energizing instead of draining in this case. Finally, intrinsic and autonomous motivations were positively related to success in both activities, while depletion before the task was negatively related to success at regulating school work.

Study 3

The goal of Study 3 was to examine whether a similar pattern of results would be found for a laboratory task that was specifically designed in the SRSM studies to be depleting. More specifically, would the task be depleting to all participants or just to some of them? Would participants report regulating themselves for different reasons, and would only the controlled forms be associated with depletion? Finally, how would depletion and autonomous and controlled extrinsic motivations relate to the objective measure of self-regulatory performance? Results revealed that just over half of participants reported being more depleted after the frustrating laboratory task than they had been before regulating themselves. Participants also reported regulating themselves for different reasons, corresponding to the extrinsic motivation subtypes proposed by SDT. Results revealed that depletion before the task and controlled forms of extrinsic motivation both positively contributed to depletion after the task. Autonomous motivation was unrelated to depletion, but was positively related to successful self-regulation of the task.

Study 4

While Study 3 showed that regulating for autonomous reasons was not depleting, it did not explain why some participants were actually energized during self-regulation. Thus, Study 4 examined SDT's hypothesis that regulation for intrinsic reasons can be revitalizing, using the same laboratory measure as Study 3. Results revealed that a majority of

participants reported being depleted by the task, but a significant minority reported being energized. Intrinsic motivation for the task, that had been designed to be frustrating, was below the midpoint, but still spanned most of the possible range of the scale. While depletion before the task was positively related to depletion after the task, intrinsic motivation was negatively related, suggesting that regulating oneself for intrinsic motivation was energizing instead of depleting. In addition, intrinsic motivation was positively related to success on the objective measure of self-regulation.

Study 5

Study 5 aimed to test the relationships between the forms of motivation, energy and success together in one model, as well as to see whether the pattern of results that emerged in specific activities of life or laboratory also existed at a more general or trait level. In addition, it aimed to provide a more psychometrically rigorous test of these questions. Results revealed that a general tendency to approach activities with intrinsic motivation was associated with higher overall subjective vitality and success. In terms of the extrinsic motivations, autonomous motivation was directly associated with more success, while the link between controlled motivation and success was completely mediated by its negative relationship with vitality. Vitality was positively related with success. This model explained more variance and provided a better fit to the data than did a model that did not include the links between motivation and vitality or success (and was thus most similar to the SRSM model) and a model that did not include the link between vitality and motivation and success (and thus most similar to previous SDT research).

In sum, this program of research strongly suggests that self-regulation itself is not depleting. When we examine more specifically each study, some results present a common

view of the processes leading to more or less vitality and success or failure at self-regulation. However, some inconsistencies are also noteworthy. These consistencies and inconsistencies are mined next.

Consistencies within the Program of Research

Although the five studies used different methodologies and measures of energy and success, most results were consistent across studies.

Self-regulation is not inherently depleting

In studies one through four, the same activity/activities proved to be draining to some and energizing to others. Thus, self-regulation itself was never draining to all participants, whether it was regulation of activities chosen by participants themselves as energizing or draining, or activities such as schoolwork or exercise that are important self-regulatory activities to most students. Even a laboratory task specifically designed within the SRSM framework to be depleting was found to deplete only 55-60% of participants in two samples. The fact that there was not something inherently draining in the regulation of specific activities evidently runs contrary to SRSM's contention that all self-regulation is depleting, and begs the question of what, then, makes an activity draining or energizing.

There are intrinsic, autonomous extrinsic and controlled motivations for regulation

Another result that was repeated across all five studies is that participants endorsed different motivations for regulation, consistent with SDT. More specifically, intrinsic motivation was measured in Studies 1, 2, 4 and 5, while autonomous and controlled extrinsic motivations were measured in Studies 1, 2, 3, and 5. Participants endorsed these different types of motivation in all studies, whether they were activities that participants generated themselves, activities that were listed for them, or laboratory activities. The fact that

participants endorsed autonomous extrinsic and intrinsic motives for a laboratory task designed to be frustrating and depleting is of particular note.

Only controlled motivations for regulation are related to depletion

The existence of these different motivations for self-regulation proved to be important, as, across all studies, only controlled motivation was associated with depletion, while autonomous extrinsic and intrinsic motivations were not. This provides strong support for SDT's contention that in order to determine whether an individual will be depleted or not, it is important to examine not only *whether* they recently self-regulated, but also *why* they self-regulated.

Intrinsic and autonomous extrinsic motivations are directly related to self-regulatory success

Finally, the last consistent result involved intrinsic and autonomous extrinsic motivations. More specifically, they were positively related to successful self-regulation in all studies, across the varying measures of success.

Inconsistencies within the Results of the Program of Research

A few inconsistencies appeared when we examined the results of each of the studies independently.

Do intrinsic and autonomous extrinsic motivations for regulation maintain or increase energy?

Although intrinsic motivation and autonomous extrinsic motivations were never depleting, it was not always clear whether they were revitalizing or neutral. More specifically, autonomous extrinsic motivation generally had a non-significant relationship with energy, but on occasion had a small positive relationship with energy. This is in line

with SDT's hypothesis that autonomous extrinsic motivation should maintain or enhance energy. Intrinsic motivation, in turn, was associated with higher self-reported energy in all studies, except its effect was non-significant in the regression predicting energy after exercising in Study 2. Exercise, by definition, involves the expenditure of physical energy and raises the heart rate. Changes in physical energy as a result of this form of self-regulation therefore may confound the effects of motivation or other psychological factors on the psyche's feelings of energy and depletion after exercise. Future studies would be needed in order to make any claims with more certainty.

What is the relationship between energy and self-regulatory success?

The other inconsistent result concerns the relationship between energy and success. Depletion was negatively correlated with success in all studies. However, in some cases the negative relationship was statistically significant and important, while in others it was not. In particular, the negative relationship between energy and success was non-significant in the laboratory studies. In this scenario, participants were very unlikely to spend zero seconds on the behavior, given that they were already sitting at a desk with the task in front of them. Thus, the measure of success in this case primarily included persisting or maintaining the behavior, as opposed to initiating it per se. Future studies may examine the possibility that self-regulatory energy is more important in successfully initiating a behavior than it is in maintaining it once it has been started. Another possibility is that depletion resulted in a passive response among some participants, who were simply slow to call the experimenter, thus obscuring the effect. This seems less likely given that the task was used with success in other SRSM studies, as well as the fact that all other relationships with this task corresponded to hypotheses in both samples. However, future studies could rule out this

possibility by including a success measure that included performance in addition to persistence.

Theoretical Implications

Overall, the results, in both their consistencies and inconsistencies, have some implications for SRSM and SDT.

Self-Regulatory Strength Model

The Self-Regulatory Strength Model has successfully shown that following instructions to suppress thoughts or emotions, or follow similar such rules in one laboratory task results in poorer performance in a subsequent laboratory self-regulatory task, a result they attribute to a depletion of self-regulatory energy due to the first task (Baumeister et al, 2007).

The results of this program of research extend the support for SRSM in some ways, and limit it in others. In terms of support, these results show that some regulation is indeed draining. While SRSM rarely measured the variable they hypothesized as the mediator, these results show that many participants do in fact feel drained after self-regulating. In addition, while SRSM has constructed many very internally-valid laboratory experiments, their external validity is not as high. Results of Studies 1 and 2 show that feeling drained by self-regulation is not limited to the laboratory. Many participants felt drained by schoolwork and exercise, self-regulatory activities very relevant to students, and listed draining activities relevant to their own lives. In further support of SRSM, depletion was associated with less success for the self-chosen draining activities, as well as schoolwork, and the overall measure of success used in Study 5.

However, the results limit the scope of SRSM in another way. In particular, it seems as though the mechanism proposed by SRSM applies only to a specific subset of self-regulation: regulation for controlled motivations. Regulation that is controlled by external sources, such constraints imposed by another person, or internal pressures such as guilt, does indeed seem to be draining. However, in starting with depletion, and limiting itself to activities done at the request of an experimenter in a laboratory setting, it seems to be missing out on another large subset of self-regulation: that done for autonomous or intrinsic motivations. This limitation prevents it from explaining why it is that some participants maintain their energy through self-regulation, and others are actually revitalized. There is thus a question that remains unanswered by SRSM: where does this energy come from?

Self-Determination Theory

Self-Determination Theory provides a theoretical rationale for the source of the energy, as well as how it relates to the different types of motivation. However, not all of the hypothesized relationships had been explicitly tested. Results of this program of research empirically situated the role of vitality within SDT.

In particular, results provided support for SDT's organismic view of vitality, suggesting that controlled motivations would decrease energy because they are perceived as demands to act, think or feel a certain way, and may entail internal conflict. Autonomous extrinsic motivation, on the other hand, was overall unrelated to energy, showing that not all extrinsically-motivated regulation was draining. Thus, regulation because an activity is deemed important or part of one's identity does not deplete the psyche's energy. Finally, intrinsic motivation for regulation was associated with increases in energy. Thus, the three

regulatory styles are able to explain the loss, maintenance and gain of energy through self-regulation.

In terms of relationships between motivation and successful self-regulation, results in this program of research echoed those of hundreds of previous studies in the laboratory and the field: intrinsic and autonomous motivations were positively related to the successful self-regulation of behavior (Deci et al., 1999; Deci & Ryan, in press). Results of controlled motivation were somewhat different in that it seems as though their relationship to success may be completely mediated by a negative impact on energy for self-regulation.

These results underscore once again the importance of distinguishing between autonomous and controlled motivations. The differences between the consequences of autonomous and controlled motivations were large: while autonomous motivations were directly related to self-regulatory success, and unrelated to energy, controlled motivations were related to feeling depleted by self-regulation, and only indirectly to success and failure at self-regulation. It is thus important to consider the amount of self-determination underlying an extrinsic motivation.

In addition, the results suggest the importance of distinguishing intrinsic motivation from autonomous extrinsic motivations. Although the very origins of SDT relate to the existence and importance of intrinsic motivation (Deci, 1975), it is now common for tests of SDT to lump intrinsic motivation with the autonomous extrinsic motivations in tests of the theory. This strategy may often be warranted given that the effects of all autonomous motivations are expected to be positive, while those of controlled motivation are expected to be negative. However, in some cases it seems important to distinguish them. Indeed, previous studies of the relationships between the forms of motivation and vitality had

combined all autonomous motivations, despite the fact that SDT suggested different hypotheses for their relationships. Examining their effects independently revealed that, as hypothesized, intrinsic motivation for regulation was associated with increases in energy or decreases in depletion, while autonomous extrinsic motivation overall presented nonsignificant relationships of the same direction, suggesting that it is related more to maintenance of energy rather than its increase.

Some may be tempted to discount results showing that intrinsic motivation increases energy and success, believing that if one enjoys it, it doesn't count as self-regulation. We believe that is flawed logic. Admittedly, it is true that not everything one enjoys could be considered self-regulation. For example, unless one had a goal of increasing fat intake and gaining weight, it would be difficult to qualify eating potato chips and cheesecake as self-regulation, although it may be a very enjoyable experience. However, that does not mean that nothing one enjoys can qualify as self-regulation. If a person finds a way to enjoy working toward a goal, it seems like a particularly healthy way to achieve that goal. We do not ask academics to subtract all publications that they enjoyed writing from their list of accomplishments. The person who has a great time exercising by joining a friend's soccer team enjoys at least the same health benefits as the one who forces themselves to ride a stationary bike, an activity they dread. Thus, the finding that individuals can be intrinsically motivated to regulate themselves at a variety of activities is important.

Applications

It is our hope that these results can help people feel more vital and self-regulate more effectively.

Perhaps the most obvious practical application relates to the choice of means to an end. More specifically, if there are several ways to achieve a goal, these results suggest that it is a good idea to choose the option that seems the most fun and interesting. For example, a person could achieve her goal of doing at least 30 minutes of cardiovascular exercise three to five times a week in countless ways. If she found the idea of joining a friend's soccer team fun, while dreading the idea of riding an incumbent bicycle, it would be a good idea to sign up for the soccer team. These results suggest picking the intrinsically motivating choice will result not only in more success, but in more energy afterwards as well. That energy may then be used to regulate behaviors that are not as fun or well integrated.

In addition to preferentially selecting behaviors that are already intrinsically or autonomously motivated, another strategy would be to increase one's intrinsic or autonomous motivation for activities. One sub-theory of SDT, Cognitive Evaluation Theory, has focused on the factors that increase or decrease intrinsic motivation, while another, Organismic Integration Theory, has focused on the factors that promote internalization of extrinsic motivations.

A substantial body of literature in Cognitive Evaluation Theory shows that contexts or events that are perceived as controlling (autonomy-thwarting) undermine intrinsic motivation. Thus, expected rewards (Deci et al, 1999), deadlines (Amabile, DeJong, & Lepper, 1976) imposed goals (Mossholder, 1980), surveillance (Lepper & Greene, 1975; Plant & Ryan, 1985) and threats of punishment (Deci & Cascio, 1972) have all been shown to decrease intrinsic motivation. On the other hand, the provision of choice about what to do or how to do it can enhance intrinsic motivation (Swann & Pittman, 1977; Zuckerman, Porac, Lathin, Smith & Deci, 1978). In addition, positive feedback (competence support) can

also enhance intrinsic motivation (Fisher, 1978; Ryan, 1982). Thus, in order to promote intrinsic motivation in others, one should minimize the use of controlling strategies and attempt to support feelings of competence. Similarly, seeking out situations that minimize control and maximize competence could help maintain or increase one's own intrinsic motivation.

These same mechanisms support internalization of extrinsic motivations as well. In addition to autonomy and competence, relatedness is expected to be particularly important for the internalization of extrinsic motivations. Typically, extrinsically motivated behaviors are prompted by its endorsement by significant others, which is somehow conveyed to the target individual. The target individual then engages in the activity out of a feeling of relatedness, or a desire for such relatedness. Thus, support of the basic needs of competence, autonomy and relatedness support can support the internalization of extrinsic motivations (Grolnick & Ryan, 1989; Ryan, Stiller & Lynch, 1994; Williams & Deci, 1996).

Supporting the basic psychological needs in order to promote intrinsic and autonomous extrinsic motivations may be particularly relevant because, as Baumeister and colleagues acknowledge (Baumeister, Vohs & Tice, 2007), success at building self-control through exercise has been inconsistent. Thus, the results of this thesis suggest that it could be fruitful to promote intrinsic and autonomous motivations for self-regulation as a strategy for maintaining or increasing their energy, and increasing their success.

Limitations

There were some limitations to this research that should be considered in the interpretation of its results.

Methodological limitations

Studies 1 through 4 were conducted with entirely student samples, and Study 5 had a large proportion of students as well. Although self-regulatory processes are hypothesized to be universal, it would be important to conduct studies with samples from other populations before generalizing with confidence. For example, if self-regulation improved with exercise as suggested by SRSM, an older population may have more success than a younger one, having had more opportunities to exercise their capability over a lifetime. There is also some indication that self-regulatory success is related to socioeconomic status (Everhart & Emde, 2006; Miech, Essex & Goldsmith, 2001), a variable on which university students tend to be high. Although mean differences themselves do not pose a threat to the relationships between the variables, it would be important to verify that the processes were indeed the same among different age groups, cultures or socioeconomic backgrounds before concluding that this was the case.

The generalizability of the results is also hindered by the fact that the measures of self-regulation primarily targeted behavioral self-regulation. Although many authors have postulated that the same processes underlie the regulation of behavior, thoughts and emotions, these results can only be assumed to apply to behavioral self-regulation until the regulation of thoughts and emotions are directly studied within this framework.

A final methodological limitation relates to the design of the studies. Studies of SRSM were all experimental, and some might have suggested that a similar approach be used here. However, the use of a depletion manipulation such as those used in SRSM relies on the potentially biased assumption that depletion is caused by regulation of a specific activity, as opposed to one's motivation for the activity. Given that this was the very

assumption this thesis was designed to question, we could not rely on a methodology that rested on that assumption. Now that it is clear that depletion is associated with controlled motivation, the next step could determine whether the ego-depletion manipulations used in the SRSM context function by thwarting a basic psychological need, thus reducing self-determination, vitality and success. The study by Moller and colleagues (2007) suggests that the choice ego-depletion manipulation was indeed mediated by perceptions of autonomy. Future studies could determine whether the same effect would be at play with other ego-depletion manipulations.

Psychometric limitations

The motivation and energy variables were self-report in all studies, and the success variables were self-report in three of the five studies. These results are thus subject to the various problems pertaining to self-report measures. In order for self-report measures to be accurate, participants must decide to respond honestly and accurately. We hope to have minimized biases such as social desirability by explicitly asking participants to answer the questionnaires as honestly as possible, as well as making them anonymous and confidential. We also kept the questionnaires as short as possible, in order to minimize carelessness. A further psychometric limitation relates to the scales themselves, some of which were based on only one item, or were not validated. Although the fact that the results were quite consistent with theory and across all studies lends credence to the results, future studies could verify the convergent and discriminant validity of different types of measures using a multitrait multimethod approach.

In conclusion, although the consistent results in this program of research offer support for the role of self-determination in feelings of energy and successful self-regulation,

future studies could be performed to remedy the limitations to these studies. Future studies may also attempt to broaden our understanding of the factors involved in energy and self-regulation. The following section provides some ideas for future directions.

Future Research

As noted in the section on potential practical applications of this research, strategies for increasing intrinsic motivation and the internalization of extrinsic motivations may be helpful in increasing individuals' feelings of energy and their self-regulatory success. Both Cognitive Evaluation Theory and Organismic Integration Theory emphasize the ways in which immediate social contexts can influence intrinsic motivation and the integration of extrinsic motivations by supporting versus thwarting the basic psychological needs. However, studies three and four showed that participants spontaneously approached the same laboratory task with different levels of intrinsic motivation and integration of extrinsic motivation, in the absence of any differences in immediate social contexts. Future studies might examine why that was the case.

Two avenues may be interesting in this regard. One possibility is that these differences in situational motivation can be explained by one's motivation at a higher level. For example, it is possible that one's contextual motivation for school or leisure affected the motivation for the laboratory study, or the anagrams more specifically. Indeed, the Hierarchical Model of Intrinsic and Extrinsic Motivation proposes that there is a top-down (as well as a bottom-up) effect of motivation (Vallerand, 1997). Study 5 showed that global motivation had a positive relationship with overall energy and success. It would be interesting to examine whether global motivation could also predict situational motivation

upon arrival at the laboratory, and thus indirectly affect energy and success for a novel activity.

Another possibility is that individuals adopted strategies to increase their own intrinsic motivation or autonomous extrinsic motivation. Indeed, a noteworthy line of research suggests that individuals can increase their intrinsic motivation by employing specific interest-enhancing strategies (Green-Demers, 1998). It would be interesting to see if individuals could also affect their extrinsic motivation for an activity, perhaps even by something as simple as focusing their attention on why the activity is important to them, as opposed to why they "have to" or "should" perform the activity. Given the importance of intrinsic and autonomous motivations for both energy and self-regulatory success, more research on strategies through which individuals can modify their own motivations seems warranted.

Another line of research may examine whether specific mass communication strategies can foster or appeal to the autonomous motivations of behaviors. Many self-regulatory behaviors impact society as well as individuals. If it were possible to foster autonomous motivations for the performance of behaviors such as exercise or the use of public transit instead of cars through mass communication, that could be a very powerful means of having a positive impact on society. Pelletier (in press) has suggested that this might be achieved through appropriate message tailoring and framing, and appealing to intrinsic rather than extrinsic goals, among other things.

In considering both intrapersonal and mass communication strategies for increasing intrinsic motivation and internalization of extrinsic motivations, it would be important to conduct longitudinal studies to examine their development. Longitudinal studies could also

examine how the roles of motivation and energy change through the initiation, maintenance and integration of behavior. For example, it seems possible that energy would be particularly important for the initiation of behavior, and diminish in importance once the behavior is integrated into one's lifestyle, thus relating to the absence of a relationship between autonomous extrinsic motivation and energy.

It is our hope that this research will shed some light on processes leading people to enjoy healthier, satisfying and pleasant lives.

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APPENDIX A

Measures Used in Study 1

1. Please name one activity that you find draining: _____

Please indicate to what extent each of the following statements corresponds to your reasons for engaging in the draining activity.

	Does not correspond at all			Corresponds moderately			Corresponds exactly
1. You do it purely for the interest and enjoyment of doing it.	1	2	3	4	5	6	7
2. Interesting or not, you feel that it expresses your values.	1	2	3	4	5	6	7
3. You make yourself do it, to avoid anxiety or guilt.	1	2	3	4	5	6	7
4. Something about your external situation forces you to do it.	1	2	3	4	5	6	7

How successful are you at this activity?

Not at all successful			Moderately successful			Extremely successful
1	2	3	4	5	6	7

1. Please name one activity that you find energizing: _____

Please indicate to what extent each of the following statements corresponds to your reasons for engaging in the energizing activity.

	Does not correspond at all			Corresponds moderately			Corresponds exactly
1. You do it purely for the interest and enjoyment of doing it.	1	2	3	4	5	6	7
2. Interesting or not, you feel that it expresses your values.	1	2	3	4	5	6	7
3. You make yourself do it, to avoid anxiety or guilt.	1	2	3	4	5	6	7
4. Something about your external situation forces you to do it.	1	2	3	4	5	6	7

How successful are you at this activity?

Not at all successful			Moderately successful			Extremely successful
1	2	3	4	5	6	7

APPENDIX B

Measures Used in Study 2

Please indicate to what extent each of the following statements corresponds to your reasons for doing schoolwork.

	Does not correspond at all			Corresponds moderately			Corresponds exactly
1. You do it purely for the interest and enjoyment of doing it.	1	2	3	4	5	6	7
2. You do it because it is important to you.	1	2	3	4	5	6	7
3. You do it because it expresses your true values.	1	2	3	4	5	6	7
4. You make yourself do it, to avoid anxiety or guilt.	1	2	3	4	5	6	7
5. Something about your external situation forces you to do it.	1	2	3	4	5	6	7

How drained do you feel **before** doing your schoolwork?

Not at all drained			Moderately drained			Extremely drained
1	2	3	4	5	6	7

How drained do you feel **after** doing your schoolwork?

Not at all drained			Moderately drained			Extremely drained
1	2	3	4	5	6	7

How successful are you at doing your schoolwork?

Not at all successful			Moderately successful			Extremely successful
1	2	3	4	5	6	7

Please indicate to what extent each of the following statements corresponds to your reasons for exercising.

	Does not correspond at all			Corresponds moderately			Corresponds exactly
1. You do it purely for the interest and enjoyment of doing it.	1	2	3	4	5	6	7
2. You do it because it is important to you.	1	2	3	4	5	6	7
3. You do it because it expresses your true values.	1	2	3	4	5	6	7
4. You make yourself do it, to avoid anxiety or guilt.	1	2	3	4	5	6	7
5. Something about your external situation forces you to do it.	1	2	3	4	5	6	7

How drained do you feel **before** exercising?

Not at all drained			Moderately drained			Extremely drained
1	2	3	4	5	6	7

How drained do you feel **after** exercising?

Not at all drained			Moderately drained			Extremely drained
1	2	3	4	5	6	7

How successful are you at exercising?

Not at all successful			Moderately successful			Extremely successful
1	2	3	4	5	6	7

APPENDIX C

Measures Used in Study 3

Depletion

Please rate to what extent each of the following statements corresponds to how you feel right now *(distributed before and after performing the anagrams).*

	Does not correspond at all					Corresponds moderately				Corresponds exactly
1. I feel drained.	1	2	3	4	5	6	7	8	9	
2. I feel energized.	1	2	3	4	5	6	7	8	9	
3. I feel tired.	1	2	3	4	5	6	7	8	9	

Extrinsic Motivation

Please indicate to what extent each of the following statements corresponds to your reasons for persisting at the anagrams.

	Does not correspond at all					Corresponds moderately				Corresponds exactly
1. Because I would have felt bad if I didn't.	1	2	3	4	5	6	7	8	9	
2. Because I'm a type of person who likes to help.	1	2	3	4	5	6	7	8	9	
3. Because I thought it was a good idea to do it.	1	2	3	4	5	6	7	8	9	
4. Because I wanted to prove that I could do them.	1	2	3	4	5	6	7	8	9	
5. Because I felt I had to.	1	2	3	4	5	6	7	8	9	
6. Because it was a sensible way to do something meaningful.	1	2	3	4	5	6	7	8	9	
7. Because I would have felt guilty if I didn't.	1	2	3	4	5	6	7	8	9	
8. Because I wanted to help the experimenter.	1	2	3	4	5	6	7	8	9	
9. Because experiencing new things is part of who I am.	1	2	3	4	5	6	7	8	9	

10. Because that's what I was supposed to do. 1 2 3 4 5 6 7 8 9

11. Because I would have felt awful about myself if I didn't. 1 2 3 4 5 6 7 8 9

APPENDIX D

Measures Used in Study 4

Depletion

Please rate to what extent each of the following statements corresponds to how you feel right now *(distributed before and after performing the anagrams).*

	Does not correspond at all				Corresponds moderately			Corresponds exactly
1. I feel drained.	1	2	3	4	5	6	7	
2. I feel energized.	1	2	3	4	5	6	7	
3. I feel tired.	1	2	3	4	5	6	7	

Intrinsic Motivation

Please indicate to what extent you agree with each of the following statements.

	Do not agree at all				Moderately agree				Very strongly agree
1. This activity was fun to do.	1	2	3	4	5	6	7	8	9
2. I would describe this activity as very interesting.	1	2	3	4	5	6	7	8	9
3. I thought this activity was quite enjoyable.	1	2	3	4	5	6	7	8	9

APPENDIX E

Measures Used in Study 5

IN GENERAL IN MY LIFE....

	Does not correspond at all			Corresponds moderately			Corresponds exactly
1. I feel alive and vital.	1	2	3	4	5	6	7
2. I don't feel very energetic.	1	2	3	4	5	6	7
3. I have energy and spirit.	1	2	3	4	5	6	7
4. I feel alert and awake.	1	2	3	4	5	6	7
5. I am drained.	1	2	3	4	5	6	7
6. I feel so alive I just want to burst.	1	2	3	4	5	6	7
7. I look forward to each new day.	1	2	3	4	5	6	7
8. I feel depleted of energy.	1	2	3	4	5	6	7
9. I feel energized.	1	2	3	4	5	6	7

Please indicate to what extent each of the following statements corresponds to the reasons why you generally do things.

	Does not correspond at all			Corresponds moderately			Corresponds exactly
In general, I do things...							
1. ... because by doing them I am fully expressing my deepest values	1	2	3	4	5	6	7
2. ...in order to help myself become the person I aim to be.	1	2	3	4	5	6	7
3. ...because I like making interesting discoveries.	1	2	3	4	5	6	7
4. ...because I would beat myself up for not doing them.	1	2	3	4	5	6	7
5. ...because I want to be viewed more positively by certain people.	1	2	3	4	5	6	7
6....because I chose them as means to attain my objectives.	1	2	3	4	5	6	7
7. ...for the pleasure of acquiring new knowledge.	1	2	3	4	5	6	7
8. ...because they reflect what I value most in life	1	2	3	4	5	6	7
9. ...because otherwise I would feel guilty for not doing them.	1	2	3	4	5	6	7
10. ...although it does not make a difference whether I do them or not.	1	2	3	4	5	6	7
11. ...for the pleasant sensations I feel while I am doing them.	1	2	3	4	5	6	7

12. …in order to show others what I am capable of.	1	2	3	4	5	6	7
13. …because I chose them in order to attain what I desire.	1	2	3	4	5	6	7
14. …even though I do not have a good reason for doing them.	1	2	3	4	5	6	7
15. …in order to attain prestige.	1	2	3	4	5	6	7
16. ...because by doing them I am living in line with my deepest principles	1	2	3	4	5	6	7
17. …because I would feel bad if I do not do them.	1	2	3	4	5	6	7
18. …even though I believe they are not worth the trouble.	1	2	3	4	5	6	7

Success

Please indicate to what extent you are successful at each of the following activities.

	Not at all successful			Moderately successful			Extremely successful
Keep my budget	1	2	3	4	5	6	7
Criticize others less	1	2	3	4	5	6	7
Physical Activity	1	2	3	4	5	6	7
Procrastinate less	1	2	3	4	5	6	7
Be patient with those around me	1	2	3	4	5	6	7
Keep my house or apartment tidy	1	2	3	4	5	6	7
Organize my time	1	2	3	4	5	6	7
Control my emotion	1	2	3	4	5	6	7
Achieve what I set out to do	1	2	3	4	5	6	7
Control what I eat	1	2	3	4	5	6	7