

RUNNING HEAD: SELF-CONTROL AND AUTONOMOUS MOTIVATION

Willful Wanting:

Self-Control and Autonomous Motivation in the Lab, Home, School, and Office

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Abstract

Most people want to lead a “purpose-driven life.” They want to pursue engaging projects that allow them to contribute to something larger than themselves. Indeed, motivation derived from a sense of truly valuing and/or enjoying one’s pursuits – as opposed to motivation born of external demands and other people’s expectations – is associated with progress, perseverance, success, and well-being. But what determines the content of a given motivation in a given situation? Many theoretical perspectives address “properties” or “contents” of goals as if they are somehow inherent to the goal. In contrast, the starting point of the current research is a more explicit acknowledgment than most other accounts that goal “content” is determined by the mind (i.e., is a construal). Based on this assumption, the current research examines self-regulation as one possible determinant of how “self-determined” one’s goal pursuit is. Specifically, using cross-sectional, experience-sampling, and laboratory-based paradigms, we find that self-regulatory processes – here, operationalized as trait self-control – are associated with the degree of autonomous motivation that a goal-pursuer experiences in everyday life. We also examine, in an exploratory fashion, how more self-determined moments might add up to a more satisfied life.

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There is no shortage of self-help books, therapies, productivity apps, and sleepless nights to help a person ask, “Am I doing what I’m supposed to be doing? Should I be spending my time differently?” People want to spend their time on projects they care about or enjoy, and with good reason. Finding the answer to a difficult research question can be enjoyable and feel as though it contributes to a greater good. But even the most enjoyable or meaningful pursuit can still feel like work at times, and there are plenty of tasks that must be completed because someone called in a favor, or because the report was due yesterday. Sometimes people’s pursuit of a goal is motivated by internal reasons and a sense of autonomy, while other times their pursuit of a goal is motivated by external reasons and a sense of being controlled. These differences are likely to have consequences for goal persistence and achievement as well as a person’s subjective experience.

Different motivations may be identified for the same activity by different people or even by the same person in different circumstances. When typing up meeting notes, one person might feel that her summary contributes to the larger project goal, while another person might complete the summary because it pleases her boss. The same action may be construed as more or less self-determined. The current research examines whether self-regulation influences people’s experience of self-determination. Specifically, we examine the association between self-regulatory processes—operationalized as trait self-control—and the extent of autonomous motivation a person reports in everyday life, and how that association relates to well being.

Self-Determination and Goal Pursuit

The motivation to pursue a goal may result from a sense of obligation or because of a genuine desire to achieve it. Self-determination theory posits that people’s experiences of motivation will lie along a continuum from controlled to autonomous depending on features of

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the situation and goal, such as whether the circumstances allow for competence and whether the goal reflects a person's values (Ryan & Deci, 2000). External motivation encompasses goals performed for rewards or to avoid punishment. When people adopt a goal as their own, their motivation may shift toward introjected or identified motivation. Introjected motivation is typically operationalized as guilt, while identified motivation involves the conscious endorsement of the value of the behavior or goal. Finally, intrinsic motivation occurs when goals are pursued for the inherent pleasure of the action (Ryan & Deci, 2000). Often, identified and intrinsic motivations are collapsed into an umbrella category of autonomous motivation and external and introjected motivations are considered controlled, and we do so in this article. Whether a person has controlled or autonomous motivation for their goals is likely to affect their experience (Milyavskaya, Inzlicht, Hope, & Koestner, 2015), expended effort (Werner, Milyavskaya, Foxen-Craft, & Koestner, 2016), and likelihood of success (Trope & Fishbach, 2000), and well-being (Sheldon, Ryan, Deci, & Kasser, 2004), and we review that literature below.

Controlled motivation. Although controlled reasons for goal pursuit might seem like they would be coercive and that people would abandon those efforts as quickly as possible, controlled motivations are common and effective, especially at the beginning of goal pursuit (Sheldon & Elliot, 2008). When intrinsic motivation is low, it can be helpful to have external pressures to continue driving pursuit. When truly determined by others, deadlines can result in comparable but faster work (Aronson & Gerard, 1966; Aronson & Landy, 1967; Landy, McCuen, & Aronson, 1969). And in fact, people self-impose early deadlines in an attempt to motivate their selves. For example, in one study, students were allowed to set their own due dates for 3 class papers. Students intentionally set their deadlines early in an attempt to motivate

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their work, even though this sometimes resulted in grade penalties they could have avoided by choosing later dates (Ariely & Wertenbroch, 2002). Payment—and the possibility of losing it—can also be a strong external motivation. Just like the students self-inflicting early deadlines to motivate paper writing, in a different study, people stake their payment upon completion to motivate enduring a painful procedure (Trope & Fishbach, 2000). These external motivators can be taken to the extreme, as with newly sober drug addicts writing self-incriminating letters that will only be sent upon relapse (Schelling, 1992) or dieters delivering embarrassing photos to their bosses upon failing to meet their goal weight (Fielder, Koman, & Mintz, 2014)¹. Fear of punishment or social pressure can be a strong motivator, but may not be consistent. In some cases, controlled goals may be achieved at a cost to subsequent motivation or interest. In educational settings, there is evidence that contingent rewards might “crowd out” students’ inherent desire to learn (e.g., Wrzesniewski et al., 2014; Bénabou & Tirole, 2003; Frey, 1994; Deci & Ryan, 1975), and in the physical endurance domain, that contingent rewards result in greater feelings of depletion (Muraven, Rosman, & Gagné, 2007). Pursuing goals more controlled reasons can result in goal achievement, but the success may have undesirable side effects.

Autonomous Motivation. At the other end of the self-determination spectrum, goals are motivated by autonomous reasons. Autonomously motivated goals are more enthusiastically pursued and maintained than controlled goals (Gagné & Deci, 2005), and inherent in much of this work, sometimes explicitly stated, is the conclusion that autonomous motivation is a better source of motivation, especially for long-term outcomes. People strive harder for goals that align with their values—self-concordant goals—and upon achieving those goals, experience greater

¹ Although the dieters here are hapless participants in a reality show scheme, not randomly assigned in a formal study, the enthusiasm with which they agree to dire consequences and lose weight speaks to the strength of controlled motivation.

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fulfillment and subsequent well-being. On the other hand, controlled motivation goals do not receive as much effort, and achieving goals motivated by controlled reasons did not result in the same large well-being gains (Sheldon & Elliot, 1999). High school students who report autonomous motivation during gym class have higher intentions to continue exercising after graduation (Erdvik, Øverby, & Haugen, 2014), and personal goals that were aligned with one's values felt easier to pursue across the semester than goals pursued for controlled reasons (Werner, Milyavskaya, Foxen-Craft, & Koestner, 2016).

People perceive fewer obstacles for their autonomously motivated goals compared to goals pursued for controlled reasons (Milyavskaya, Inzlicht, Hope, & Koestner, 2015). For example, people who reported wanting to eat healthy foods because it was “fun to create meals that are good for my health” and “because it is how I have chosen to live my life” reported less temptation from unhealthy snacks across a week's worth of meals and snacks than those who wanted to eat healthy foods because “I don't want to be ashamed of how I look.” Personal goals held for autonomous reasons rather than controlled reasons were also perceived as easier to pursue, as people recalled fewer obstacles for their autonomously motivated goals compared to their externally motivated goals.

Autonomously motivated goals are associated with better well-being outcomes. People who reported externally motivated goals such as being rich were more anxious and unhappy, while individuals who reported autonomously motivated goals, such as family closeness were less anxious and more satisfied with their lives (Kasser & Ryan, 1993; 1996). College students who reported more autonomous goals for their first year after graduation were more satisfied with their lives and experienced more positive daily affect one year later compared to the students who reported more goals pursued for controlled reasons (Sheldon, Ryan, Deci, &

Kasser, 2004). Autonomously motivated goal pursuit seems better for the pursuer both during their goal pursuit efforts and after the goal is achieved.

The Potential Effect of Personality on Autonomous Motivation. Throughout this literature, the focus is usually on features of the goal, such as the purpose it serves or how it aligns with one's values (Ryan, 1995; Milyavskaya et al., 2016; Sheldon & Elliot, 1999) or aspects of the environment that are supportive of authenticity and autonomy, allowing for competence demonstrations or agentic decisions (Williams & Deci, 1996; Gagné & Deci, 2005). The effects of both the goal and the context in which it is pursued may also have synergistic effects, such that goal pursuit is most successful when the goal contents and context align. When intrinsic goals such as competence demonstrations occur in competitive environments, performance is maximized (Harackiewicz & Elliot, 1998), and when the goal of serving one's community occurs in autonomy supportive environments, learning is maximized (Vansteenkiste, Lens, & Deci, 2006). But, even when there are naturally occurring differences in people's motivations for the same goal, emphasis is given to the consequences of those differences and not the origins. In much of the self-determination studies, people report their own goals and the motivations that drive them. If people happen to hold the same goals, such as to perform well in school, but identify different motives for that goal, such as pleasing their parents versus enjoying the subject, the origins of these differences are not usually explored (e.g., Erdvik et al., 2014; Milyavskaya et al., 2015; Deci & Ryan, 1985). There are two scales that are intended to measure how people differ in their baseline tendencies toward autonomous motivation (Deci & Ryan, 1985; Weinstein, Pryzbylski, & Ryan, 2012), but again, there is no exploration of what might underlie those differences, simply the quantification of their existence. In this project, we delve

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deeper into the idea of individual differences in self-regulation tendencies underlying people's motivation.

We propose that autonomous motivation is affected by factors beyond the traditional focus on goal features or the circumstances of goal pursuit, and it can be predicted by individual differences such as self-regulation. There is evidence to suggest that autonomous motivation can be affected by basic personality traits, and this work further diverges from a strict self-determination perspective in that it allows for people to experience autonomous and controlled motivations simultaneously. Based on a series of lab studies exploring the contrast between “goal-defined” and “experience-defined” motivation, it seems that intrinsic motivation can ironically result from high levels of extrinsic motivation. Although a strict application of self-determination theory posits that goals must be fully adopted and integrated into the self to be associated with interest and fun (e.g., Ryan & Deci, 2000), it seems interest in a task motivated by external reasons can be cultivated (Sansone, Thoman, & Smith, 2010), and there are individual differences in this ability (Sansone, Wiebe, & Morgan, 1999). For example, a boring letter copying task can be made more interesting by changing the font, but all participants do not automatically employ these strategies. But, giving people an external reason for the task, such as health benefits, resulted in an increased use of strategies to encourage interest and subsequent increased persistence on the task (Sansone, Weir, Harpster, & Morgan, 1992). There appear to be individual differences on this ability to create interest, as people high in hardiness—psychological resilience, with a presumed tendency to focus on the experience of goal pursuit—demonstrate this effect to a much greater extent than people high in conscientiousness, with their tendency to focus on achieving outcomes (Sansone, Wiebe, & Morgan, 1999). Personality differences in goal pursuit styles can affect how intrinsically motivating a task seems through the

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use of interest-enhancing strategies or through interactions with the situation. In the next section, we propose that self-control is one such trait, given what is known about how self-control affects goal pursuit through the use of adaptive strategies and self-regulatory processes.

Individual Differences in Self-Control

Self-control refers to the host of processes of regulating behavior, thoughts, and emotions, and more specifically, *overriding* dominant response tendencies in favor of more desirable behaviors, thoughts, or emotions (Baumeister, 2002; Baumeister, Vohs, & Tice, 2007; De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). Self-control allows people to resist short-term temptations like cupcakes in the service of their long-term goals like maintaining a healthy weight. The self-control processes brought to bear on that resistance could, among others, include avoiding the cupcake shop (Hofmann et al., 2012), convincing yourself that the cupcakes are not that appealing after all (Trope & Fishbach, 2005), or convincing yourself that carrots are delicious and that you love cooking healthy foods (Milyavskaya et al., 2015).

Self-control is also a more generalized ability and stable personality trait. Trait self-control is how frequently and successfully an individual is able to exert self-control across time and domains (Tangney, Baumeister, & Boone, 2004). People high in trait self-control are able to consistently override their impulses and engage in long-term goal pursuit, resisting temptations and distractions, while people low in trait self-control find themselves drawn off course and unable to resist temptations (De Ridder et al., 2012). Traditionally, self-control has been conceived of as willpower, and one's strong ability to resist temptation when it was encountered (Baumeister & Tierney, 2011; Baumeister, 2002; Baumeister, Vohs, & Tice, 2007; Metcalfe & Mischel, 2009; Mischel, Cantor, & Feldman, 1996). But, increasingly it seems like the positive

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effects of self-control extend beyond instances of temptations and goal conflict. Self-control seems to be a proactive process that changes habits and response patterns, allowing people high in self-control to down-regulate conflict upon encountering temptations and in many cases, to avoid temptations and obstacles altogether (Hofmann et al., 2012; Gillebaart, Schneider, & de Ridder, 2015; Milyavskaya & Inzlicht, 2016; Adriaanse, Kroese, Gillebaart, & De Ridder, 2014).

In this work, we measure self-control using the Brief Self-Control Scale (Tangney et al., 2004), a widely used 13-item measure with strong established internal ($\alpha = .83-.85$) and test-retest reliability (.87). The Brief Self-Control Scale includes face-valid items such as “I am good at resisting temptation” or “Sometimes I can’t stop myself from doing something, even if I know it is wrong” (reversed). The scale is a reliable and valid predictor of the long-term outcomes associated with self-control (De Ridder et al., 2012), described in detail below.

Trait self-control predicts dieting success (Kuijer, de Ridder, Ouwehand, Houx, & van den Bos, 2008) GPA and work performance (De Ridder et al., 2012; Tangney et al., 2004; Tice & Baumeister, 1997; Cox, 2000), as well as long-term health outcomes (Wills, Isasi, Mendoza, & Ainette, 2007; Pratt & Cullen, 2000). Trait self-control aids in the consistent prioritization of long-term goals and is an important predictor of successful outcomes in the context of short-versus long-term goal conflict.

If self-control helps people avoid challenging situations, benefits would likely accrue to multiple areas in a person’s life. Indeed, trait self-control does have strong positive impacts across many life domains, lending credence to updated conceptualization of self-control as a proactive process. Trait self-control predicts more positive interpersonal relationships (Mishel, Cantor, & Feldman, 2006; Mischel, Shoda, & Peake, 1988), more adaptive emotional responses (Baumeister, Bratslavsky, Muraven, & Tice, 1998), and overall well-being (Hofmann, Luhmann,

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Fisher, Vohs, & Baumeister, 2014). As self-control helps in prioritizing long-term goals and seems to help in cultivating low-conflict response styles, it benefits a person in myriad ways. These relationships suggest that self-control improves the way people interact with their surroundings.

Potential Effects of Self-Control on Autonomous Motivation

In the following sections, we review the relevant literature that suggests self-control could influence autonomous motivation: counteractive control and construal levels. Effective self-control is associated with increasing perceived goal value relative to a temptation's value, known as counteractive control, and people feel autonomously motivated when pursuing goals that align with their values. Increasing autonomous motivation might be a pathway by which value is amplified during the counteractive control process. If this were the case, then people high in self-control would experience more autonomous motivation as a means of amplifying goal value relative to temptations.

Self-control success is also associated with perceiving goals in a more abstract, high-level way; it could be that self-control encourages thinking about one's goals in a way that is more conducive to autonomous motivation. A tendency toward high-level construals of goals would make it easier for people to connect their daily activities to their identified purpose goals, and this connection to valued goals would increase people's sense of autonomous motivation. This pathway suggests a more global shift in autonomous motivation.

We review the relevant literature on how self-control affects and is affected by goal value and construal level, and the implications of that research for the proposed relationship between self-control and self-determination.

Self-Control & Autonomous Motivation: Counteractive Control. There is evidence that self-control processes change how people respond to goals and temptations, and it is reasonable to expect that self-control might affect autonomous motivation. When goal pursuit is difficult or unpleasant and there are few external constraints to encourage pursuit, people must rely on self-control to persevere and resist temptation. One way in which self-control operates is by amplifying the value of the goal relative to temptations, allowing for greater resistance (Trope & Fishbach, 2005; Fishbach & Converse, 2010; Ozaki, Goto, Kobayashi, & Hofmann, 2017). People rate objectively boring or inconvenient tasks as more valuable and interesting when they are trying to motivate themselves to complete the task compared to when they know there is contingent punishment or an experimenter monitoring their behavior (Fishbach & Trope, 2005). Gym-goers asked to rate the appeal of health bars and chocolate bars *before* making their choice of treat said that health bars were more appealing and enjoyable than chocolate bars; those asked to rate the bars *after* making their choice rated the bars equally. Similarly, students resisting the temptation to drop a difficult class report that leisure time was less enjoyable to them than students rating leisure time a few days later, after the add/drop deadline had passed (Myrseth, Fishbach, & Trope, 2009). These asymmetric value patterns for goals in the face of temptation appear when evaluated implicitly as well, suggesting that this may be an automatic and adaptive response (Fishbach, Zhang, & Trope, 2010). Shifting the value of goals relative to temptations can be an effective way to ensure subsequent goal pursuit.

Successful self-control efforts are associated with greater use of these counteractive control strategies, and there is indirect evidence that suggests people higher in trait self-control employ counteractive control efforts more often. Compared to people who are lower in self-control, people higher in self-control have a stronger approach motivation to healthy foods than

unhealthy foods, perceiving healthy snacks to be larger and more salient than the unhealthy foods (Cheung, Gillebaart, Kroese, & de Ridder, 2016). High self-control individuals report lower levels of desire for temptations and conflict on average than their low self-control counterparts in both the lab (Gillebaart, Schneider, & De Ridder, 2015) and in daily life (Hofmann et al., 2012). Although these findings do not measure value per se, trait self-control does seem to be affecting people's perceptions of goals relative to temptations: goals are larger and more salient, and temptations are less tempting. It is reasonable to surmise that people high in trait self-control are using counteractive control strategies more than people low in trait self-control and that trait self-control can and does change how people value their goals across situations.

Self-Control & Autonomous Motivation: Construals and Mindset. Successful self-control efforts are also associated with high-level construals of goals and activities. When people think about their goals in a more abstract, psychologically distant way compared to a low-level, concrete way, they are better able to resist temptation and persist on difficult tasks (Fujita, Trope, Liberman, & Levin-Sagi, 2006; Fujita & Carnevale, 2012), and people appear to use this strategy in the pursuit of difficult long-term goals (MacGregor, Carnevale, Dusthimer, & Fujita, 2017). Thinking about “why” a goal is being pursued, and its connections to other goals makes goal pursuit more enjoyable than thinking about “how” a goal is being pursued, and this encourages goal-directed actions (Freitas, Gollwitzer, & Trope, 2004; Freitas, Solvey, & Liberman, 2001). High-level construals are associated with greater success in situations that require self-control. There are hints that this is true at the trait level as well, as people who report a general tendency to engage in high-level construals report being less impulsive relative to those people who tend toward low-level construals (Vallacher & Wegner, 1989). Given that high-level construals makes

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long-term goals more salient, it is reasonable that a tendency toward high-level construals would aid the pursuit of long-term goals, and that high-level construals might be associated with trait self-control.

In turn, high-level construals might also be related to autonomous motivation, since high-level construals would make it easier to think of one's actions as serving one's valued goals. To the extent that people construe of their actions in the service of their valued goals, autonomous motivation would result.

However, this hypothesized relationship may be complicated by the contribution of both fun and value (intrinsic and identified) to autonomous motivations. Thinking of goals in a high-level, abstract way is likely more related to autonomous motivation from value than from fun. But, the strongest form of autonomous motivation is when a person finds intrinsic pleasure in the experience of goal pursuit (Gagne & Deci, 2005; Grolnick & Ryan, 1989). When intrinsically motivated, a person would be focused on and relishing the concrete, enjoyable experience of the goal pursuit. For example, someone might enjoy a yoga class specifically because it requires a focus on the physical practice. But, focusing on the concrete experience of an intrinsically pleasurable experience seems antithetical to the abstract mindset required for high-level construal during goal pursuit. Given the existing literature, it is unclear how the two components of autonomous motivation—fun and interest—might be related to construal level or if construal level would influence these elements to the same degree. The construal pathway to autonomous motivation might operate primarily through identified motivation rather than intrinsic motivation.

The Nature of the Relationship Between Self-Control and Autonomous Motivation

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Given the research reviewed above, it is reasonable to predict a positive relationship between trait self-control and autonomous motivation. Counteractive control processes might be increasing the value of a goal through the amplification of autonomous motivation. Goal value accrues from many different processes, including seeming intangibles such as the “fit” between a person’s regulatory style and their goal pursuit (Higgins, 2000). Here, we propose that autonomous motivation may contribute to a person’s assessment of goal value, and that self-control might increase value by increasing autonomous motivation. This suggests a reactive process, in which self-control would increase autonomous motivation more when temptations were present or people were otherwise relying on self-control to continue goal pursuit, such as when they were tired. This also suggests that autonomous motivation might be a stronger predictor of goal value than controlled motivation, at least for people higher in self-control.

Or, self-control might operate on autonomous motivation in much the same way it affects construals, such that people see their activities in a more abstract way and relate their activities to their valued goals more easily. This suggests a general process by which self-control might increase autonomous motivation. Self-control might change how people think about their goals all the time, without needing a temptation present to active value amplification.

Throughout this paper, we will consider the personality trait, self-control, to be the origin of behavior and motivation, rather than vice versa, and the potential processes reviewed above reflect that perspective. However, there is some limited evidence that self-control is associated a greater internal locus of control, such that people high in self-control feel more agentic and efficacious (Baumeister & Brewer, 2012). Situations that support competence and autonomy encourage autonomous motivation (Ryan & Deci, 2000; Gagné & Deci, 2005); perhaps people who feel competent also encourage autonomous motivation in their lives. But, it may be that

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autonomous motivation precedes self-control. People who identify autonomously motivated reasons to persist on an endurance task are less depleted and persist longer on a subsequent endurance task than those who are motivated by controlled reasons (Muraven, Gagne, & Rosman, 2008). Goals pursued for autonomous rather than controlled reasons are met with fewer obstacles (Milyavskaya et al., 2015). Perhaps it is this accrual of autonomously motivated successes that lead a person to report that they are high on self-control. Where possible, we have attempted to rule out third variables and reverse causation in our study designs.

If the value and construal of a goal can be shifted—and there is plenty of evidence to suggest they can be—then knowing when and why that shift occurs deepens our understanding of goal pursuit and self-regulation. People must pursue goals that seem to be not intrinsically motivating, such as homework, exercise, or chores, but moving beyond a situational conceptualization of autonomous motivation opens new avenues for theoretical research and possible interventions. Further, an understanding of self-regulatory processes that more explicitly acknowledges personality differences suggests that “fit” between person and situation may contribute to self-control success.

The Current Research

In this project, we establish a clear relationship between self-regulation and self-determination, finding that trait self-control is reliably associated with reporting greater levels of interest or enjoyment during goal pursuit. Even when pursuing the same, objectively tedious task, we find that people higher in self-control report more autonomous motivation.

Research Overview. We report on five studies that demonstrate the positive effect of trait self-control on the experience of autonomous motivation. To examine the relationship between self-control and autonomous motivation, we began with correlational studies in the lab

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and using experience sampling methodology (ESM). In ESM studies, people respond to repeated short surveys across time, usually on their smartphone. By using this technique, we can examine people's in-situ experiences of goal pursuit. People already hold valued goals that they must regularly decide how and why they are best prioritized. Experience sampling capitalizes on this fact and so participants report on real experiences of motivation as a result of goals they genuinely want to accomplish. Asking them to report on their behavior as it happens eliminates concerns about recall ability or memory bias, and short, frequent surveys create a dense picture of people's lives without being unreasonably burdensome. By using a mix of experience sampling and cross-sectional surveys in these correlational studies, we ensure that we are capturing a diverse representation of goals within and across individuals.

We begin by using experience sampling in Study 1 and online cross-sectional surveys in Study 2 and 3 to examine the relationship between self-control and autonomous motivation across the range of activities that people pursue in their leisure and work life. We find that higher levels of self-control are associated with greater autonomous motivation in daily life and in the workplace. To rule out the possibility that people high in self-control are simply choosing different activities, we also examine the relationship between self-control and autonomous motivation when holding the task constant in Study 3. We use an ESM design in Study 4 to examine how self-control is related to autonomous motivation when energy levels are low and self-regulation is required to persist on a task. In our final study, we examine whether this relationship between self-control and self-determination is strongest in the face of a self-regulation challenge or if the relationship reflects a general disposition. Across studies, we also find that self-control is associated with greater well-being, and that this effect is mediated by a

person's experience of autonomous motivation. We finish by discussing implications from these studies and contextualize our findings within the existing literature.

Expected Contribution. We conducted a series of studies to examine the relationship between self-control and people's experiences of autonomous motivation. Across a variety of contexts and goal types, using different methodologies and with large and diverse participant samples, we found that trait self-control is reliably and positively associated with autonomous motivation. People with higher levels of self-control experience more autonomous motivation than people with lower levels of self-control, in their daily life, when constrained on tasks at work, and when assigned to the same task in an experiment. This work provides empirical evidence that autonomous motivation can and does arise in situations that would be expected to result in a sense of controlled motivation. That autonomous motivation might originate from a stable personality trait and is not bound by features of the situation or the goal implies that our current understanding of autonomous motivation is incomplete. This project is a first step in understanding this potential additional path to autonomous motivation.

Study 1: The Autonomous Motivation of Daily Life

In Study 1, we test whether trait self-control is reliably associated with more autonomous motivation. As part of a larger ESM data collection to examine how people motivate and reward themselves for unpleasant activities, people in Study 1 reported on their levels of autonomous motivation multiple times a day for a week. We examine the correlation between people's average autonomous motivation and their reported level of trait self-control.

Method

Participants. Participants were recruited through a large university-wide participant pool in Switzerland. Half of the sample participated in exchange for course credit and half

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participated in exchange for financial reimbursement of up to 70 Swiss Francs (~ \$70) contingent on completion. In order to be enrolled in the study, participants had to own a smartphone with data service.

An initial sample of 233 participants was recruited, but technical details resulted in a third of the sample having missing data, and an additional wave of participants was recruited for a total sample of 287 students. Of these 287, 10 did not provide full personality measures and were missing self-control scores, and an additional 9 did not receive or respond to any signals.

The final sample consisted of 268 participants (229 female) from Zurich, Switzerland, and its surroundings. On average, participants were 23.11 years old ($SD = 4.54$, range 18-54). The majority held a high school (74%) or university degree (23%). Forty-two percent of the sample reported being employed with an average of workload of about 12 hours per week (29% workload, $SD = 18\%$, ~7.7 hours).

On average, participants responded to 74% of signals ($SD = 27\%$; $Mdn = 86\%$) and everyone in the sample had responded to at least two signals ($M = 37.28$ of 49, $SD = 13.11$, $Mdn = 43.0$).

Procedure. Interested participants were asked to visit a website that contained extensive information about the study procedure, data confidentiality, and compensation. By leaving their personal information on that website, they also provided informed consent to study participation. After enrollment, participants received more detailed instructions on the study procedure, as well as links to two sets of baseline surveys, including Bertrams & Dickhäuser's (2009) German translation of the Brief Trait Self-Control Scale (Tangney et al., 2004), using a response scale from 1 = *does not apply at all* to 7 = *fully applies*. Participants were asked to fill in these surveys within two days after receiving the e-mail. Within two days, the experimenter registered the

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participant to receive text message surveys through SurveySignal (Hofmann & Patel, 2015; surveysignal.com). All surveys had been programmed with www.soscisurvey.de. Once signaling began, participants received seven signals within a 14-hour window each day for 7 consecutive days. Signals occurred within 2-hour blocks, and were separated by at least an hour. If participants had a response rate below 80%, the schedule was extended by one additional day (21.2 % of participants).

At every signal, participants reported whether or not they had engaged in an unpleasant, boring, or challenging activity to achieve a goal within the prior 45 minutes. Those who reported such an activity then reported on their affective state and the strategies they used to increase motivation. They also reported on their most recent activity (which may have been the aforementioned unpleasant activity) and its hedonic qualities. These data were collected for a separate project and are reported elsewhere. Finally, participants answered two proxy questions for autonomous and controlled motivation. Autonomous motivation was assessed by asking, “To what extent did you choose the activity because you enjoy it for its own sake?” and controlled reasons were assessed via “To what extent did you do this activity because of an official deadline or because another person was waiting for you to do it?” All responses were made on the same 7-point scale (*does not apply at all* to *fully applies*).

Results

Analysis Strategy. All analyses throughout our studies are conducted using R Version 3.3.0 (R Core Team, 2016). Multilevel models are analyzed using the “lme4” package (Version 1.1-12; Bates, Maechler, Bolker, & Walker, 2015). Instance-level responses such as autonomous and controlled motivation are centered within person. All data are considered nested within

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person and so multilevel models include a random intercept. Across all regression models, person-level predictors such as trait self-control scores are grand-mean centered.

Descriptives. Trait self-control was relatively normally distributed ($M = 4.16$, $SD = 0.95$), as were the measures of autonomous and controlled motivation. Autonomous motivation ($M = 4.73$, $SD = .68$) was significantly higher than controlled motivation ($M = 1.94$, $SD = .57$) in this sample, $t(267) = 46.84$, $p < .001$. Autonomous motivation and controlled motivation were negatively correlated, $r(266) = -.22$, $p = .001$, 95% CI $[-.32, -.09]$.

The relationship between self-control and autonomous motivation. To determine if there was an association between self-control and autonomous motivation, we ran a multi-level model regression of autonomous motivation on trait self-control with a random intercept of person ($ICC = .11$). Self-control was reliably and statistically significantly associated with autonomous motivation, $b = 0.12$, $t = 2.84$, $p = .005$, 95% CI $[0.04, 0.20]$ (see Fig. 1). There was not a significant relationship between self-control and controlled motivation, $b = 0.02$, $t = 0.81$, $p = .416$, 95% CI $[-0.04, 0.10]$.

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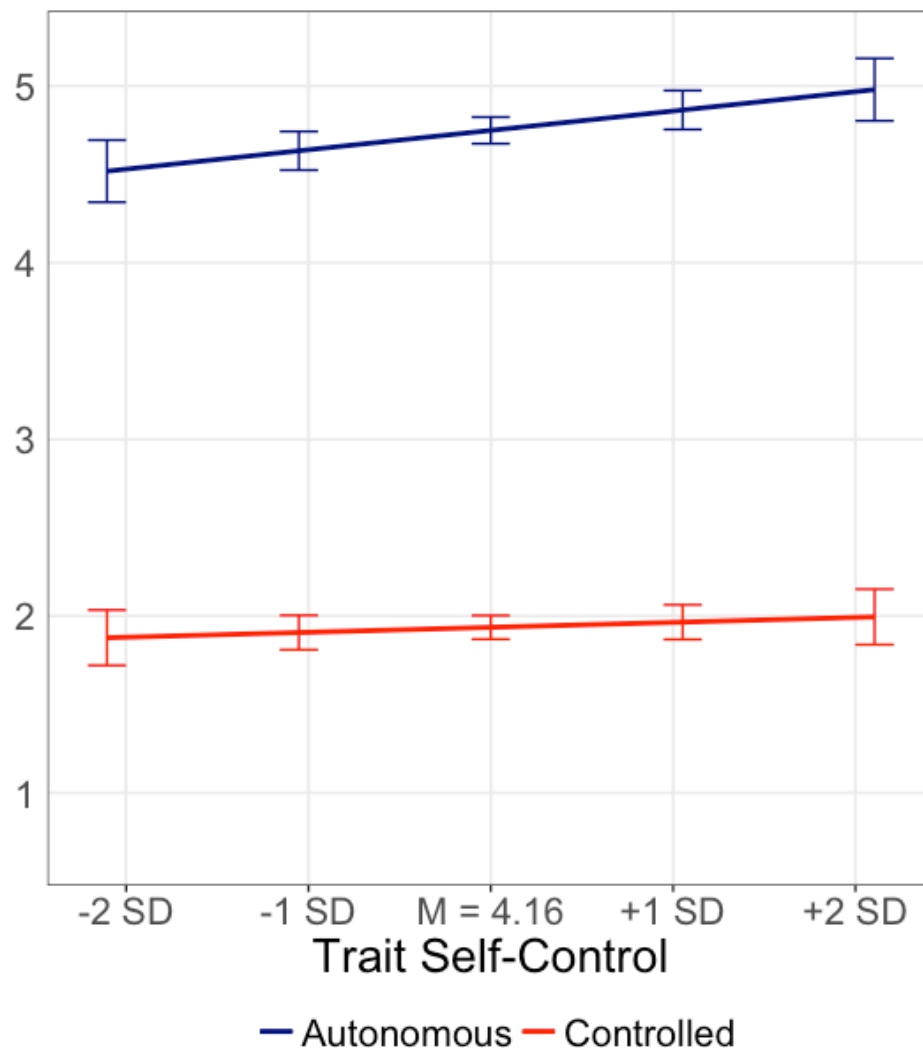


Figure 1. Predicted endorsement level of autonomous and controlled motivation from trait-self control. Error bars are 95% CIs.

Discussion

Across the regular activities of a mostly student population, we found that self-control is positively related to autonomous motivation but not to controlled motivation. Using participants' actual goals, we were able to test the full range of autonomous and controlled motivation, ensuring that “fun” goals were actually enjoyable to the participant and that social pressure arose not from an experimenter but from someone whose opinion mattered to the participant. The

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experience sampling methodology allows for a great deal of external validity and multiple time points per respondent, capturing individual variability in how people respond to their environment. However, we appended our questions to an experience sampling design intended to test a different research question, and so we were necessarily limited in how extensive our operationalization of motivation could be. Although we are interested in autonomous motivation from both intrinsically motivated, fun activities as well as identified motivation from valued activities, we were only able to assess fun. We used multiple response items in our subsequent studies to address this limitation. We are also interested in the downstream consequences of greater autonomous motivation, given prior work linking both self-control (Hofmann et al., 2012) as well as autonomous motivation (Sheldon et al., 2004) to wellbeing, and in our subsequent studies we included satisfaction and wellbeing measures.

Given the primary focus of this data collection on unpleasant activities and subsequent rewards, participants may be reporting on an extreme subset of their usual encounters. This data collection effort may have omitted the range of neutral or mixed-motivation activities that people also encounter in the course of daily life. In our subsequent studies, we focused on a context that encompasses a large proportion of people's daily lives and offers the opportunity for varied and frequent goal pursuit for different motivations: the workplace.

There is a possibility of selective responding in any experience sampling study, and so we use cross sectional designs in Study 2 and Study 3. We are also unable to assess the directionality of the relationship between self-control and self-determination using the experience sampling design. In Study 2 and 3, we randomly assigned participants to rate their motivation before or after completing the self-control scale to examine whether thinking about

autonomously motivated tasks affects how people rate their ability to engage in successful long-term goal pursuit.

Study 2: The Autonomous Motivation of Workplace Tasks

We recruited participants taking a break at work and asked them to report on their motivation for their most recent work task to study a population engaged in tasks motivated for a variety of reasons, often simultaneously. We expanded the items used to assess autonomous and controlled motivation to improve reliability and more closely approximate intrinsic, identified, introjected, and external motivation as proposed in self-determination theory. We included a brief satisfaction item to test the relationship between self-control, autonomous motivation, and momentary well being. Finally, we randomly assigned participants to complete the self-control measure at the beginning or end of the study to test whether thinking about task motivation changes how people report their self-control levels. If considering autonomous motivation results in people feeling more agentic and more capable of self-control, then asking people about their goals before they report self-control may affect reported self-control levels. In this scenario, people high on autonomous motivation would report higher self-control scores when autonomous motivation ratings preceded self-control; the relationship between self-control and autonomous motivation would be more extreme in this order. On the other hand, if self-control does not fluctuate based on autonomous motivation, then self-control and autonomous motivation should be equally related regardless of order.

Method

Participants. We recruited 1354 participants who consented for participation in Study 2 or 3, and 57 participants dropped out before completion of the screener questions to be funneled into Study 2 or 3. We screened in 775 MTurk participants, and 748 participants completed the

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study (356 female, 387 male, and 5 who reported non-binary responses or declined to report). On average, participants were 35.35 years old ($SD = 10.53$, range 18-74).

Procedure. We recruited MTurk participants for participation in a 5-minute, \$0.50 study on Wednesday, Jan. 18, 2017. We posted it at 11 am and took it down at 3, and restricted it to Eastern Time Zone state IP addresses, running participants only during standard work hours. We recruited as many participants as possible during this time period, intending to recruit at least 500 “at-work” participants.

We screened for work status using three questions embedded in a series of short questions about what the respondent had accomplished that morning. Participants were funneled into this workplace study if they reported full-time employment, being at work, and taking a break (rather than at the beginning or end of their workday) at the time of the study. Participants who said they were unemployed, not at work, or not in the middle of their workday were funneled into Study 3, running concurrently.

After responding to the funnel questions, participants began the study. Half of participants were randomly assigned to complete the 13-item Brief Trait Self-Control Scale (SCS; Tangey et al., 2004) at the beginning of the study, while the other half completed the SCS at the end of the study, just before demographics. Participants identified their most recent work task. Participants reported whether the task was scheduled or not and whether they were working on their own or with others, and they reported how long ago they had started working on the task, when they stopped working on the task, and whether or not they had completed the task. Then, participants identified the reasons why they had chosen to work on that task. Participants indicated to what extent (1 - 4; *not at all, a little, somewhat, completely*) each of four reasons was the impetus for their decision: because it was for a project they truly cared about, because

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there was an official deadline, because it was fun or enjoyable, and because someone was waiting or counting on them. Half of participants saw the reasons in the order listed, while the other half saw the reasons in the reverse order, beginning with someone waiting and ending with truly care. If there was an additional reason for their decision, participants could write in their own response, but they did not rate it.

Then, participants reported on their subjective experience while working. Using a 5-point scale (1- 5; *not at all, slightly, somewhat, strongly, extremely*), participants reported how motivated they felt, how conflicted they were about their time use, how concerned they were about needing to work on something else, and how torn they felt between goals. Participants also reported how satisfied they were with how they were spending their time using a 7-point scale (1 – 7; *very dissatisfied, somewhat dissatisfied, slightly dissatisfied, neutral- neither dissatisfied nor satisfied, slightly satisfied, somewhat satisfied, very satisfied*). Finally, participants reported their age, gender, and highest level of education before they were thanked for their time, debriefed, and paid.

Results

Descriptives. Most participants reported working alone (616 alone, 104 in a small group of 2-4 people, and 28 in a large group of 5+) and with a great deal of freedom (378 reported unstructured or free time and 213 said they had scheduled the task while 105 said someone else had scheduled the task and 52 said it was a regular occurrence).

The reliability of SCS was high ($\alpha = .88$), and the distribution was relatively normal ($M = 3.60$, $SD = .70$). The Care ($M = 2.54$, $SD = 1.10$) and Fun ($M = 2.11$, $SD = 1.03$) reason items were correlated, $r(746) = .51$, $p < .001$, and were averaged into a composite *Autonomous* reason ($M = 2.32$, $SD = .92$). The Deadline ($M = 2.57$, $SD = 1.21$) and Social ($M = 2.86$, $SD = 1.16$)

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reasons were also correlated, $r(746) = .32, p < .001$, and were averaged into a composite *Controlled* reason ($M = 2.72, SD = .96$). Autonomous motivation was not correlated with controlled motivation, $r(746) = -.03, p = .441, 95\% CI [-.10, .04]$.

The three conflict items (*torn, concern, conflict*) were highly correlated ($\alpha = .87$) and were averaged into a *Conflict* composite ($M = 1.36, SD = 0.34$). Participants reported average motivation levels ($M = 3.46, SD = 1.07$).

The relationship between self-control and autonomous motivation. Trait self-control was positively correlated with average endorsement of autonomous reasons, $r(746) = .19, p < .001, 95\% CI [.12, .25]$, but not correlated with average endorsement of controlled reasons, $r(746) = .06, p = .117, 95\% CI [-.02, .13]$ (see Figure 2).

The correlation between self-control and autonomous motivation did not differ as a result of order, Fisher's $Z = 1.27, p = .204$. Although the correlation is weaker when self-control is assessed after reporting autonomous motivation, $r(382) = .14, p = .005, 95\% CI [.04, .24]$, rather than before, $r(362) = .23, p < .001, 95\% CI [.14, .32]$, the effect was not statistically significant. The evidence does not reliably support the claim that people rely on their autonomous motivation levels to infer their self-control ability.

The relationship of self-control and autonomous motivation with satisfaction. We examined whether the increases in autonomous motivation mediated the relationship between trait self-control and satisfaction using the Preacher and Hayes (2008) bootstrapping method. The total effect of self-control on satisfaction was significant, $b = .67, SE = .07, t = 9.08, p < .001$. As noted, self-control was associated with greater autonomous motivation, $b = .25, SE = .05, t = 5.17, p < .001$. When we included the mediation, the direct effect of self-control was weakened but remained significant, $b = .54, SE = .07, t = 7.63, p < .001$, and the effect of

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autonomous motivation was also significant, $b = .54$, $SE = .05$, $t = 10.05$, $p < .001$. The indirect (mediation) effect was significant, as the 95% confidence interval produced from the bootstrap analysis did not overlap with 0; indirect effect = .13, $SE = .03$, 95 % CI [.08, .19]. This partial mediation indicates that a significant proportion of the positive effect of self-control on satisfaction is explained by a corresponding increase in autonomous motivation.

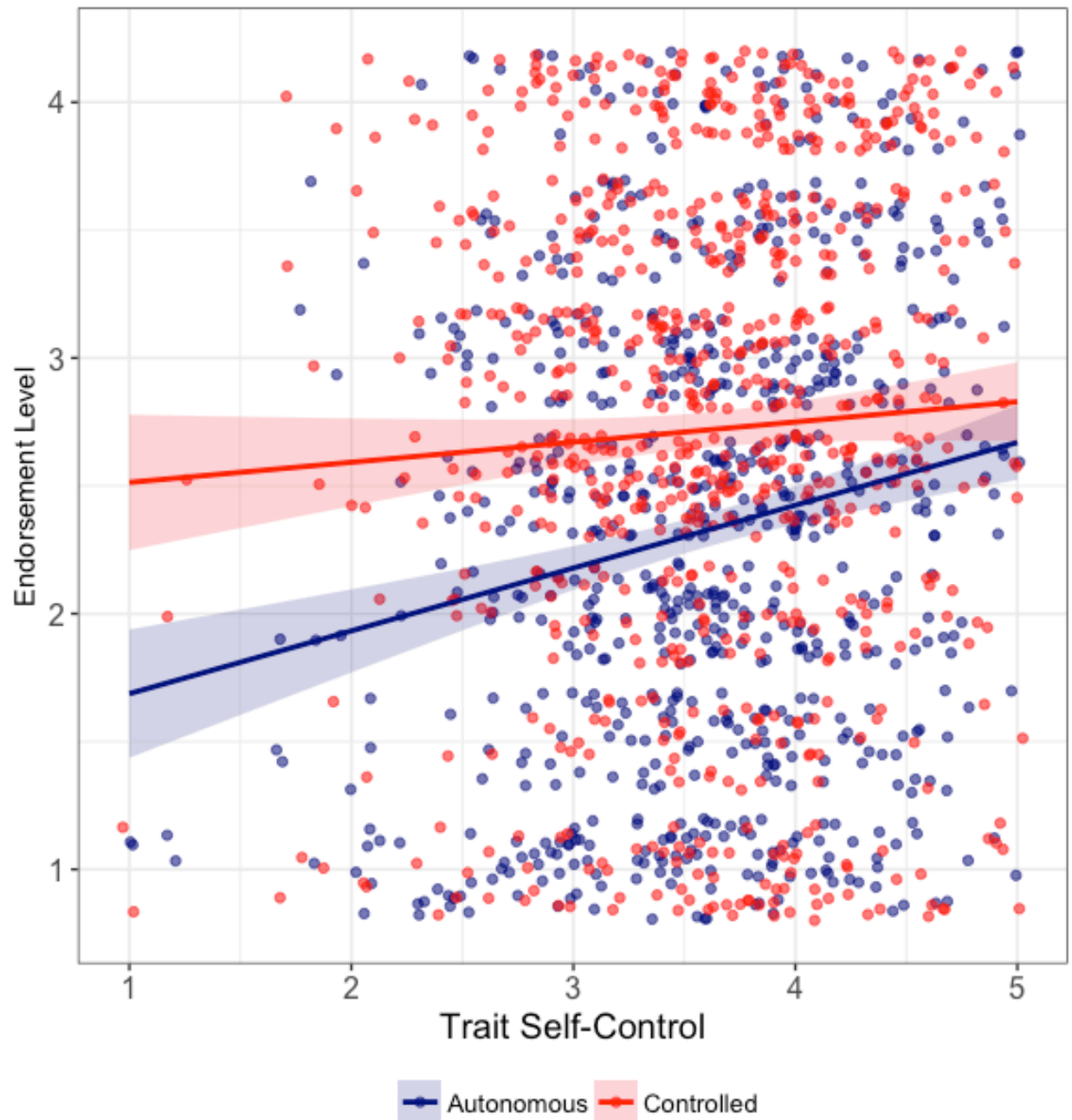


Figure 2. Scatterplot and correlation line with 95% CI of trait self-control with autonomous and controlled reasons.

Discussion

When participants are limited to considering tasks that are part of their work responsibilities, we find that self-control is positively associated with autonomous motivation.

When thinking about their workplace tasks, which can be motivated by any combination of

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autonomous or controlled reasons, people higher in self-control report greater autonomous motivation than people lower in self-control. We also tested whether thinking about task motivation affects reported self-control, but we observed no reliable difference in the strength of the relationship between trait self-control and autonomous motivation as a result of order. Although we were unable to randomly assign people to experience autonomously motivated tasks or to manipulate self-control, randomly assigning order provides preliminary evidence that self-control does not depend on a person's experience of autonomous motivation.

In both Study 1 and 2, participants are free to choose their day's tasks and in Study 1, whether or not they want to report on it. In Study 3, we ask people about their day's tasks and motivation for those tasks, but we also ask people about their motivation for completing our survey, effectively holding the task constant. This allows us to examine if autonomous motivation varies based on self-control while ruling out that high self-control people are reporting on different types of tasks.

Study 3 Autonomous Motivation Differences on Identical Tasks

In Study 3, we asked participants funneled out of Study 2 about their motivation for completing our survey as well as their motivation for their upcoming daily tasks. Holding task constant, we tested whether self-control was positively associated with greater autonomous motivation. We were also able to expand the generalizability of this effect by asking people to predict their motivation for future tasks. If people high in self-control report more autonomous motivation even when the task is in the future, this suggests that there may be global differences in how people high in self-control interpret all their tasks, not just the ones they are currently engaged in or have just completed.

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As in Study 2, we varied the order of the self-control scale and the motivation ratings to examine whether the relationship between self-control and self-determination was stronger when people thought about their autonomously motivated tasks before reporting their self-control levels.

Method

Participants. We screened in 522 participants, and 508 participants completed the study (254 female, 247 male, and 7 who reported non-binary responses or declined to report). On average, participants were 35.12 years old ($SD = 12.91$, range 18-77).

Procedure. MTurk participants were recruited for participation in a 5-minute, \$0.50 study on Wednesday, Jan. 18, 2017. Participants were funneled into this non-work study if they did not meet the screening criteria for Study 2. Participants in Study 3 are all people screened out of participation in Study 2 for not being employed full-time and taking a break while at work.

After responding to the embedded funnel questions, participants began the study. Half of participants were randomly assigned to complete the 13-item Brief Trait Self-Control Scale (SCS; Tangey et al., 2004) at the beginning of the study, while the other half completed the SCS at the end of the study, just before demographics.

To assess motivation on a future task, participants were asked to briefly describe “the most important thing” they were hoping to accomplish that day. All participants reported whether the task was scheduled or not and if they would complete it on their own or with others. Participants indicated to what extent (1-4; *not at all, a little, somewhat, completely*) each of four reasons accounted for including that task on their day’s to-do list: because it was for a project they truly cared about, because there was an official deadline, because it was fun or enjoyable, and because someone was waiting or counting on them.

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To assess motivation on a task held constant across participants, people reported on their reasons for completing our survey on MTurk, using the same response scale and reasons as above. The order of the two reason-matrix questions were counterbalanced across participants.

Then, participants reported on their experience of conflict and satisfaction while completing our survey. Using a 5-point scale (1 = *not at all*, 2 = *slightly*, 3 = *somewhat*, 4 = *strongly*, 5 = *extremely*), participants reported how motivated they felt, how conflicted they were about their time use, how concerned they were about needing to work on something else, and how torn they felt between goals while they were completing our survey. Participants also reported how satisfied they were with how they were spending their time using a 7-point scale (1 = *very dissatisfied*, 2 = *somewhat dissatisfied*, 3 = *slightly dissatisfied*, 4 = *neutral- neither dissatisfied nor satisfied*, 5 = *slightly satisfied*, 6 = *somewhat satisfied*, 7 = *very satisfied*). Finally, participants reported their age, gender, and highest level of education before they were thanked for their time, debriefed, and paid.

Results

Descriptives. The reliability of SCS was high ($\alpha = .88$), and the distribution was relatively normal ($M = 3.52$, $SD = .71$). Care ($M = 2.08$, $SD = 1.02$) and Fun ($M = 2.62$, $SD = .99$) reasons for MTurk were correlated, $r(506) = .51$, $p < .001$, and averaged into a composite *Autonomous* measure as planned ($M = 2.35$, $SD = .87$). The Deadline ($M = 1.54$, $SD = .92$) and Social ($M = 1.50$, $SD = .88$) reasons for MTurk were also correlated, $r(506) = .47$, $p < .001$, and averaged into a composite *Controlled* measure ($M = 1.52$, $SD = .77$). Autonomous reasons were positively correlated with controlled reasons, $r(506) = .31$, $p < .001$, 95% CI [.23, .39].

The three conflict items (*torn*, *concern*, *conflict*) were highly correlated ($\alpha = .92$) and were averaged into a *Conflict* composite ($M = 1.49$, $SD = 0.76$). Participants reported average

motivation levels ($M = 3.74$, $SD = 0.98$).

The relationship between self-control and autonomous motivation. Trait self-control was positively correlated with average endorsement of autonomous reasons for completing the survey, $r(506) = .26$, $p < .001$, 95% CI [.18, .34], but not correlated with average endorsement of controlled reasons, $r(506) = -.03$, $p = .531$, 95% CI [-.11, .06] (see Figure 3).

The correlation between self-control and autonomous motivation did not significantly differ as a result of order, Fisher's $Z = 1.26$, $p = .208$. Although the correlation is weaker when self-control is assessed after reporting autonomous motivation, $r(242) = .09$, $p = .157$, 95% CI [-.04, .21], rather than before, $r(262) = .20$, $p < .001$, 95% CI [.08, .32], the comparison was not statistically significant. As in Study 2, the evidence does not reliably support the claim that people rely on their autonomous motivation levels to infer their self-control ability.

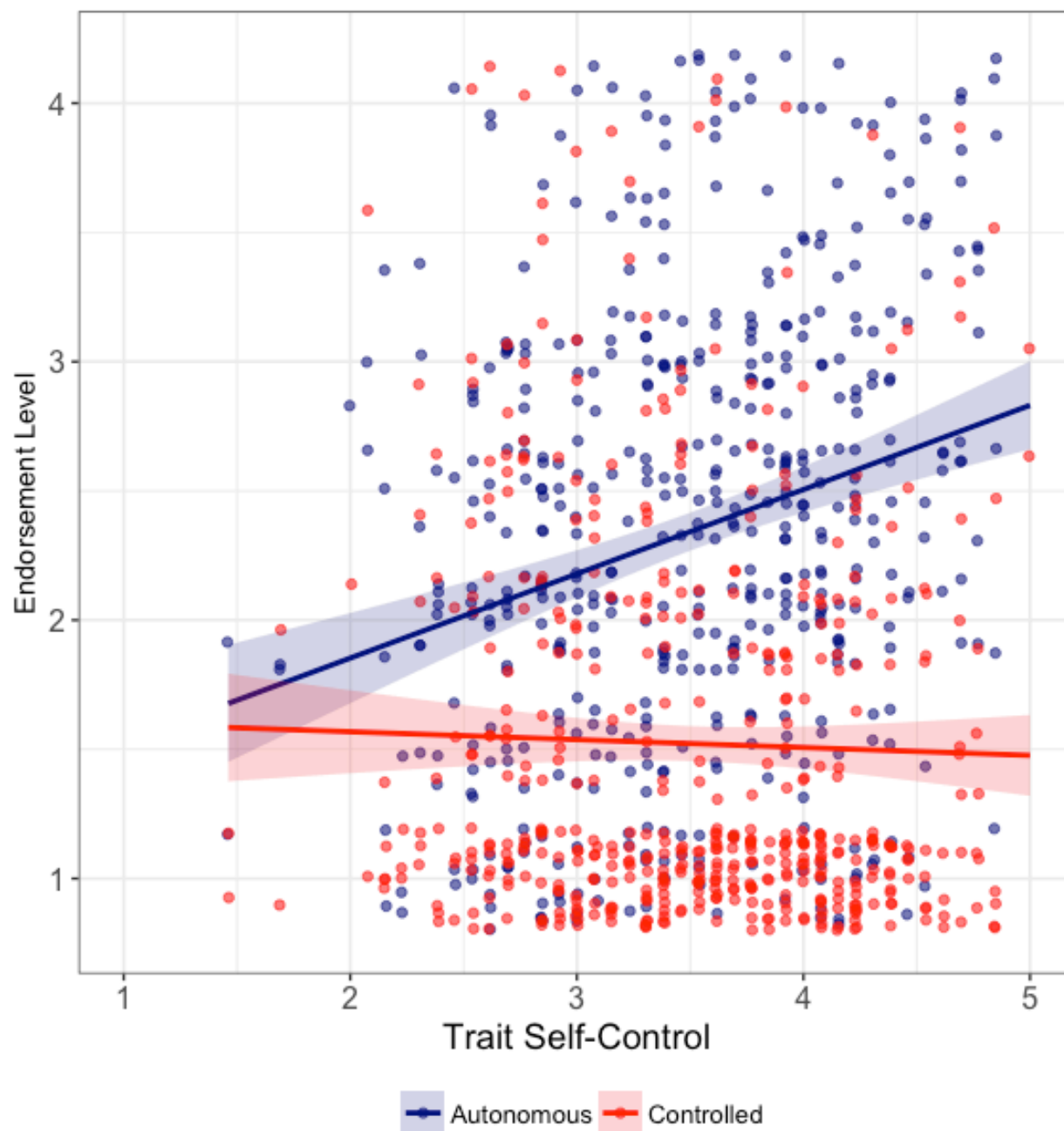


Figure 3. Scatterplot and correlation line with 95% CI of trait self-control with autonomous and controlled reasons.

The relationship between self-control and autonomous motivation on to-do list tasks.

The positive relationship between self-control and motivation also held for the participant's own, future task ratings, replicating our findings from Study 1 and 2 and extending the evidence to include future tasks. Self-control was positively correlated with autonomous motivation, $r(506) =$

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.15, $p < .001$, [.06, .23], while self-control was negatively correlated with controlled motivation, $r(506) = -.09$, $p = .041$ [-.18, -.004].

The relationship of self-control and autonomous motivation with satisfaction. We examined whether the increases in autonomous motivation for the survey mediated the relationship between trait self-control and satisfaction. We employed the Preacher and Hayes (2008) bootstrapping test for mediation in which significant mediation is indicated by 95% confidence intervals around the indirect effect that do not cross 0.

The total effect of self-control on satisfaction was significant, $b = .69$, $SE = .09$, $t = 7.98$, $p < .001$. As noted, self-control was associated with greater autonomous motivation, $b = .33$, $SE = .05$, $t = 6.16$, $p < .001$. When we included the mediation, the direct effect of self-control was weakened but remained significant, $b = .53$, $SE = .09$, $t = 6.19$, $p < .001$, and the effect of autonomous motivation was also significant, $b = .49$, $SE = .07$, $t = 7.08$, $p < .001$. The indirect (mediation) effect was significant, as the 95% confidence interval produced from the bootstrap analysis did not overlap with 0; indirect effect = .16, $SE = .04$, 95 % CI [.10, .23]. This partial mediation indicates that a significant proportion of the positive effect of self-control on satisfaction is explained by a corresponding increase in autonomous motivation.

Discussion

In Study 3, we took advantage of the cross-sectional study design to ask participants to indicate their autonomous motivation for the same task, the survey itself. This provides preliminary, albeit correlational evidence that the greater autonomous motivation reported by high self-control participants is not a consequence of those individuals prioritizing different tasks than their low self-control counterparts. We also replicated the positive relationship between self-control and autonomous motivation on participants' ratings of their own tasks. By asking

participants to prospect on their future activities, rather than their current or just completed actions, as in Study 1 and 2, we also expand the generalizability of these findings.

Although we were able to hold the task constant in Study 3, asking participants about their experience completing our survey, we have very little information about the context of goal pursuit in Studies 1-3. In Study 4, we report a second experience sampling study that focuses on people's experiences at work. We are able to examine the effect of self-control across multiple instances of goal pursuit across a person's week and how self-control affects autonomous motivation in situations that may require more self-regulation than others. Finally, we examine how self-control and autonomous motivation relate to general wellbeing including satisfaction and sense of purpose.

Study 4: Autonomous Motivation at Work

As part of an ESM data collection to examine how people's balance of important and urgent tasks in daily life affects their sense of purpose, young professionals reported on their experience of autonomous and controlled motivation multiple times per day across the workweek. Participants completed a battery of individual difference scales and responded to brief surveys throughout their workday, providing an in-depth picture of how people experience motivation levels in a variety of circumstances both within and across individuals.

We are able to examine whether there are differential effects of self-control on autonomous motivation when participants are more or less likely to require self-regulation. When people are tired, or have already exhausted their self-control, then pursuing their long-term goals becomes more difficult, and self-control is required to persist (Hofmann, Vohs, & Baumeister, 2012; Baumeister, Bratslavsky, Muraven, & Tice, 1998). When engaged in a difficult endurance task, people who report more autonomous motivation for the task are able to

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persist longer (Muraven, Gagne, & Rosman, 2008). In Study 4, we examine whether self-control effects on autonomous motivation are stronger when participants are tired but must still persist on work tasks. Finally, we are able to connect these daily patterns to overall well being, allowing us to consider potential pathways and consequences of self-control and self-determination.

In our signaling, we added 3 additional items to the list of four reasons used in Study 2 and 3 to assess motivation for completing a task. In addition to care, fun, deadline, and social pressure, we included a guilt item to more closely align with self-determination theory, and two items assessing the desire to complete a task quickly. We believed this wider array of reasons would more completely capture people's experience of work motivation.

Method

Participants. We recruited 226 individuals who completed the preliminary surveys, but 15 did not confirm their phone number, leaving 211. An additional 15 never responded or stopped responding after the first day, leaving 196. Of those 196, 3 did not complete their follow-up survey. The final sample includes these 196 participants.

On average, participants were 27 years old ($SD = 3.08$, range: 21-37), female (161; 32 males; 3 non-binary or declined to say), and had been at their job for slightly under 2 years ($M = 22.02$ months), though this varied widely ($SD = 16.11$ months, range: 1.03-86.23). Most participants received a salary (81%), and 87% of the sample made between \$65,000 and \$140,000 annually².

Participants worked in a variety of positions and domains. Twenty-nine percent of participants had supervisory roles or managed others. A plurality of participants were in the education or library science field (15%), followed by arts (12%), business (11%), social service (9%), administration (9%), legal (8%), management (8%), sciences (7%), computer/math (7%),

² The remaining 7% report making greater than \$140,000 annually; the sample is relatively wealthy.

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and all other fields (14%). On average, people responded to 84% of signals received (*Mdn* = 88%, range: 25% -100%). They reported working 66% of those responded signals (*Mdn* = 68%, range: 22% -100%).

Procedure. Participants were recruited via emails and postings advertising a study into the day-to-day experience of young professionals. The authors emailed alumni list-servs, social and professional networks, and employed acquaintances, and posted an advertisement on a popular blog (the-toast.net). Interested participants were directed to a website (<https://pages.shanti.virginia.edu/BattenSamplingStudy/>) describing the general purpose of the study and information about how to participate. This site in turn directed them to a Qualtrics survey that automatically screened for eligibility (i.e., employment, age, and a smartphone).

Pre-signaling surveys. Upon eligibility confirmation, participants provided informed consent and indicated a continuous eight-hour window during which they would be working and able to receive experience sampling surveys via text message. If participants indicated a window greater than eight hours, we trimmed equal amounts from the start and end times to create an eight-hour window. They then completed the *preliminary surveys*, a battery of ten time management and work style questionnaires including the Brief Trait Self-Control Scale (SCS; Tangney, Baumeister, & Boone, 2004), the Behavioral Identification Form to measure people's tendency toward high-level construals (Vallacher & Wegner, 1989), and a short form of the Big 5 personality traits, including conscientiousness (TIPI; Gosling, Rentfrow, & Swann, 2003). Participants completed demographics and reported on characteristics of their job. For a complete list of the surveys and items used in this data collection, please see Appendix A.

Signaling. After completing the preliminary survey battery, participants completed payment information and waited for the experience-sampling portion of the study to begin,

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usually on the following Monday. We used SurveySignal (Hofmann & Patel, 2015; surveysignal.com) to organize the sending of our experience sampling survey via text message. Participants were registered to receive signals via text messages on their smartphone. On each experience-sampling day, 8 signals were randomly distributed across an eight-hour window with the restriction that signals were separated by at least 20 minutes.

Participants who responded within 10 minutes of receipt completed the entire survey. They were asked to briefly describe what they were working on “*right now*,” and if they were working with others. They reported whether the activity had been planned in advance or if it was a more spontaneous decision, and they indicated whether each of 7 reasons explained why they were working on that particular task “*right now*” on a scale from 1 (not at all true) to 4 (completely true). The 7 reasons provided to participants assessed traditional self-determination categories—*fun*, *care*, *social pressure*, *guilt*—as well as elements of actual or perceived urgency, as assessed by our *deadline* item from the previous studies and two assessing the desire to work on the activity so as to *not think* about the task anymore or because the task was already so *close* to being finished. Participants could also write in their own reason for acting if it was not covered by any of the provided options; fewer than 5% of all responses included a participant-provided reason.

Participants then indicated how motivated they felt and if they felt conflicted about what they should be working on using a scale from 1 (not at all) to 5 (extremely), and how satisfied they were with spending their time on that activity on a scale from 1 (very dissatisfied) to 7 (very satisfied). Finally, participants indicated to what extent they felt *drowsy*, *relaxed*, *enthusiastic*, or *nervous* from 1 (not at all or slightly) to 5 (extremely) (the top-loading terms for each of the four factors in the Job Affect Scale; Burke, Brief, George, Roberson, & Webster, 1989). We use the

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drowsy measure as a proxy for energy levels to understand how self-control affects autonomous motivation when people feel tired and may need to exert more self-control to persist in work tasks.

Participants who responded after 10 minutes of receiving the text message were given a partial survey. They were asked why they had been delayed and then completed the survey through the reasons questions; they did not complete any feelings measures.

Regardless of response time, participants who indicated that they were not working when they received the signal were taken to the end of the survey and not asked any follow-up questions. The signal link timed out after an hour.

In an attempt to ensure sufficient responses for all participants, participants who were missing more than 5 or more signals from a single day or who reported not working on 5 or more signals on multiple days were asked to extend their sampling by one additional workday. Forty-one percent of the final sample was asked to complete an additional day ($n = 76$); 76% of this subset complied with the request ($n = 58$).

Post-signaling. After the experience sampling portion of the study ended, participants completed a final short set of *post surveys* to assess wellbeing and satisfaction with one's life and job, including the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985), the Ryff Purpose Scale (Boyle, Buchman, Barnes, & Bennett, 2010), and the Copenhagen Burnout Inventory, minus the client sub-scale (Kristensen, Borritz, Villadsen, & Christensen, 2005), among others (see Appendix A). Upon completion of this final set of surveys, participants were thanked and debriefed with a more in-depth explanation of the study, final contact information for the researchers, and links to reading for the interested participant.

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Participants were paid \$36 for their participation upon completion of the preliminary surveys. At the end of the study, participants were also awarded a \$5 Amazon.com gift card and entry into a lottery for one of three \$50 Amazon.com gift cards if they had responded to at least 80% of signals.

Results

Analysis Strategy. We follow the same analytic procedures as in Study 1; per recommendations of Barr and colleagues, we include random slopes when supported by the data (Barr, Levy, Scheepers, & Tily, 2013).

Descriptives. The reliability of SCS was high ($\alpha = .84$), and the distribution was relatively normal ($M = 3.37$, $SD = .63$). Self-control correlated positively with the proportion of responses that a participant reported working, $r(194) = .21$, $p = .004$, 95% CI [.07, .34].

The 7 reasons a person endorsed at each signal can be reduced into simplified umbrella categories based on their content and the theoretical conceptualization of Controlled and Autonomous motivation. “Care” and “Fun” were highly correlated ($\alpha = .87$) and were combined into an *Autonomous* composite, while “Guilt” and “Social” and “Deadline” were also correlated ($\alpha = .68$) and were combined into a *Controlled* composite. Autonomous motivation was significantly lower than controlled motivation in this sample, $t(195) = -9.36$, $p < .001$ (see Tables 1 & 2 for descriptives). Autonomous motivation was uncorrelated with controlled motivation, $r(194) = -.03$, $p = .644$, 95% CI [-.17, .11]³. Participants reported low average conflict ($M = 1.52$, $SD = .49$) and average motivation levels ($M = 2.54$, $SD = .56$).

³ Although a strict self-determination definition would exclude “deadline” from this composite, we have included this measure given the correlations between all three variables and our use of deadline as a controlled motivation component in the prior three studies. If only “guilt” and “social” are used, there is no meaningful change in the estimates reported throughout this section. Using a guilt-social composite, autonomous motivation was still lower than controlled motivation ($M = 2.68$, $SD = .53$), $t(195) = 10.12$, $p < .001$, and autonomous motivation was marginally positively correlated with controlled motivation, $r(194) = .126$, $p = .078$, 95% CI [-.01, .26].

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	Care	Fun	Social	Deadline	No Think	Close
Fun	.79***					
Social	.08	.15*				
Deadline	-.08	-.03	.55***			
No Think	-.20**	-.21*	.29***	.34***		
Close	.09	.18*	.24***	.33***	.48***	
Guilt	.12	.07	.47***	.25***	.37***	.32***

Table 1. Correlations between person-level, average reason endorsement. * indicates $p < .05$, ** indicates $p < .01$, and *** indicates $p < .001$. Raw reason correlations may be viewed in the Supplemental Materials

Care	Fun	Social	Deadline	No Think	Close	Guilt	Autonomous	Controlled
2.29	2.00	3.03	2.55	2.39	1.88	2.34	2.19	2.64
(.68)	(.58)	(.56)	(.59)	(.61)	(.54)	(.68)	(.91)	(.48)

Table 2. Average person-level endorsement of each original and composite reason prompt (SD in parentheses). Responses were made on a 1 - 4 scale such that higher values indicate stronger endorsement.

The relationship between self-control and autonomous motivation. In a multi-level model with a random intercept of person ($ICC = .37$), we regressed autonomous motivation on trait self-control. Self-control was a reliable and statistically significant predictor of greater autonomous motivation, $b = 0.21$, $t = 3.18$, $p = .002$, 95% CI [0.08, 0.34]. There was a significant negative relationship between self-control and controlled motivation⁴, $b = -0.12$, $t = -2.26$, $p = .025$, 95% CI [-0.23, -.02] (see Figure 4).

⁴ If we use the strict composite of Social and Guilt only for controlled motivation in the regression of controlled motivation on trait self-control, there was significant negative relationship between self-control and controlled motivation, $b = -0.19$, $t = -3.10$, $p = .002$, 95% CI [-0.30, -.07].

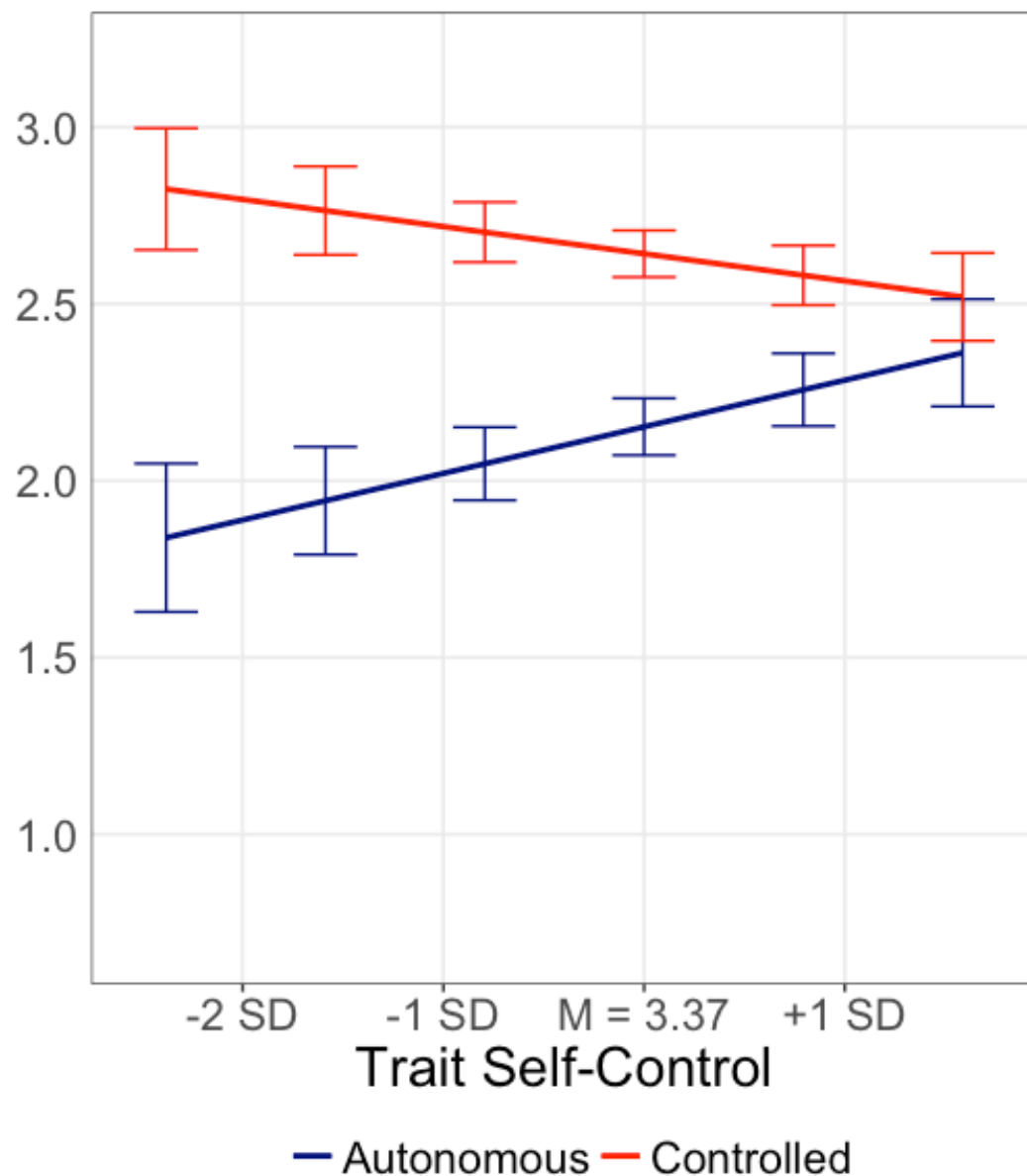


Figure 4. Predicted endorsement level of autonomous and controlled reasons from trait-self control. Error bars are 95% CIs.

Self-control and autonomous motivation in situations requiring self-regulation. To examine how self-control might increase autonomous motivation as a self-regulatory process, we examined the relationship between self-control and autonomous motivation when energy levels were low. We regressed autonomous reasons on trait self-control, participant-reported drowsiness, and their interaction, using a multilevel model with a random slope of drowsiness

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(ICC = .01). Self-control was significantly associated with greater endorsement of autonomous motivation $b = 0.21$, $t = 3.21$, $p = .002$, 95% CI [0.08, 0.34], while drowsiness was significantly associated with lower autonomous motivation, $b = -0.12$, $t = -7.53$, $p < .001$, 95% CI [-0.15, -0.09]. The main effects were qualified by a significant interaction, $b = 0.07$, $t = 2.82$, $p = .005$, 95% CI [0.02, 0.12]. When people are more energized, there is a weaker relationship between trait self-control and autonomous motivation levels. When people are less energized and presumably require more self-regulatory effort to stay engaged in a task, it appears the relationship between trait-self control and autonomous motivation levels is stronger (see Figures 5 & 6).

We used the online simple slopes tool from Preacher, Curran, and Bauer to decompose this interaction (<http://www.quantpsy.org/interact/hlm2.htm>, as described in Preacher, Curran, & Bauer, 2006). The simple slope between self-control and autonomous reasons is significant when drowsiness is greater than 0.97. At that point, the simple slope estimate is 0.15. That is, for participants with drowsiness ratings of 0.97 or higher, self-control is associated with higher levels of autonomous motivation (see Figure 7). When participants are below that threshold, self-control is not reliably associated with motivation experience⁵.

⁵ An alternative way to consider the simple slopes of this interaction is the simple slope between reported drowsiness and autonomous reasons. That simple slope is significant when self-control is lower than 4.26. At that point, the simple slope estimate is -.05. That is, for participants with self-control scores of 4.26 or lower, increased drowsiness is associated with lower levels of autonomous motivation. When participants are above the self-control threshold, then their autonomous motivation is unaffected by drowsiness levels.

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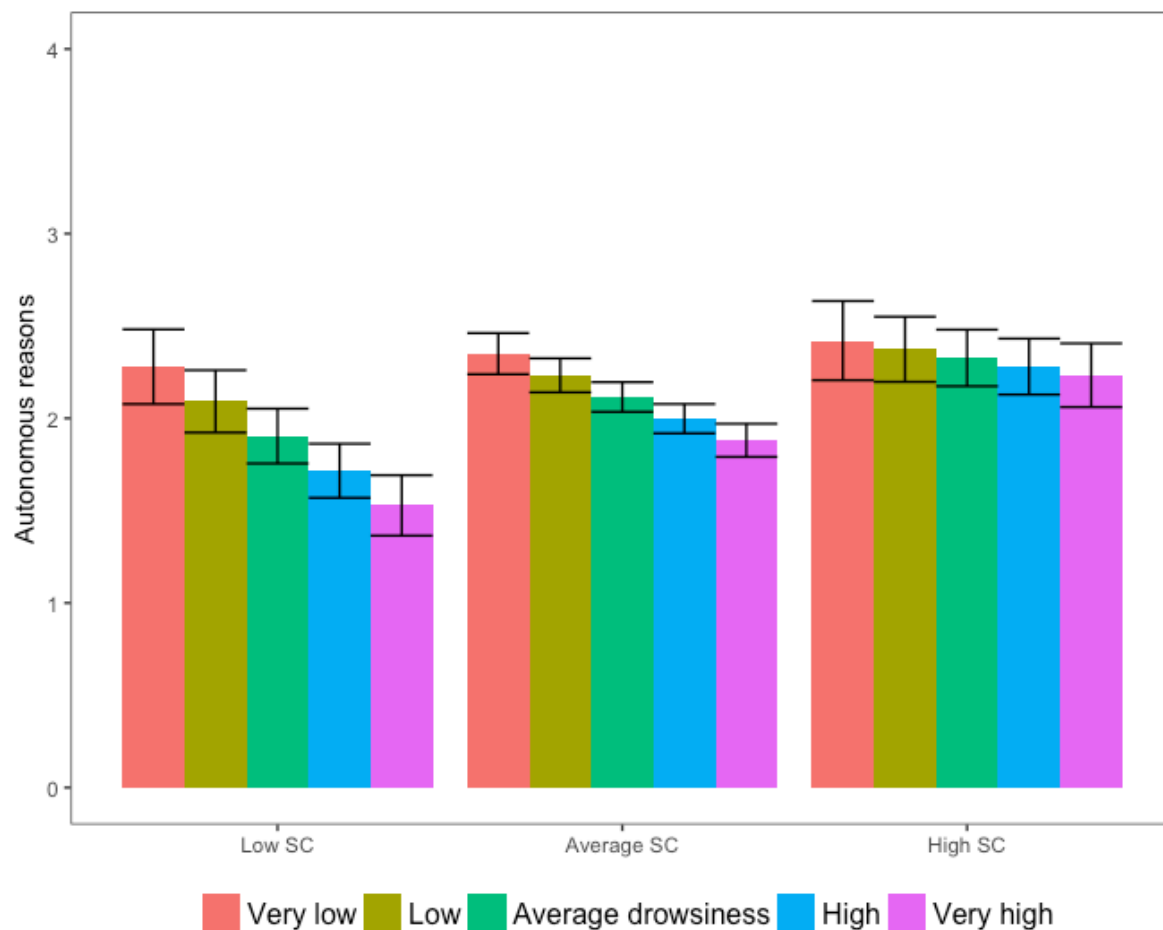


Fig. 5. Predicted levels of autonomous motivation at varying levels of drowsiness, grouped by self-control levels. Error bars are 95% confidence intervals. The groups are graphed at ± 1.58 SDs of Self-Control and at -2, -1, 0, 1, 2 values of centered drowsiness (the SD of drowsiness is 1.03, so slightly less than SD intervals)

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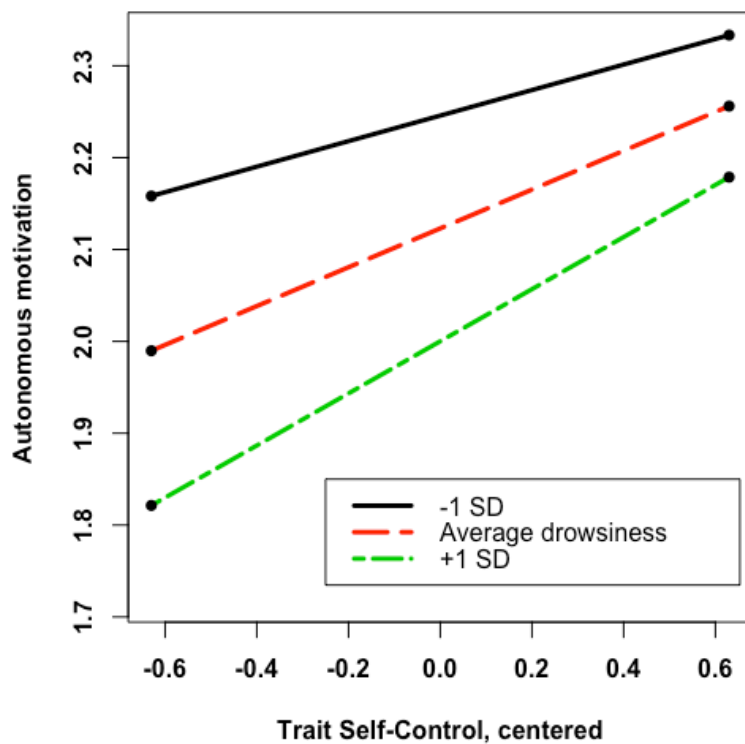


Fig. 6. Predicted values of autonomous motivation as a function of trait self-control ($M = 3.36$, $SD = .63$), grouped by drowsiness.

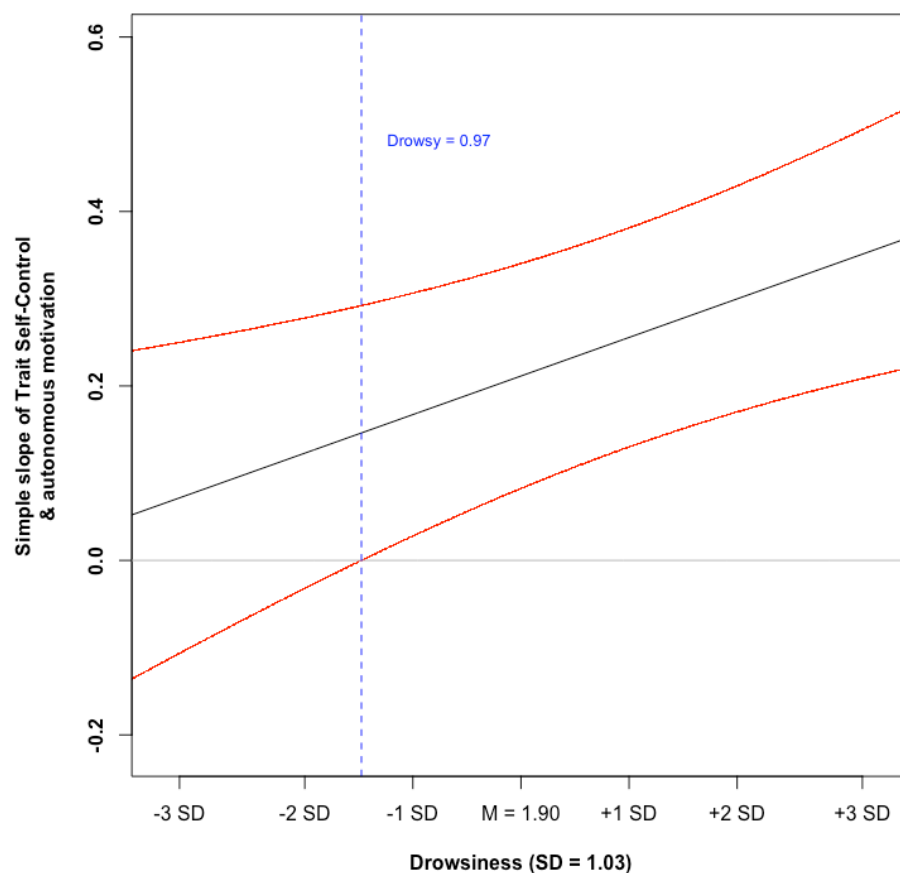


Fig. 7. Simple slope estimates with 95% confidence bands as a function of drowsiness. The simple slope is significant and negative when drowsiness is greater than 0.97.

The relationship of self-control and autonomous motivation with well being. We also examined the effect of higher levels of autonomous motivation throughout the week on people's well-being at the end of the week. Participants reported on their levels of self burnout and purpose, in addition to life satisfaction (SWLS). Each of these was reliably predicted by trait self-control as well as average autonomous motivation levels. We tested for mediation and found that autonomous motivation partially mediated the relationship between self-control and purpose, as well as life satisfaction, and that autonomous motivation completely mediated the relationships between self-control and self burnout (see Table 5 and Fig. 8). The positive effect

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of self-control on well-being outcomes is at least partially explained by an increased sense of autonomous motivation when working on daily tasks.

	a	b	c	c'	ab	Bootstrap CI
Purpose	0.20**	0.24***	0.53***	0.48***	.05	[0.01, 0.1]
SWLS	0.20**	0.26 [†]	0.86***	0.80***	0.05	[0.00, 0.13]
Burnout	0.20**	-7.29***	-5.14*	-3.65	-1.49	[-2.80, -0.48]

Table 5. Estimates for mediation path components and average indirect effect. Bootstrap estimates are based on 1000 iterations. *Purpose* = Ryff Purpose Scale mean; *SWLS* = Satisfaction with Life Scale mean; *Burnout* = Copenhagen Self Burnout Scale mean. [†] = 0.057, $p < .05^*$, $p < .01^{**}$, $p < .001^{***}$

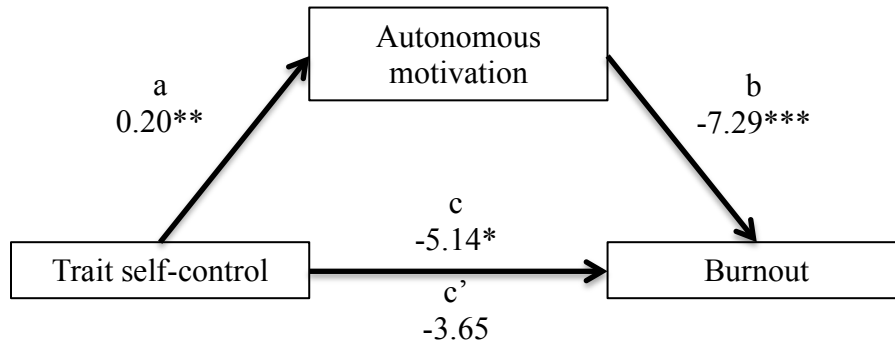


Figure 8. Mediation pathway diagram from trait self-control to burnout through autonomous motivation. $p < .05^*$, $p < .01^{**}$, $p < .001^{***}$

Exploratory Findings

We examined the correlations between trait self-control and the correlations with the other individual difference measures included in this study (see Table 3). One of the strongest correlations is between self-control and conscientiousness, $r(194) = .68$, $p < .001$, 95% CI [.60, .75]. Given the empirical and theoretical similarity between the two measures, we re-ran the model regressing autonomous motivation on self-control, controlling for conscientiousness. The main effect of self-control remained significant, $b = 0.18$, $t = 2.02$, $p = .044$, 95% CI [0.01, 0.36], but there was no main effect of conscientiousness, $b = 0.02$, $t = 0.41$, $p = .684$, 95% CI [-0.06,

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0.10]. Conscientiousness did not correlate with how often a participant reported working, $r(194) = .09, p = .209, 95\% \text{ CI } [-.05, .23]$.

Given our focus on construal, we also re-ran our model regressing autonomous motivation on self-control, controlling for the participant's BID score. The main effect of self-control remained significant, $b = 0.18, t = 2.5, p = .012, 95\% \text{ CI } [0.04, 0.31]$ but there was no main effect of BID, $b = 0.01, t = 1.59, p = .113, 95\% \text{ CI } [-.003, 0.03]$.

BIS	CBI-Self	Perfect	CBI-Work	COS	Poly	BAS	Extra	NfCC	Open
-.35***	-.18*	-.16*	-.07	.00	.01	.02	.03	.11	.14*
Agree	JDI-General	Power	Affect	BID	Passion/Purpose	Stable	SWLS	Ryff	Conscientious
.16*	.19**	.24***	.28***	.31***	.36***	.43***	.44***	.50***	.68***

Table 3. Correlations of all individual difference scales with Trait Self-Control, ordered by correlation strength and direction. For full scale names, please see Appendix A. All correlations use the full dataset, which includes 196 participants, 3 of whom do not have follow-up surveys. The Need for Cognitive Closure scale was added midway through data collection and was only measured for 116 participants. $p < .05^*, p < .01^{**}, p < .001^{***}$

Discussion

In this study, we find that trait self-control is reliably associated with higher levels of autonomous motivation in daily life and that this relationship explains subsequent well-being. Using experience sampling methodology, we examined the regular, real-world occurrences of goal pursuit by people across the self-control continuum. In a workplace setting, people engage in a variety of tasks, many of which may be obligatory or low on hedonic pleasure. However, people who are higher in self-control seem to find their tasks more engaging than people lower in self-control, reporting that their motivation arises from truly caring about the project or finding it fun. These higher levels of autonomous motivation are associated with more positive

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downstream consequences in turn. People higher in self-control report lower levels of burnout and greater life satisfaction and a great sense of purpose. These improved well-being outcomes are mediated through higher levels of autonomous motivation throughout the week.

An ongoing question has been whether the relationship between self-control and autonomous motivation is a general tendency for people higher in self-control to perceive all their actions as autonomously motivated or if the relationship reflects a particular self-regulatory process engaged when people are trying to complete a task. In this study, we find suggestive evidence that self-control interrupts the relationship between energy levels and autonomous motivation. When energy levels are depressed, trait self-control is associated with greater autonomous motivation, but this relationship weakens as energy levels increase. When people feel energized, there is little to no effect of self-control on autonomous motivation. It seems that the effect of trait self-control on autonomous motivation is stronger in situations that require self-regulation, but further work is necessary to support this theory. In our next study, we test this claim by asking people to report on real or hypothetical tasks, assuming that self-regulatory processes will not be active when considering a hypothetical task.

Study 5: Autonomous Motivation as Self-Regulatory Process or Disposition

In this experiment, all participants were presented with a tedious task, monitoring a series of 100 images of shapes for the infrequent occurrence of an octagon. Half of participants were asked to actually complete the task, requiring self-control, while the other half of participants merely previewed the task. All participants reported on their experience of the task, including their level of autonomous and controlled motivation. If the relationship between self-control and autonomous motivation depends on activated goals, and perceptions of autonomous motivation are amplified to encourage goal pursuit, then participants high in self-control should report

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higher levels of autonomous motivation than participants low in self-control, but only when self-control is required in the real task condition rather than the hypothetical task condition. On the other hand, if high self-control participants report higher autonomous motivation regardless of condition, that pattern suggests that the relationship between the two is not specific to activated goals. An interaction between condition and trait self-control is compatible with a goal activation explanation while only a main effect of self-control is compatible with more global disposition.

In this study, we changed the items assessing controlled motivation to more accurately encompass presumed motivation for paid MTurk studies. We used a guilt item to assess introjected motivation and a payment item to assess external motivation.

Method

Participants. We recruited 637 participants who provided trait self-control scores and began the security detection task, and 609 completed the study. There were no differences in dropout by condition or as a result of trait self-control. The final sample uses the 609 complete responses. Participants were 36.51 years old ($SD = 12.01$, range: 18-82) and roughly evenly split across genders (283 male, 323 female, 3 non-binary or declined to say).

Procedure. MTurk participants were recruited for participation in a 10 minute, \$1.00 survey. After providing informed consent, all participants completed brief demographics and the Brief Trait Self-Control Scale (Tangney et al., 2004). Participants were randomly assigned to either the *Goal Activation* or *Hypothetical* condition.

In the Goal Activation condition, participants were told they would be completing the “Security Detection Task,” in which they would see a series of images. Each image was comprised of many different shapes on a plain background, and they were to categorize the image as “Safe” if it did not contain an octagon, or as “Threat” if it did contain an octagon. They

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saw two sample images (see Appendix B) and then worked through 5 preview trials. After these trials, the participants reported on their reasons for working on the task. They reported on their motivation due to *payment*, shame or *guilt*, belief that participation was *valuable*, or that participation was *fun* using a 5-point Likert-type scale (1-5; *Not at all true*, *Slightly true*, *Moderately true*, *Very true*, *Extremely true*). After giving their ratings, the participants were told they would complete 100 trials of the task, although they would view 4 images at a time to speed up the task. Participants completed 100 trials and then were debriefed, thanked for their time, and paid. The octagon did not appear in the 5 preview trials and did appear in 3 of the images that occurred after the ratings.

In the goal condition, participants were told they would be previewing the “Security Detection Task.” The Security Detection Task was identical to the task in the goal activation condition except that participants were told they would not be asked to complete the task, only to rate it after previewing. As above, participants saw two sample images and then worked through 5 preview trials and reported on their reasons for working on the task. After giving their ratings, the participants completed a second short survey for a separate research project, and then were debriefed, thanked for their time, and paid.

Results

Descriptives. The reliability of SCS was high ($\alpha = .89$), and the distribution was relatively normal ($M = 3.58$, $SD = .75$). The Value ($M = 3.02$, $SD = 1.23$) and Fun ($M = 3.06$, $SD = 1.22$) reason items were correlated, $r(607) = .58$, $p < .001$. The Guilt ($M = 3.44$, $SD = 1.29$) and Payment ($M = 3.10$, $SD = 1.34$) reasons were weakly and negatively correlated, $r(607) = -0.17$, $p < .001$. Value and Fun were averaged into an *Autonomous* composite reason ($M = 3.04$, $SD = 1.09$), while Guilt and Payment were left as individual items (see Table 4). There were no

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meaningful differences in the correlations by condition. Reason endorsement also did not differ by condition except for the Payment item. Participants in the hypothetical condition reported that pay would be a stronger motivator for them ($M = 3.22$, $SD = 1.33$) than did the participants in the goal condition, ($M = 2.99$, $SD = 1.34$), $t(607) = 2.18$, $p = .030$. Autonomous motivation was negatively correlated with pay, $r(607) = -.37$, $p < .001$, 95% CI $[-.44, -.30]$, but positively correlated with guilt, $r(607) = .44$, $p < .001$, 95% CI $[.38, .50]$.

	Value	Fun	Guilt
Fun	.58***		
Guilt	-.38***	.41***	
Payment	-.30***	-.36***	-.17***

Table 4. Correlations between raw reason endorsement. *** indicates $p < .001$.

The relationship between self-control and autonomous motivation. We regressed autonomous motivation on centered trait self-control, condition, and their interaction to test if trait self-control amplified autonomous reasons only when the task would require self-regulation. Trait self-control was marginally associated with greater autonomous motivation, $b = 0.14$, $t = 1.76$, $p = 0.079$, but there was no main effect or interaction as a result of condition, $ps > .500$ (see Figure 9). The raw correlation between self-control and autonomous motivation was significant, $r(607) = .09$, $p = .033$, 95% CI $[.01, .16]$.

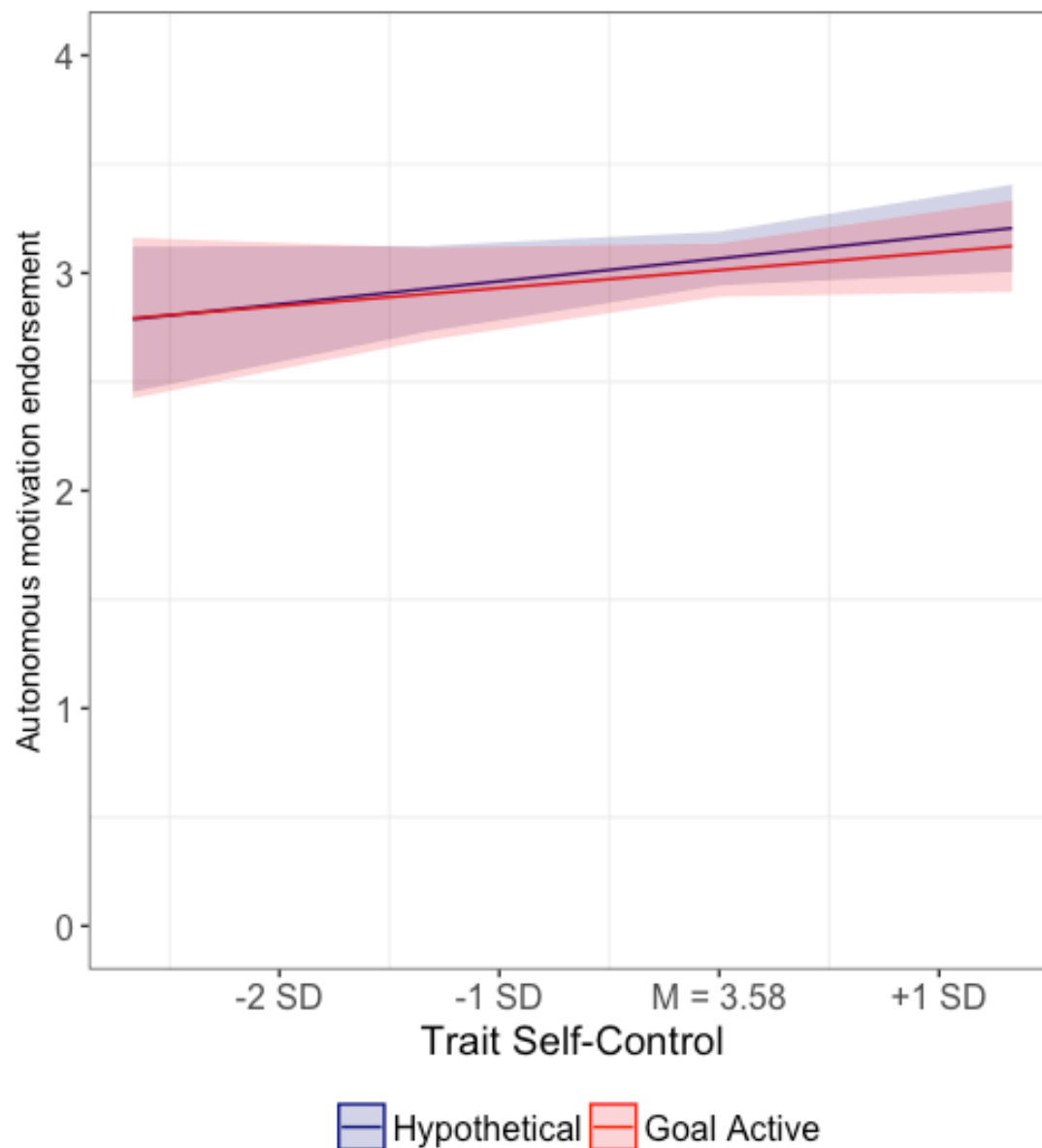


Figure 9. Predicted autonomous motivation from trait self-control, condition, and the interaction thereof. Error bars are 95% CIs.

Secondary Results

We ran the same model on each of the individual reasons, regressing endorsement of value, fun, guilt, and payment on condition, trait self-control, and their interaction. There were no interactions between condition and trait self-control in any of the models. There was a

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significant positive main effect of self-control on reporting that the research was valuable, $b = 0.22$, $t = 2.42$, $p = 0.016$. There was also a significant negative main effect of self-control on reporting that pay was a motivator, $b = -0.40$, $t = -3.55$, $p < .001$; as mentioned previously, there was also a small effect of condition such that goal activation participants reported being less motivated by payment, $b = -0.23$, $t = -2.14$, $p = 0.033$.

Performance on the 5 preview trials was uniformly high across conditions ($M = 97\%$ correct, $SD_{Hyp} = 13\%$, $SD_{Goal} = 12\%$) and in the extended trials that followed ratings in the real condition ($M_{accuracy} = 91\%$ correct, $SD = 14\%$). Trait self-control was not correlated with performance (signal detection d , $M = 2.09$, $SD = 1.07$) on the longer set of trials in the goal activation condition, $r(306) = -.01$, $p = .818$.

Discussion

Holding a relatively tedious task constant, we find that people higher in self-control experienced more autonomous motivation than people lower in self-control. This study was intended to test whether the relationship between trait self-control and autonomous reasons was the result of goal activation only when the task required completion by the participant. However, there was no effect of condition; participants felt equally autonomously motivated when they anticipated completing the entire task as when they believed they were finished with that task.

Although it may be that there is no goal activation component to the relationship between self-control and autonomous motivation, there are a few reasons why our study may not have been a perfect test of this theory. We expected that 5 trials would be sufficient for participants to get a feel for the task and to recognize that completing 100 trials would be unpleasant and require self-regulatory effort, but the task may have been more interesting than the average MTurk Hit. More likely, however, is that it remained salient to participants in the hypothetical

condition that they were still mid-study, even if that particular task was finished. As reported elsewhere, MTurk participants are not a naïve population (Chandler, Mueller, & Paolacci, 2014), and our participants may have been anticipating a surprise second round of the task, or at the very least, knew that additional tasks were forthcoming. Self-regulatory processes may still have been active across both conditions. Although the current findings suggest a global disposition, follow-up work will attempt a stronger manipulation to ensure that participants are in different goal phases when rating the task, more definitively testing how goal activation might affect autonomous motivation.

Although secondary to our analysis, we also found that our measure of controlled motivation did not hang together as it had in previous studies. This was the first study in which we used payment and guilt as the components of our measure of controlled motivation. In our prior studies, we have used social pressure, deadlines, and guilt. It seems that payment for completed work is not as interchangeable with social pressure and time limits as we had thought it would be. The norms around work for others for pay are different from the norms around completing favors or finishing one's own projects under deadlines, and this difference appears to be reflected in our data and the lack of a strong correlation between pay and guilt. Future work could more formally test these ad-hoc explanations.

Meta-Analysis

We conducted an internal meta-analysis across these 5 studies using the “metafor” package in R (Viechtbauer, 2010). We used Fisher's Z transformations of the raw correlations⁶ and used standardized coefficients as correlation coefficients for the two ESM studies, per the recommendations of Peterson & Brown (2005). We used the random-effects meta-analytic

⁶ We used the raw correlation between TSC and autonomous motivation in Study 5, as there were no condition effects. If we use the standardized *B* estimate, .09, and 95% CI from the interaction regression, [-.01, .22], the meta-analytic estimate remains effectively unchanged except for a slightly smaller confidence interval, .16 [.10, .22].

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procedure given our I^2 of 62.49% and $Q(4) = 10.75$, $p = .030$ suggesting a good deal of variability by study.

The meta-analytic correlation coefficient across the 2329 participants was .16, 95% CI [.09, .23] (see Figure 10). The relationship between self-control and autonomous motivation is small but robust.

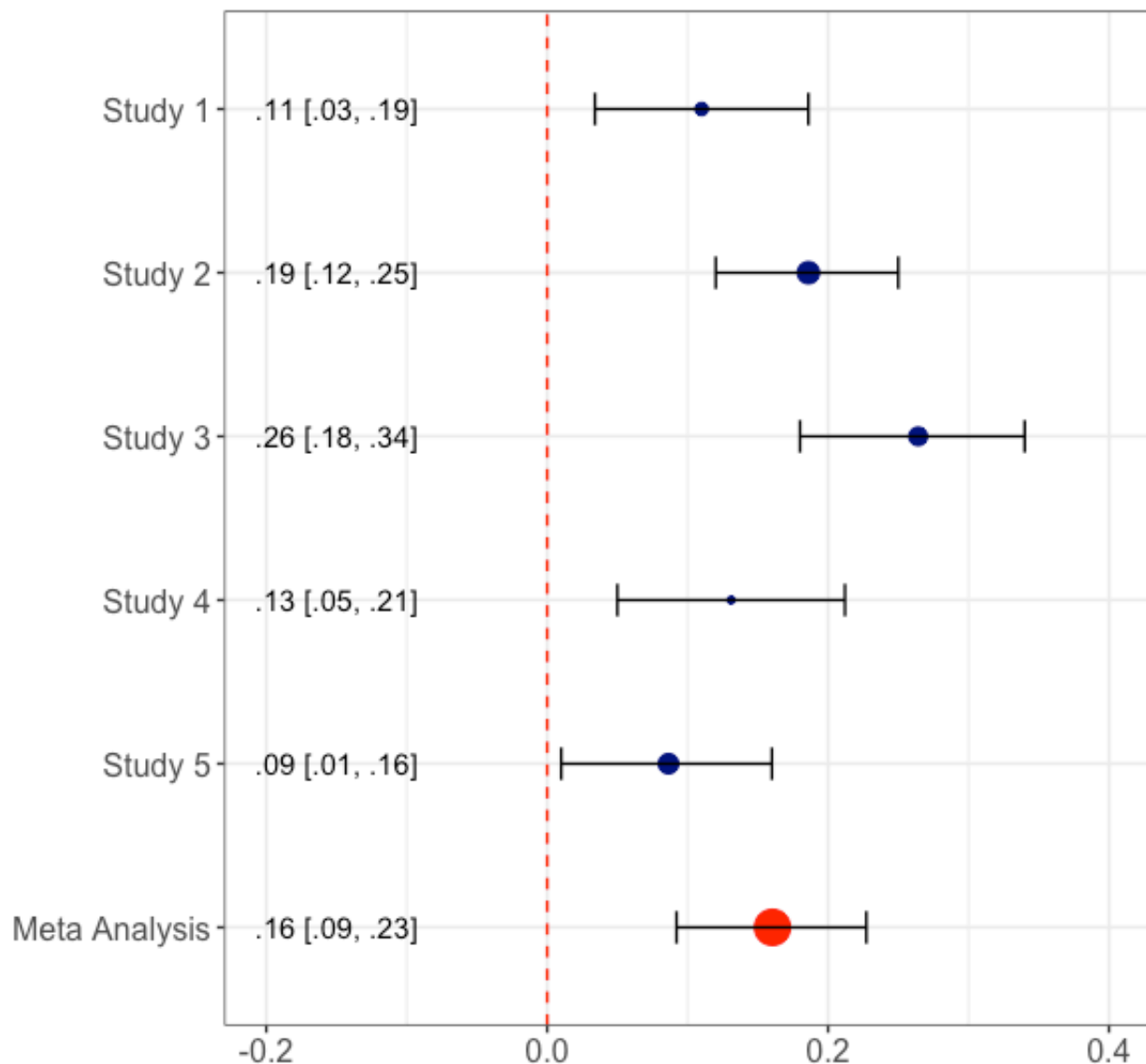


Figure 10. Forest plot of correlation coefficients or standardized beta estimates by study, with 95% CIs. Point size is scaled to study N.

General Discussion

The present work establishes that autonomous motivation can arise from stable individual differences and may not be as bound to the situation or to goal content as current conceptualizations suggest. Across five studies, we found that self-control has reliable, positive association to autonomous motivation levels. Using their actual goals and activities as targets, people reported greater autonomous motivation when they were higher on self-control, whether in the moment or in retrospect (Studies 1, 2, and 4), or looking forward to future tasks (Study 3). When examining the effect of self-control in more constrained circumstances, when people have less ability to be selective about their activities (Study 3 and 5), self-control still related positively to autonomous motivation. We found that this was particularly the case when energy levels were low (Study 4), suggesting that this relationship is a consequence of self-regulatory processes deployed strategically, rather than a general disposition toward autonomous motivation. However, when we attempted to manipulate whether a situation required self-control to firmly establish that this relationship is the result of strategic amplification (Study 5), our evidence suggested this relationship may be a more general disposition. In three studies, we also found that this positive relationship between self-control and self-determination has consequences for wellbeing.

Limitations. It is worth considering the generalizability of our samples, as they are convenience samples rather than statistical samples, and our participants are opting into tedious and/or long studies, especially in the sampling-intensive Study 1 and 4. We assign goals to participants in only two of our studies, instead allowing them to volunteer their own goals which means we cannot rule out different choice tendencies as a result of self-control.

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Across all our studies, we assessed self-control as a self-report personality trait and employed correlational designs so we cannot prove that self-control causes greater autonomous motivation. Trait self-control is assessed during our baseline measures in the two experience sampling studies, offering at least chronological precedence to our measures of autonomous motivation. We used the natural variation in people's reported energy levels to test possible effects of needing more self-control in Study 4, and we attempted to manipulate whether self-control was relevant or not in Study 5, but we did not manipulate people's level of self-control through a depletion manipulation. Further, using an order manipulation in studies 2 and 3, we are able to offer some evidence to rule out the reverse causation explanation: that more autonomous motivation results in greater reported self-control. The correlation between self-control and autonomous motivation did not significantly differ when self-control was assessed after people thought about how autonomously motivated their tasks were, suggesting that autonomous motivation does not drive self-control reports. Although we cannot definitively rule out this explanation based on our data, it seems that focusing on goals pursued for autonomous reasons does not result in higher reports of trait self-control, or a stronger relationship between autonomous reasons and self-control.

Establishing causality would improve the theoretical and empirical implications of this research. It may be that a tendency toward autonomous motivation precedes self-control, or some third variable affects them both. Perceiving most tasks as autonomously motivated might result in people being able to more easily prioritize their difficult goals. People would report being high on self-control because of their high autonomous motivation and not vice versa. They would experience very few self-control conflicts not because of their high self-control abilities but

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because they were always focused on the enjoyable experience of the goal pursuit and believing the activity served their cherished goals.

Or, both autonomous motivation and self-control may result from some other personality trait or consistent situational circumstance. For example, an internal locus of control or high sense of self-efficacy might increase both autonomous motivation and self-control. In Study 4, we included additional personality variables and tested the effects of a global tendency toward high level construals as well as the effect of conscientiousness, but our selected surveys are not an exhaustive list of individual differences that might affect autonomous motivation and self-control. We cannot rule out the possibility of reverse causality or third variables with the existing data, and future studies should explore these questions.

However, the external validity and relevance of our research questions to our participants' experience is clear and high. Our existing studies take advantage of naturally occurring goals and survey and experience sampling methodologies to document the existence and strength of the relationship between self-control and autonomous motivation across a diverse array of people, goals, and situations. Taken together, we believe this is strong correlational evidence, but future work could attempt an experimental approach for causal evidence.

Contributions. This work makes several important contributions. First, it contributes to our understanding of autonomous motivation and self-determination more generally.

Traditionally, autonomous motivation is conceptualized as arising from features of the situation or the goal being pursued (e.g., Ryan & Deci, 2000). Situations with low supervision or that offer a chance to prove competence are expected to result in higher levels of autonomous motivation, while situations lacking these elements are not expected to allow for autonomous motivation. Similarly, some goals are thought to facilitate autonomous motivation more than others, such as

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learning goals compared to performance goals (Vansteenkiste, Lens, & Deci, 2006). This work extends the research examining the effect of personality traits on self-determination (Sansone et al., 1999; Deci & Ryan, 1985; Weinstein et al., 2012) by demonstrating that trait self-control is associated with greater autonomous motivation. Self-control might help explain where differences in causality orientations originate. Our work also contributes to our currently limited understanding of how interest and enjoyment in otherwise boring tasks can be cultivated (Sansone et al., 2010; Sansone et al., 1992). In our studies, we found that to the extent that a person is high on self-control, autonomous motivation can still be high when the situation is relatively constrained or when the goal does not have many intrinsically appealing features. Self-control seems to affect how people interpret their motivation for a goal.

As such, this research also contributes to our understanding of self-control. Just as construal levels (Fujita et al., 2006) and goal value (Trope & Fishbach, 2000) are likely increased by self-control, this work suggests autonomous motivation is also increased by self-control. This work follows in a tradition of research examining how self-control processes change people's perceptions of activities to seem more valuable or more all-encompassing, and we found that self-control also seems to change how much people say they are engaged in an activity because it is interesting or fun. In our introduction to this project, we reviewed how the existing literature suggested that autonomous motivation could be increased by self-control and suggested that this might be a reactive process deployed strategically in situations requiring self-control or that this might be a dispositional effect that occurred across situations regardless of self-control requirements.

The evidence across our studies is mixed that these increases in autonomous motivation are the result of a reactive process. In Study 3, self-control is positively related to greater

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autonomous motivation on the MTurk survey as well as greater autonomous motivation for their upcoming tasks. In Study 5, we designed a study that required self-control in one condition and that would not necessitate self-control in the other condition. We found no difference in autonomous motivation by condition. Both of these findings suggest that there is no distinction in autonomous motivation based on the situational self-regulatory requirements.

On the other hand, the moderation by energy levels in Study 4 suggests that the increase in autonomous motivation does seem to be deployed in situations requiring self-regulation. We also examined the correlations between self-control and the variability in a person's autonomous ratings in the two experience sampling studies. If autonomous motivation is higher overall for people high in self-control, then people high in self-control might show a ceiling effect on their autonomous motivation ratings and self-control would negatively correlate with variability. In Study 1, this correlation was marginally significant and negative, ($r = -.12$), and in Study 4, the correlation was non-significant ($r = -.03$).

Future Work. Given our data, it is difficult to make a definitive claim about what processes result in the positive effect of trait self-control on autonomous motivation, although it leans toward the global interpretation. It may be that all goals are perceived as more autonomously motivated, or that when self-regulation is needed, autonomous motivation is amplified, or some combination of these or other factors. Future work should focus on identifying how self-control affects autonomous motivation by examining shifts in value, perhaps using willingness to pay as an outcome. We will also test how intrinsic and identified motivations may vary; in our studies, the two types of motivation are highly correlated, but understanding when self-control affects these two elements differently could be illuminating. We are also testing a potentially more effective manipulation of self-control requirements by

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manipulating whether a person is in an active or complete goal mindset to offer greater certainty.

This research project is a generative first step in connecting the self-regulation and self-determination literatures for a more complete picture of goal pursuit and motivation.

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Appendix A: Complete List of Scales & Items from Study 4

Pre-Sampling Scales

Inventory of Polychronic Values (Poly; Bluedorn, Kalliath, Strube, & Martin, 1999).

Brief Trait Self-Control (SCS; Tangney, Baumeister, & Boone, 2004): Produced in full below
Frost Perfectionism: 3 sub-scales (Perfect; Stallman & Hurst, 2011; Frost, Marten, Lahart, & Rosenblate, 1990).

Passion v. Purpose (8 items assessing motivation for work, created for study).

Communal Orientation Scale (COS; Clark, Ouellette, Powell, & Milberg, 1987).

Behavioral Inhibition/Activation System (BIS/BAS; Carver & White, 1994)

Barratt Impulsiveness-11: Factors 1 & 5. (Patton, Stanford, & Barratt, 1995; Barratt, 1959)

Behavior Identification Form (BID; Vallacher & Wegner, 1989).

TIPI (Gosling, Rentfrow, & Swann. 2003)

Personal power: at work stem (Power; Anderson & Galinsky, 2006).

Demographics

Job descriptives

Brief Trait Control Scale

I am good at resisting temptation.

I have a hard time breaking bad habits (R).

I am lazy (R).

I say inappropriate things (R).

I do certain things that are bad for me if they are fun (R).

I refuse things that are bad for me.

I wish I had more self-discipline (R).

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People would say that I have iron self-discipline.

Pleasure and fun sometimes keep me from getting work done (R).

I have trouble concentrating (R).

I am able to work effectively toward long-term goals.

Sometimes I can't stop myself from doing something, even if I know it is wrong (R).

I often act without thinking through all the alternatives (R).

Post-Sampling Scales

Satisfaction with life scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985).

Scale of Positive and Negative Experience (SPANE; Diener et al., 2010).

Job Descriptive Index (JDI; Lake, Gopalkrishnan, Sliter, & Withrow, 2010; Smith, 1969).

Ryff Purpose Scale (Purpose; Boyle, Buchman, Barnes, & Bennett, 2010).

Copenhagen Burnout Inventory, minus the client sub-scale (CBI; Kristensen, Borritz, Villadsen, & Christensen, 2005).

Midway through sampling, we added the Need for Cognitive Closure 15-item form (NfCC; Roets & Van Hiel, 2011; Webster & Kruglanski, 1994) along with three items modeled after the “goal tenacity” items used in the goal shielding literature (Shah, Friedman, & Kruglanski, 2002). Sixty-percent ($n = 112$) of the final sample have Need for Cognitive Closure and Goal Tenacity scores.

Questions during a signal

working What are you up to right now? (If you are between tasks, what were you doing 5 minutes ago?)

☐ Engaged in a work-related activity (1)

☐ NOT engaged in a work-related activity. (0)

If This is not a work-related ... Is Selected, Then Skip To End of Survey

activity Please describe in a word or two what you're working on: _____

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alone I am working ...

- ☐ individually (1)
- ☐ in a small group (2-4 people) (2)
- ☐ in a large group (5+ people) (3)

schedule Which statement best describes the circumstances of your current activity?

- ☐ Unscheduled / unstructured time (1)
- ☐ Scheduled in advanced (mostly my decision) (2)
- ☐ Scheduled in advance (mostly someone else's decision) (3)
- ☐ Standing event, regularly held at this time (4)

reasons Help us understand your reason(s) for working on this activity at this time. I am working on this right now ...

	not at all true (1)	a little true (2)	somewhat true (3)	completely true (4)
... because it is for a project I truly care about. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... because I just don't want to have to think about it anymore. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... because it is hard to stop when I am so close to finishing it. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... because it has an official deadline approaching. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... because I would feel ashamed, guilty, or anxious if I didn't. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... because it is fun and enjoyable to be working on. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... because someone else is waiting on me or depending on me. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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other Is there some other reason why you are working on this right now?

- ☐ No, I stated my main reason(s) earlier. (0)
- ☐ Yes, I am working on this now because... (1) _____

motivate Right now, do you feel motivated?

- ☐ Not at all motivated (1)
- ☐ Slightly motivated (2)
- ☐ Somewhat motivated (3)
- ☐ Strongly motivated (4)
- ☐ Extremely motivated (5)

conflict Do you feel any conflict about what you should be working on right now?

- ☐ Not at all conflicted (1)
- ☐ Slightly conflicted (2)
- ☐ Somewhat conflicted (3)
- ☐ Strongly conflicted (4)
- ☐ Extremely conflicted (5)

satisfy Do you feel satisfied or dissatisfied with how you are spending your time right now?

- ☐ very dissatisfied (1)
- ☐ somewhat dissatisfied (2)
- ☐ slightly dissatisfied (3)
- ☐ neutral - neither satisfied nor dissatisfied (4)
- ☐ slightly satisfied (5)
- ☐ somewhat satisfied (6)
- ☐ very satisfied (7)

feelings How do you feel right now?

	very slightly or not at all (1)	a little (2)	moderately (3)	quite a bit (4)	extremely (5)
DROWSY (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
RELAXED (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ENTHUSIASTIC (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NERVOUS (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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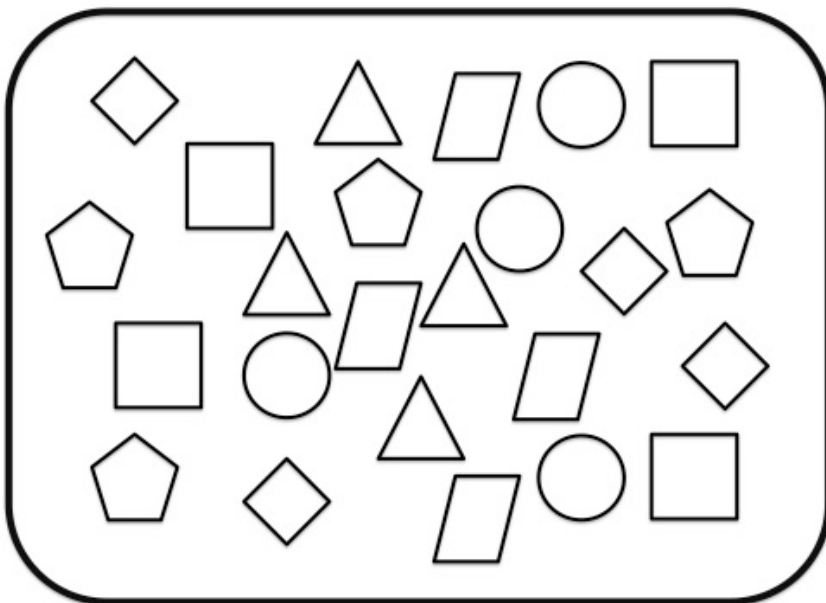
WhyMissed Uh oh! You were not able to respond within 10 minutes so we closed the survey for that time period. The signal came at $\{e://Field/TIME\}$, $\{e://Field/DelayResponse\}$ minutes ago. It would be helpful to know what you were doing at that time.

- ☐ I was not engaged in a work activity anyway. (0)
- ☐ I was working but did not have my phone available. (1)
- ☐ I was working but did not notice or could not respond to the text message. (2)
- ☐ I was in a meeting and could not respond. (3)
- ☐ Other: (4) _____

If Ps responded to a signal more than 10 minutes after its arrival, they only responded to the questions through Reasons (not motivation through feelings)

Appendix B: Sample image of Security Detection Task

“Safe” Image Example:



“Threat” Image Example:

