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Too much of a good thing? Exploring the inverted-U relationship between self-control and happiness

Christopher W. Wiese,
Purdue University

Louis Tay,
Purdue University

Angela L. Duckworth,
University of Pennsylvania

Sidney D'Mello,
University of Notre Dame

Lauren Kuykendall,
George Mason University

Wilhelm Hofmann,
University of Cologne

Roy F. Baumeister, and
Florida State University

Kathleen D. Vohs
University of Minnesota

Abstract

Objective—Can having too much self-control make people unhappy? Researchers have increasingly questioned the unilateral goodness of self-control and proposed that it is beneficial only up to a certain point, after which it becomes detrimental. The little empirical research on the issue shows mixed results. Hence, we tested whether a curvilinear relationship between self-control and subjective well-being exists.

Method—We used multiple metrics (questionnaires, behavioral ratings), sources (self-report, other-report), and methods (cross-sectional measurement, day-reconstruction method, experience sampling method) across six studies (N_{total} = 5,318).

Results—We found that self-control positively predicted subjective well-being (cognitive and affective), but there was little evidence for an inverted U-shaped curve. The results held after statistically controlling for demographics and other psychological confounds.

Corresponding Author: Christopher W. Wiese, Psychological Science Building, 703 3rd Street, West Lafayette, IN 47907. chriswiese@purdue.edu.

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Conclusion—Our main finding is that self-control enhances subjective well-being with little to no apparent downside of too much self-control.

Keywords

happiness; well-being; self-control; curvilinear; self-regulation

Can too much self-control make you unhappy? The literature suggests different answers. One perspective argues that there is no downside to self-control since people with more tend to be happier and view their lives as being highly satisfying (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2013). Another perspective holds that some self-control is beneficial, but there could be costs to having too much — namely in the form of reduced subjective well-being (SWB) or affective and cognitive evaluations of one's life (Diener, Suh, Lucas, & Smith, 1999). Self-control, defined as the ability to control short-term impulses and desires in conflict with long-term goals (Hofmann, Baumesiter, Förster, & Vohs, 2011), could entail frequent and sometimes unnecessary regulation of emotions, thoughts, and behaviors, resulting in a life marked by rigidity and blandness, thereby lowering SWB (Grant & Schwartz, 2011).

Among different virtues, self-control has been recognized as a “master virtue” which makes all other virtues possible (Baumeister & Exline, 1999). At the same time, the development of self-control is a central concern of schools (Diamond & Lee, 2011) and, consequently, interventions have been designed to improve self-control under the assumption that there is no downside. However, these interventions may be harmful if self-control is ranged to problematic levels. Despite the importance of self-control (Duckworth & Kern, 2011), SWB (Diener, et al., 1999), and competing viewpoints on their relationship, there is scant research on the topic. Hence, we tested whether happiness declines at high levels of self-control.

Two theoretical perspectives on self-control and SWB

Psychologists widely agree that self-control promotes SWB. There are many mechanisms through which self-control fosters SWB. Someone with high self-control may feel a flush of success by routinely setting goals, making progress toward them, and ultimately accomplishing their objectives. Similarly, when faced with a choice between the immediate and delayed reward, individuals can experience positive emotions by simply anticipating what it will feel like when they eventually reach a distal goal (MacLeod, Coates, & Hetherton, 2008). Further, self-control aids in making progress toward goals, which leads to positive emotions (Bagozzi, Baumgartner, & Pieters, 1998). Those with higher levels of self-control also employ better strategies that facilitate goal progress and accomplishment (Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2011), which leads to longer-term happiness (Diener, et al., 1999).

Although most researchers agree that self-control is generally positive, they do not agree on whether someone can have too much self-control. One perspective, which argues that self-control has a functional relationship with SWB, states that SWB monotonically increases as self-control increases. This reasoning makes sense through an evolutionary lens—people exercise self-control in order to increase their chances of survival, which is inextricably tied

to well-being. It is hypothesized that the prefrontal cortex (the part of the brain most responsible for self-control) developed when humans needed to restrain impulsive instincts to improve survival (and well-being) of their present and future self (Barkley, 2001; Dunbar, 2003). Behaviors that improved the chances of survival were rewarded with positive feelings, whereas negative feelings were the result of behaviors that decreased the likelihood of survival (Grinde, 2005). It is not surprising that self-regulation benefits a wide variety of life outcomes such as health (Tsukayama, Toomey, Faith, & Duckworth, 2010), relationships (Tangney, Baumeister, & Boone, 2004), and work/scholastic outcomes (Duckworth & Seligman, 2005), all of which in turn can promote SWB. If exercising self-control only occurs when it is beneficial for well-being, it is unlikely that we would observe downturns in well-being at high levels of self-control.

Conversely, positive antecedents can eventually turn negative if taken too far. This is known as the “too much of a good thing” effect (Pierce & Aguinis, 2013), which questions the unilateral goodness of self-control. Ideas of a “dark side” of self-control run deep in psychology, beginning as early as Freud's ideas of anal retentiveness, which refers to individuals with a strong compulsion for control. More recent research suggests something similar—overregulating cognitions, emotions, and behaviors can harm positive interpersonal relationships (Letzring, Block, & Funder, 2005), which will likely have detrimental consequences for well-being given the importance of social relations for SWB (Tay & Diener, 2011). Individuals with excessive self-control may have obsessive-compulsive tendencies for rigidity and inhibition, which may hinder social relationships (Letzring et al., 2005). In line with this, researchers have found the expected curvilinear pattern in closely related constructs. For example, abnormally high levels of conscientiousness predict obsessive-compulsive behaviors and less psychological well-being (Carter, Guan, Maples, Williamson, & Miller, 2015). Similarly, anorexia, which can be regarded as overregulation of eating (Halse, Honey, & Boughtwood, 2007), is associated with lower SWB (Kitsantas, Gillgan, & Kamata, 2003).

Another line of research argues that goal-setting may not always be beneficial (Ordóñez, Schweitzer, Galinsky, & Bazerman, 2009). Goal-setting is a primary mechanism through which self-control produces positive life outcomes such as SWB (Cheung, Gillebaart, Kroese & de Ridder, 2014; Hofmann et al., 2014). There are personal and psychological trade-offs when setting and investing in goals. Individuals with high self-control may focus exclusively on the accomplishment of their personal goals, potentially to the detriment of their personal happiness (McGregor & Little, 1998). Furthermore, ignoring this trade-off may lead to excessive worrying and anxiety (Pomerantz, Saxon, & Oishi, 2000). By consistently refraining from immediate gratification and instead focusing on one's goals, one never fully reaps the fruits of one's labor, thereby negatively impacting SWB.

Past Studies

Scant research has investigated the curvilinear relationship between self-control and well-being. To our knowledge, the three studies that directly test for a curvilinear relationship have had limited success in finding supporting evidence. In a study of young adults, Tangney et al., (2004) found that people with more self-control were less depressed, anxious,

paranoid, and had less obsessive/compulsive tendencies. Further, Finkenauer, Engels, and Baumeister (2005) found that adolescents with more self-control were less depressed and less stressed. Neither of these studies found significant curvilinear effects. In contrast, Situ, Li, and Dou (2015) examined the relationship between self-control and emotional well-being (e.g., depression, anxiety) and found significant quadratic effects across three different samples (adolescents, young adults, employees). However, people with high self-control did not experience more emotional problems. Instead, the results reflected a pattern of diminishing returns where self-control improved emotional well-being up to a point, beyond which it had no effect.

It is important to note that none of these studies measured SWB directly. In each of the studies, well-being was conceptualized as maladaptive attitudes or behaviors (e.g., depression; obsessive-compulsion). Research has shown that these are related to SWB but are conceptually distinct (e.g., Brown, Chorpita, & Barlow, 1998; Watson, Clark, & Carey, 1988). Furthermore, these studies only evaluated affective/emotional components of well-being, and it is important to further evaluate the curvilinear relationship between self-control and cognitive aspects of SWB (i.e., life satisfaction). Methodologically, past research has been conducted using cross-sectional assessments with self-reported data. Although SWB is often assessed through self-report questionnaires, it is beneficial to use multiple measures (e.g., informant reports, behavioral measures) and research designs (e.g., day reconstruction, experience sampling) to examine this issue.

Current Investigation

The current investigation uses new and existing data to test our hypotheses. Previous publications have used data from Study 1 (e.g., Park, Tsukayama, Goodwin, Patrick, & Duckworth, 2016), Study 2 (e.g., Tsukayama, Duckworth, & Kim, 2013), Study 3 (e.g., Galla et al., 2014) and Study 6 (e.g., Hofmann et al., 2012; Hofmann, Luhmann, Fisher, Vohs, Baumeister, 2014). The current research questions and analyses do not overlap with previous reports from these data sets.

Through six studies, the present paper directly examines how self-control relates to different components of SWB while also expanding on the past methodological approaches. Although we varied the methodological techniques across studies, we consistently measured SWB using Diener and colleagues' (1999) tripartite conceptualization (positive affect, negative affect, and life satisfaction). Also, although self-control manifests differently across contexts and age ranges, our measures were centered on the idea that self-control represents the tendency to control short-term impulses that conflict with long-term goals (Hofmann, et al., 2011). We also took precaution to control for potentially confounding variables, such as demographics, extraversion, openness, agreeableness, and neuroticism when they were available. Because self-control is a facet of conscientiousness (Eisenberg, Duckworth, Spinrad, & Valiente, 2014), it was not included as a control due to shared variance.

We adopted a similar analytic strategy across studies by conducting hierarchical linear regression analyses with a base model (control variables), self-control model (base model with self-control measure), and a quadratic model (self-control model with the addition of a

quadratic term). Additionally, we took extra analytic steps in examining the inverted-U effect. Because individuals use an ideal point response process (i.e., it assumes a non-monotonic relation between the trait and observed score) for self-reports of constructs such as self-control and SWB (Tay, Drasgow, Rounds, & Williams, 2009; Tay & Drasgow, 2012; Tay & Kuykendall, 2016) and recent research suggesting that ideal-point response models may more accurately detect curvilinear relationships (Carter et al., 2014), we also examine whether ideal point scoring (compared to typical factor scoring) yields different results. Furthermore, due to the multiple comparisons conducted, we applied Bonferroni corrections in each study to reduce the likelihood that significant results are due to chance (Abdi, 2007). That is, we divided traditional significance values (i.e., .05, .01) by the total number of analyses conducted in each study.

The first three studies were conducted on similar samples (5^{th} through 12^{th} graders) using similar measures (self-reports of SWB, self- and teacher- reports of students' self-control). Given the similarity of the measures, we also conducted an integrative data analysis (Curran & Hussong, 2009) and these studies are discussed both individually and collectively. In order to address the issue of reference bias (i.e., the use of different standards when endorsing items based on context; Duckworth & Yeager, 2015) associated with questionnaires, we added a behavioral self-control task (D'Mello, Galla, & Duckworth, 2017) known to be immune to these effects (O'Brien et al., in preparation) in Study 4.

Study 5 tested the predictions using college undergraduates. Because there can be systematic biases associated with self-report measures of SWB, this study used the Day Reconstruction Method (DRM; Kahneman, Krueger, Schkade, Schwartz, & Stone, 2004) that evokes specific contexts to gather reports of episodic affect. Last, Study 6 used an experience sampling method (ESM) on a sample of community adults. Our use of diverse measures and samples allowed for more robust tests of the competing hypotheses.

Study 1

Study 1 used middle-school students to test for a curvilinear effect between self-control and SWB. Students completed a measure of self-control that taps their ability to control their impulses in academic and interpersonal contexts. Additionally, teachers rated students' self-control in these two contexts. Students also reported their SWB through reports of positive and negative affect as well as a rating of their current life satisfaction.

Method

Participants—Participants were 1,539 5^{th}- through 8^{th}-grade students (mean age = 11.65, *SD* = 1.30; 52.4% female) from seven schools in the United States. The sample included African-American (32%), Caucasian (17%), Hispanic (43%), Asian (5%), Native American (1%) and multi-racial (2%) individuals.

Measures

Self-Control: Students completed the Domain Specific Impulsivity Scale for Children (Tsukayama, Duckworth, & Kim, 2013). The measure required students to rate their self-control behaviors at school (α = .73) with 4 items (e.g., *I paid attention and resisted*

distractions) and during interpersonal interactions (α = .78) with 4 items (e.g., *I remained calm even when criticized or otherwise provoked*) on 7-point Likert scales (1 = Almost Never, 7 = Almost Always).

Teachers (N = 134) were presented with the same self-control items as the students; however, they asked to provide an overall evaluation of each student's school and interpersonal self-control on 7-point Likert scales (1 = Almost Never, 7 = Almost Always). On average, teachers rated 3.5 students and inter-rater reliability was moderate for both school (r_{wg} = .49) and interpersonal (r_{wg} = .40) self-control. Student and teacher ratings were also moderately correlated (r = .44, p < .01 for school; r = .46, p < .01 for interpersonal).

Subjective Well-Being: Students reported how often they feel six positive feelings (e.g., happy, relaxed, excited) and four negative feelings (e.g., sad, worried, angry) to assess positive (α = .83) and negative (α = .68) affect (1 = Never, 5 = Always). As an indicator of life satisfaction, students answered the question "Overall, how satisfied are you with your life?" (1= Extremely Unsatisfied, 7 = Extremely Satisfied).

Statistical Controls: We controlled for gender, the school the student attended, and ethnicity. We also controlled for student reported extraversion (α = .66), agreeableness (α = .80), openness (α = .74), and neuroticism (α = .82) using 4 selected items from the BFI-44 (John & Srivastava, 1999) for each construct, which was measured concurrently with the self-control and SWB ratings.

Results

Table 1 reports results from the regression analyses. We applied Bonferroni corrections to the 12 regression analyses. Significance values were divided by 12, resulting in significance threshold of .004 (for α at .05) and .0008 (for α at .01). Both self-reported and teacher reported ratings of self-control significantly predicted all three components of SWB, with the exception that teacher ratings of school self-control did not predict negative affect (r = -.05, p > .004). There was no evidence for curvilinear effects.

We then applied an ideal point model scoring approach (as recommended by Carter et al., 2014) to all multi-item measures (student-reported self-control, positive and negative affect) through the GGUM2004 software (Roberts, Fang, Cui, & Wang, 2006). This approach cannot be applied to single item measures (teacher ratings of student self-control, and self-reports of life satisfaction). Ten of the aforementioned analyses were re-run using the ideal-point model scores in lieu of mean estimates. The two exceptions were the relationship between teacher reported self-control (both school and interpersonal) and life satisfaction as all three relied on a single item measure. The results 10 remaining analyses mirrored the earlier results in that there was evidence of a linear relationship between self-control and SWB, but no evidence of a quadratic effect.

Study 2

Study 1 found a linear relationship between self-control and SWB on 11 of 12 tests, indicating a consistent association. The more that students possessed self-control (as rated my themselves and their teachers), the more they experienced positive affect, negative affect, and were satisfied with their lives. There was no indication of a curvilinear effect. Study 2 aimed to replicate these effects using slightly different measurements to ensure that the effects of Study 1 were not dependent on specific measures.

Method

Participants—Participants were 667 6th- through 8th- grade students (52.8% female) enrolled in three schools in the United States. On average, students in these grades range between 11 and 14 years old. The sample included African-American (26%), Caucasian (24%), Hispanic (45%), Asian (3%), and multi-racial (2%) students.

Measures

Self-Control: Using the same scale as in Study 1, students self-rated their school (α = .63) and interpersonal (α = .72) self-control with four items each. Unlike Study 1, teachers were asked to report student's self-control using the same 8-item measure as the students. Also, although teachers did rate several students, each student was only rated once. We found sufficient internal consistency reliability for teacher ratings of both school (α = .91) and interpersonal (α = .89) self-control. Student and teacher ratings were moderately correlated for both school (r = .24, p < .01) and interpersonal (r = .37, p < .01) self-control.

Subjective Well-Being: Using the Positive and Negative Affect Scale for Children (PANAS-C: Laurent et al., 1999), students rated 15 positive and 15 negative emotions (e.g., delighted, active, afraid) on 5-point Likert scales (1 = Very slightly or not at all, 5 = Extremely). Both positive (α = .87) and negative affect (α = .88) were internally consistent. We assessed life satisfaction using the 5-item Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). Students were asked to rate their current life satisfaction (e.g., *In most ways my life is close to my ideal*, *The conditions of my life are excellent*) on a 5-point Likert scale (1 = Disagree strongly, 5 = Agree strongly), which yielded and good reliability (α = .80).

Statistical Controls: Our analyses controlled for gender, school, and ethnicity. We also controlled for student reported extraversion (8 items; α = .66), agreeableness (9 items; α = .68), openness (10 items; α = .70), and neuroticism (8 items; α = .70) measured via the BFI-44 (John & Srivastava, 1999).

Results

We conducted 12 regression analyses and used Bonferroni corrections for significance thresholds (.004 for α = .05; .0008 for α = .01). Results (Table 2) produced only two significant main effects: students' self-reports of school self-control and life satisfaction (β = .13, p < .0008) and teacher ratings of students' school self-control and positive affect (β = .14, p < .0008).

Additionally, student ratings of interpersonal self-control showed a significant quadratic effect on life satisfaction (β = -.14, p < .004); likewise, teacher ratings of school self-control had a significant quadratic effect on negative affect (β = .13, p < .004). However, the shape of the curves did not reflect the too much of a good thing effect (Figure 1).

We also used an ideal-point modeling scoring approach on all self-control (i.e., both student and teacher reports) and SWB (i.e., positive affect, negative affect, life satisfaction). These results replicated the linear effects and there was no evidence of a too much of a good thing effect.

Study 3

Although Study 1 found linear association between self-control and SWB, the evidence in for the linear effect was less strong in Study 2. Further, there was no evidence that more self-control would result in worse SWB. Study 3 was conducted to test the competing hypotheses again, and thus was another replication attempt.

Method

Participants—Participants were 1,386 12th-grade students (mean age = 17.98, SD = .55; 51.1% female) from three United States schools. The ethnic breakdown of the sample was African-American (31%), Caucasian (36%), Hispanic (11%), Asian (20%), and multi-racial (2%).

Measures

Self-Control: Study 3 used the school (4-items; α = .68) and interpersonal (4-items; α = .72). self-control scales from Study 1 (Tsukayama, et al., 2013). Teacher ratings for self-control were gathered in the same manner as Study 1. Two teachers for each student answered one item tapping the student's self-control at school (r_{wg} = .53) and one item tapping student's interpersonal self-control (r_{wg} = .61). We averaged the scores across teachers. Correlations between student and teacher ratings of self-control were r = .22, p < .01 for school self-control and r = .19, p < .01 for interpersonal self-control.

Subjective Well-Being: We also measured SWB similarly to Studies 1 and 2. Participants responded to 5 positive items (e.g., happy, related, excited) and 5 negative items (e.g., sad, worried, angry) to assess positive (α = .79) and negative (α = .74) affect respectively. The students answered one Life Satisfaction question, “Overall, how satisfied are you with your life,” on a 7-point Likert scale (1= Extremely Unsatisfied, 7 = Extremely Satisfied).

Statistical Controls: Analyses also controlled for gender, school, ethnicity, extraversion (α = .75), agreeableness (α = .68), openness (α = .69), and neuroticism (α = .78). The latter four were measured using 4 selected items (16 total) from the BFI-44 (John & Srivastava, 1999).

Results

Bonferroni corrections on 12 regression analyses resulted in significance thresholds of.004 (for α at .05) and .0008 (for α at .01). Regression results (Table 3) demonstrated that, while student ratings of school self-control predicted all three components of SWB, student ratings of interpersonal self-control only predicted negative affect (β = -.10, p < .0008). None of the teacher ratings of student's self-control significantly predicted SWB. Most important, adding a quadratic term to the models did not account for additional variance in any of the SWB measures. We conducted ideal point scoring of self-reported self-control as well as positive and negative affect. These models did not reveal any significant inverted-U effects.

Study 1-3 Discussion

Studies 1-3 found indications of a linear relationship between self-control and SWB — but no quadratic effects. In order to make stronger claims, we conducted an Integrative Data Analysis (IDA; Curran & Hussong, 2009). IDA allows for pooling data across different samples, which can increase the power to detect relationships beyond that of an individual study. We harmonized the measures (e.g., transforming all items to be on the same scale), integrated the data sets, and created scale means of each construct using observed item scores (as recommended by Bainter & Curran, 2015; Curran & Hussong, 2009). We then assigned each student a corresponding Study ID and conducted hierarchical linear modeling (HLM) modeling with Study ID as a Level 2 random effect.

The results from the IDA are reported in Table 4 using traditional significance values. There were clear, consistent linear effects between students' self-reported self-control scores and SWB after controlling for demographic and psychographic variables (as reported in Studies 1-3). Additionally, some teacher reports of students' self-control significantly predicted SWB. Most importantly, there was no evidence of a significant inverted-U shape effect. That is, neither teacher ratings nor student self-ratings indicated that students with very high self-control are less happy than others. The one significant quadratic effect between teacher reported school self-control and negative affect was not in the expected direction (Figure 2).

Study 4

Studies 1-3 found no evidence of a downturn in SWB at high levels of trait self-control. One possible objection is that self- or informer-reports of self-control are biased. Study 4 therefore used a behavioral measure of self-control called the Academic Diligence Task (ADT). The ADT presents participants with the ongoing choice between working toward academic goals (e.g., practicing math or spelling) and doing fun, rewarding activities (e.g., playing a video game or watching YouTube videos). This measure aptly captures one possible route by which self-control could reduce SWB, because high scores require foregoing pleasures for the sake of work. If scoring very high on the ADT indicates a joyless, duty-bound approach to life, it might well lead to lower SWB.

Method

Participants—Participants were 1,280 9th-grade students (mean age = 14.89, SD = .47, 50.4% female) from eight schools in the United States. The sample was comprised of

African-American (45%), Caucasian (26%), Hispanic (16%), Asian (12%), and multi-racial (1%) students. A sub-sample of students completed the Academic Diligence Task (n = 300), a behavioral measure of self-control.

Measures

Self-Control: Students completed the same items for school and interpersonal self-control as Study 1 (Tsukayama, et al., 2013), plus an additional item for each domain (i.e., 5 items total per domain). Both school (α = .77) and interpersonal (α = .79) self-control demonstrated good reliability.

Teacher ratings of student self-control were gathered in the same manner as Study 1. On average, the 59 teachers rated approximately 91 students each on both school and interpersonal self-control. We calculated r_{wg} for both school (.75) and interpersonal (.70) self-control and averaged ratings to create overall scores for each.

Academic Diligence Task: The ADT is a web-based computerized task designed to mirror real-world situations where a student must make the difficult decision of completing an easy but tedious skill-building task (i.e., single-digit subtraction for the math domain; spelling for the verbal domain; and navigation for the spatial domain) while forgoing entertaining distractions (e.g., viewing music videos, movie trailers, sports highlights, or playing Tetris). After explaining the importance of the skill-building task, students interact (across three, 3-minute blocks) with a split-screen interface that provides them the choice to either complete the skill-building activity or engage with the distractors. The dependent variable is the percent of time spent on the skill-building activity (time on task) and how many skill-building tasks they answered correctly (productivity).

Subjective Well-Being: Subjective well-being was measured with three indices: positive affect, negative affect, and life satisfaction. Positive and negative affect was measured (1 = Never; 5 = Always) using four and six items (Diener et al., 2009). Participants indicated how often in the past month they felt good, happy, joyful, and satisfied (α = 82). Negative affect was measured using six items Diener et al., 2009). Participants were asked how often they felt bad, sad, afraid, angry, worried, and stressed (α = .79). Life satisfaction was measured with a single item (*How satisfied or unsatisfied were you with your life?*) on a 6-point Likert scale (1 = Strongly unsatisfied; 6 = Strongly satisfied).

Statistical Controls: We used gender, school, and ethnicity as controls.

Results

The Bonferroni corrections for the 18 regression analyses resulted in significance targets of .003 (for α at .05) and .0006 (for α at .01). Parallel to the IDA conducted on Studies 1-3, both self-report self-control measures significantly predicted positive affect, negative affect, and life satisfaction (Table 5). Teacher reports of student self-control predicted positive affect and life satisfaction, but not negative affect. Neither metric of self-control from the Academic Diligence Task (productivity, time on tasks) predicted SWB (Table 6).

Most central to our paper, the addition of the squared term to test the curvilinear effects between self-control and SWB revealed no significant effects. Re-running the models after using the ideal-point modeling scoring approach on self-reported self-control ratings as well as positive and negative affect revealed no significant curvilinear effects.

Discussion

As in Studies 1-3, Study 4 provided strong support that perceptions of self-control were linearly related to SWB with no downturn. When we assessed self-control using other methods, such as teacher ratings and the behavioral task, there was less evidence of a relationship between self-control and SWB. More importantly, we did not find the inverted-U effect, which could conceal the lack of a positive relationship.

The behavioral measure of self-control likewise failed to show any sign of a curvilinear relationship to SWB. However, it also failed to find the linear relationship that has been robust across self-report measures. The lack of a positive relationship suggests two possibilities. First, the task may be too specific, and doing well on the specific task may not generalize to broader life domains to affect SWB. Second, the task may demonstrate that behavioral measures of self-control are not related to SWB. This would imply that there is some degree of global positivity bias—individuals who view themselves as having greater self-control also view themselves as happy. Study 5 was designed to tease these apart.

Study 5

The failure of the behavioral measure in Study 4 to yield results comparable to those of the self-report measures raises the possibility of a global positivity bias in aggregate self-reports. Study 5 aimed to minimize that problem by using the Day Reconstruction Method (DRM) (Kahneman, et al., 2004), which has people list activities during different segments of their day. We had them rate their SWB during each event.

Method

Participants—We tested 320 college undergraduates (mean age = 19.33, *SD* = 1.38; 48% female). The sample was comprised of African-American (4%), Caucasian (72%), Hispanic (3%), Asian (17%), Native American (1%) and multi-racial (3%) individuals.

Measures

Self-Control: We used four measures to assess self-control. Participants completed the 36-item Self-Control Scale (Tangney, et al., 2004), the 30-item Barratt Impulsiveness Scale Version 11 (BIS-11; Patton, Stanford, & Barratt, 1995), the 12-item Delay of Gratification Scale (Ray & Najman, 1986), and the 10-item Academic Delay of Gratification Scale (Bembenutty & Karabenick, 1998). Each measure demonstrated acceptable internal consistency (α = .97, .83, .74, .69, respectively).

Subjective Well-Being: We measured the affective components of SWB in two ways. First, participants completed the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) before engaging in the DRM. The PANAS presented 10 mood states of

each valence (positive affect, α = .88; negative affect, α = .89). Second, we calculated positive and negative affect using the DRM (Kahneman, et al., 2004). Using this method, participants split the previous day into three parts: morning, afternoon, and evening. Within these three parts, they listed as many events as they could think of, and the time the event began and ended. For each event, they rated on a scale from 0 to 10 how much they felt each of the 14 positive affect states (e.g., excited, serene, active, proud) and 16 negative affect states (e.g., upset, guilty, bored). These affective responses were subsequently weighted by how long the event lasted to create a single score for positive and negative affect.

Controls: We controlled for age, gender, and ethnicity.

Study 5 Results

Bonferroni corrections stipulated significance thresholds of .003 (for α= .05) and .0006 (for α= .01) for the 16 regression analyses. For PANAS measures, self-control indices significantly predicted both positive and negative affect (Table 7), with the exception that delay of gratification did not significantly predict self-reported positive affect ($\beta = .15$, $p > .003$). Furthermore, all self-control measures significantly predicted negative affect using the DRM, but they did not predict positive affect.

Crucially, no significant curvilinear effects were found in these analyses and after estimating self-reported positive and negative affect (via PANAS) and all four measures of self-control using ideal-point modeling scoring.

Discussion

The DRM was employed to overcome potential biases in global assessments of self-control and SWB. Nonetheless, and consistent with Studies 1-4, Study 5 found no evidence for a curvilinear relationship between self-control and SWB.

The linear positive relationship between self-control and SWB was once again found in Study 5, especially with self-report measures. The four self-control scales predicted both traditional self-reported and DRM negative affect, but not DRM positive affect. Although DRM positive affect was significantly correlated with self-reported positive affect ($r = .34$, $p < .01$), it was not significantly correlated with any of the self-control measures. These findings suggest that self-control may not produce positive affect in the moment, whereas engaging in self-control may reduce negative feelings.

Still, the main finding is that there was no sign that high levels of self-control bring a downturn in SWB. Study 5 ruled out the alternative interpretation that the linear relationship between self-reported SWB and self-control reflects a positivity bias in one-shot aggregate self-report measures, because it still emerged with the DRM.

Study 6

Studies 1-5 tested our hypothesis across a developmental span of 5th grade through young adults. Study 6 further extended the investigation to a community sample of adults. We analyzed data from the *Everyday Temptations Study* (Hofmann, Baumeister, Förster, &

Vohs, 2012), which applied an experience-sampling method (ESM) to capture self-control episodes in daily life. The use of ESM rules out the possible influence of lay theories that may be present in global judgments (in Studies 1-3). In particular, traditional self-report survey data are dependent on reconstructive judgments, which may be influenced by existing lay theories of the universal 'goodness' of self-control. This may result an artificial linear effect between self-control and happiness and mask the true underlying inverted-U effects. Because momentary assessments are focused on specific events, they would be less prone to these biases (Hektner, et al., 2007). Hence this approach offered our best hope for finding evidence for an inverted-U relationship between self-control and SWB.

Method

Participants—As described in Hofmann et al. (2012), the sample consisted of 205 adults (66% female) from Würzburg, Germany. Participants ranged from 18 to 55 years old (M = 25.24, SD = 6.32). Participants were given €20 with an additional incentive of movies passes (€15) if they completed 80% of the signals as well as entrance into raffle for one of two portable music players (iPod Touch).

Procedure—Participants were provided with Blackberry personal data assistants (PDAs) for seven consecutive days (for a detailed overview of the procedure, see Hofmann et al., 2012). Each day they received seven signals to the PDA and completed an experience-sampling protocol designed to assess whether they were experiencing any desires and whether they used self-control to resist their desires.

Measures

Self-Control: Self-control was measured both at the person and event level. Before completing the ESM part of the study, participants completed the 13-item version of the Trait Self-Control Scale (Tangney et al., 2004, α = .87). Additionally, event-level self-control was measured by having participants rate how successful they were at resisting a given desire using a 6-point Likert scale. Importantly, in order to receive this question, participants needed to have indicated that they experienced a temptation within the previous half an hour and that they had tried to resist it. Unlike previous investigation using these data, our sample excluded events when individuals gave into their temptations.

Subjective Well-Being: SWB was also measured at both the person and event level. Prior to the experience sampling portion of the study, participants completed the five-item Satisfaction with Life Scale (Diener et al., 1985, α = .80). The event-level indication of SWB was a single item concerning their momentary affective well-being on a 7-point Likert scale (1 = very bad, 7 = very good).

Controls: We controlled for several demographic variables (age, gender, nationality) and used a German adaptation of the brief ten-item personality measure (Gosling, Rentfrow, and Swann, 2003) to measure extraversion (α = .63), neuroticism (α = .75), agreeableness (α = .14), and openness (α = .54).

Results

We used three approaches to examine the data. With the person-level data, we investigated the potential curvilinear relationship between trait self-control and life satisfaction. Results from the hierarchical linear regression analysis demonstrated a significant linear effect ($\beta = .38$, $p < .01$), but not a significant curvilinear effect ($\beta = .06$, $p > .05$). The ideal-point scoring replicated the results with respect to a linear but no inverted-U effect.

Given that the event-level data was nested within individuals, hierarchical linear modeling (HLM) assessed the relation between both momentary self-control (i.e., self-control success; SCS_{ij}) and self-control success aggregated to the person level (i.e., $\overline{SCS}_j$), where j represents the person and i represents the event. To disentangle momentary effects from aggregated effects, we conducted group-mean centering of momentary self-control (i.e., an individual's momentary self-control score minus the average of the same individual's momentary self-control scores; Enders & Tofighi, 2007). The quadratic scores were calculated from the group-mean centered self-control success variable (i.e., $\left[SCS_{ij} - \overline{SCS}_j\right]^2$) and the aggregated self-control variable (i.e., $\overline{SCS}_j^2$).

Level 1:

$$SWB_{ij} = \beta_{0j} + \beta_{1j}(SCS_{ij} - \overline{SCS}_j) + \beta_{2j}([SCS_{ij} - \overline{SCS}_j]^2) + r_{ij} \quad (1)$$

Level 2:

$$\beta_{0j} = \gamma_{00j} + \gamma_{01}(\overline{SCS}_j) + \gamma_{02}(\overline{SCS}_j^2) + \mu_{0j} \quad (2)$$

$$\beta_{1j} = \gamma_{10j} + \mu_{1j} \quad (3)$$

$$\beta_{2j} = \gamma_{20j} + \mu_{2j} \quad (4)$$

Additional controls in equation (2) including gender, age, and personality (extraversion, agreeableness, neuroticism, openness) were also included but not displayed in the equations for simplicity.

We used the lme4 (Bates, Maechler, Bolker, & Walker, 2015) in R to run these models. Due to the multilevel nature of the data, we estimated a conditional R, which explains the proportion of variance explained by both random and fixed factors. Results from these analyses are presented in Table 8. Aggregated self-control success significantly predicted

average momentary SWB (at Level 2 of the model); however, the quadratic term was not significant. Additionally, we found a significant linear relationship between momentary self-control success and momentary SWB (at Level 1) as well as a significant quadratic effect, however it was not in the shape of an inverted-U relationship (Figure 3).

We also used multiple regression analysis to test whether aggregated self-control success at the person level predicted participants' scores on the Satisfaction with Life Scale as an alternative measure of SWB. Again, the linear term was significant, $\beta = .21$, $p < .01$, while the quadratic term was not, $\beta = -.07$, $p > .05$. Last, a bootstrapping mediation analysis (Preacher & Hayes, 2004) established that aggregated self-control success partially mediated the above relationship between dispositional self-control (TSC) and SWB as measured with the Satisfaction With Life Scale, as indicated by a reliable indirect effect ($\beta = .03$; 95% confidence interval > 0).

Discussion

Study 6 used ESM to overcome potential biases associated with self-report data. Further, this study extends the previous studies by using a sample of adults. We found consistent evidence of a linear effect of self-control on SWB with person-level (i.e., trait self-control and aggregated self-control successes) and event-level (i.e., self-control success) data. But once again there was no evidence of an inverted-U relation.

Supplementary Re-Analysis

Refer to Web version on PubMed Central for supplementary material.

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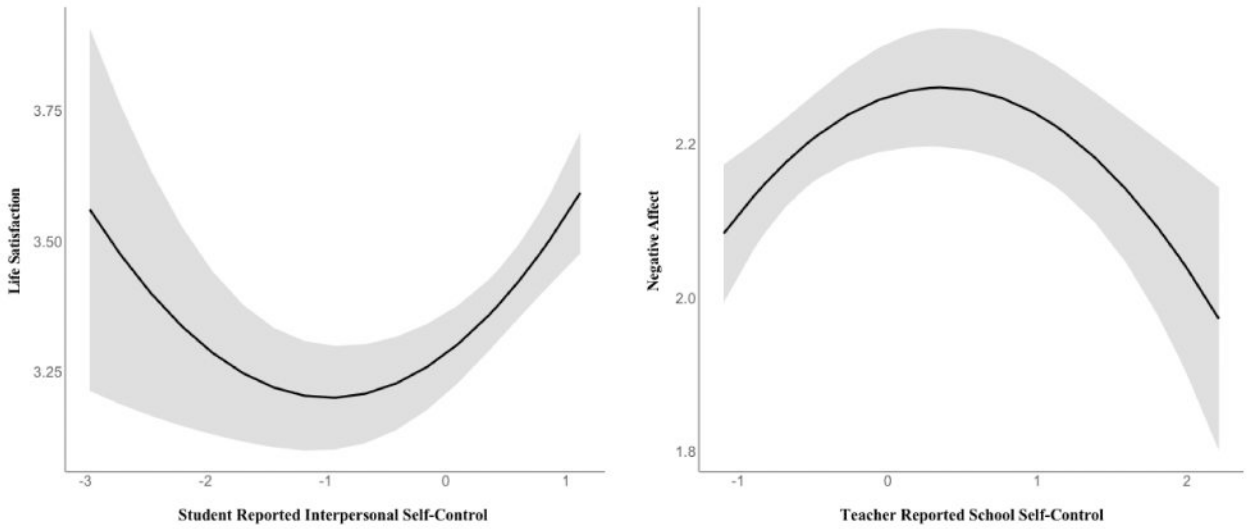

Figure 1. Study 2 curvilinear relations for: a) student reported interpersonal self-control and life satisfaction and b) teacher reported school self-control on negative affect

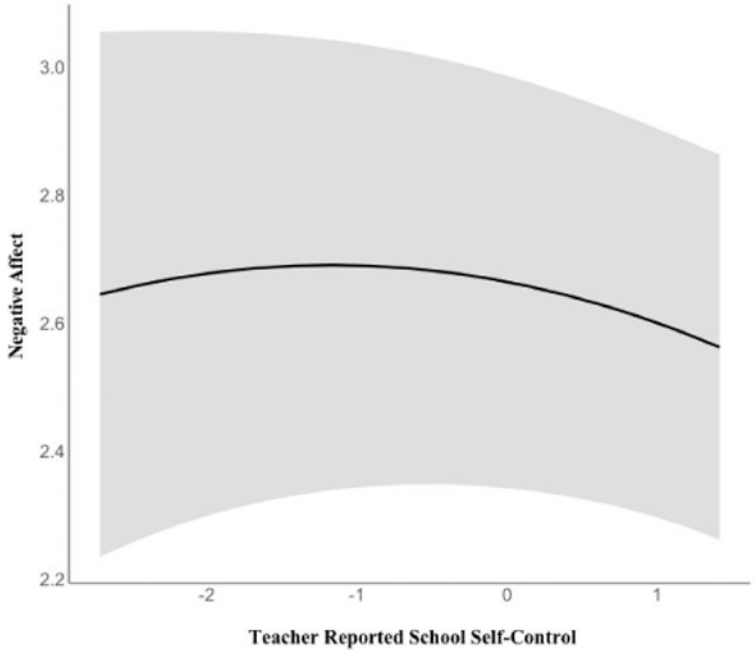

Figure 2. IDA curvilinear relations for teacher reported school self-control on negative affect

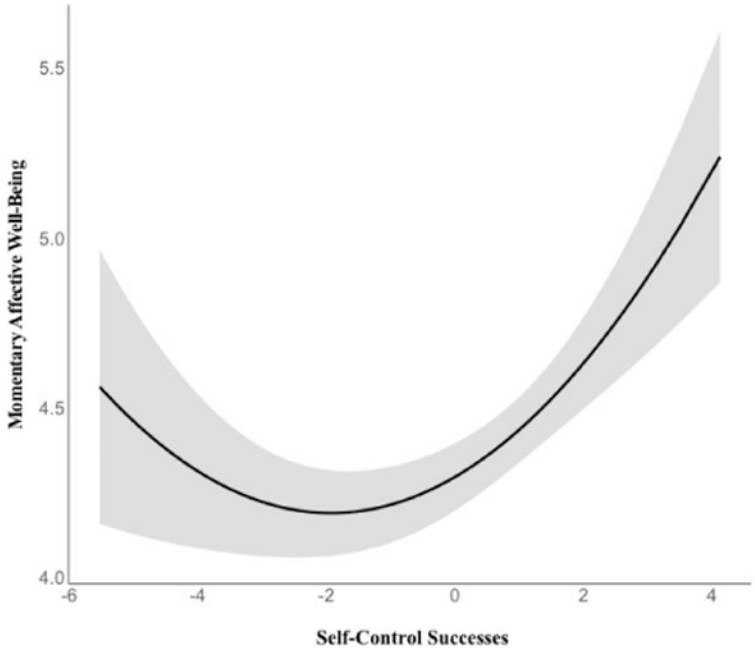

Figure 3. Study 6 curvilinear relations for self-control successes and momentary affective well-being

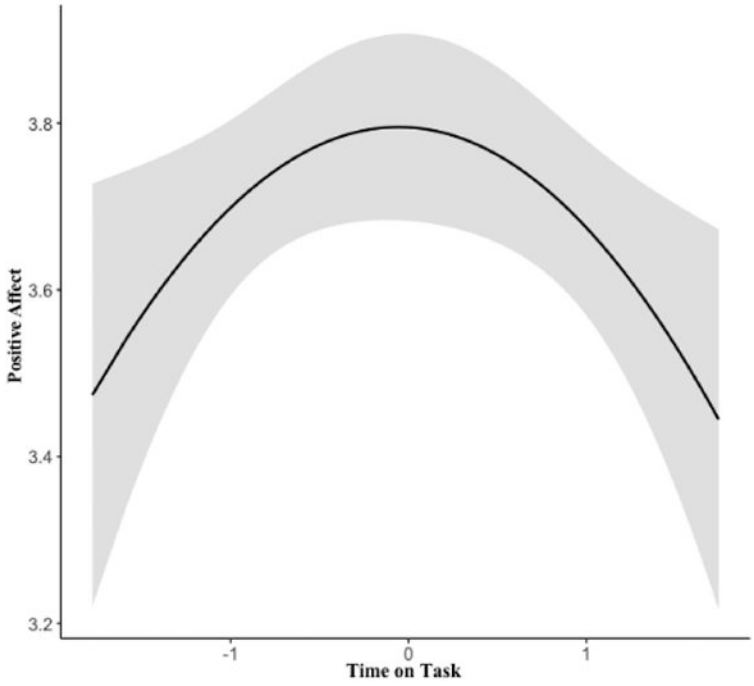

Figure 4. Study 4 curvilinear relations for time on task and positive affect

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Table 1

Standardized regression coefficients of Self-Control variables on SWB from Study 1 (*n* = 1539)

	Positive Affect				Negative Affect				Life Satisfaction			
	Self Report		Teacher Report		Self Report		Teacher Report		Self Report		Teacher Report	
	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$
SCS	.30**	.31**	.13**	.11**	-.18**	-.18**	-.05	-.05	.27**	.24**	.11**	.11**
SCS^2		.01		-.05		-.01		.00		-.06		.00
R^2	.26**	.26**	.20**	.20**	.23**	.23**	.21**	.21**	.21**	.21**	.17**	.17**
ΔR^2	.07**	.00	.01**	.00	.03**	.00	.00	.00	.06**	.00	.01**	.00
SCI	.30**	.32**	.11**	.11**	-.23**	-.23**	-.10*	-.10*	.22**	.20**	.10**	.11**
SCI^2		.04		.00		.00		-.01		-.05		.02
R^2	.25**	.25**	.20**	.20**	.25**	.25**	.22**	.22**	.19**	.19**	.17**	.17**
ΔR^2	.07**	.00	.01**	.00	.04**	.00	.01*	.00	.03**	.00	.01**	.00

Note. SCS = Self-Control School; SCI = Self-Control Interpersonal; Self-Control variables were added to the regression equation after controls (gender, school, ethnicity, extraversion, agreeableness, openness, and neuroticism)); ΔR^2 denotes self-control variables over and above controls (and self-control main effects for squared terms)

Bonferroni corrected p-values:

* p < .004;

** p < .0008

Table 2

Standardized regression coefficients of Self-Control variables on SWB from Study 2 (*n* = 667)

	Positive Affect				Negative Affect				Life Satisfaction			
	Self Report		Teacher Report		Self Report		Teacher Report		Self Report		Teacher Report	
	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$
SCS	.05	.06	.14**	.19**	-.09	-.09	-.00	-.09	.13**	.14*	.07	.11
SCS^2		.01		.07		.01		.13*		.01		.06
R^2	.32**	.32**	.34**	.34**	.35**	.35**	.35**	.36**	.26**	.26**	.25**	.25**
ΔR^2	.00	.00	.02**	.00	.01	.00	.00	.01*	.01**	.00	.00	.00
SCI	.03	.02	.03	.17	-.09	-.11	-.04	.01	.11	.20**	.02	.02
SCI^2		-.01		.17		.05		-.06		-.14*		.00
R^2	.32**	.32**	.32**	.33**	.35**	.35**	.35**	.35**	.25**	.26**	.25**	.25**
ΔR^2	.00	.00	.00	.01	.01	.00	.00	.00	.01	.01*	.00	.00

Note. SCS = Self-Control School; SCI = Self-Control Interpersonal; Self-Control variables were added to the regression equation after controlling for gender, school, ethnicity, extraversion, agreeableness, openness, and neuroticism; *ΔR2* denotes self-control variables over and above controls (and self-control main effects for squared terms)

Bonferroni corrected p-values:

* p < .004;

** p < .0008

Table 3

Standardized regression coefficients of Self-Control variables on SWB from Study 3 (*n* = 1386)

	Positive Affect				Negative Affect				Life Satisfaction			
	Self Report		Teacher Report		Self Report		Teacher Report		Self Report		Teacher Report	
	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$
SCS	.15**	.15**	.00	.00	-.12**	-.11**	-.03	-.04	.18**	.19**	.03	.04
SCS^2		.03		.00		.04		-.02		.03		.03
R^2	.35**	.35**	.34**	.34**	.49**	.49**	.47**	.47**	.19**	.19**	.16**	.16**
ΔR^2	.02**	.00	.00	.00	.01**	.00	.00	.00	.03**	.00	.00	.00
SCI	.05	.04	-.02	-.02	-.10**	-.09**	.03	.02	.06	.05	-.02	.03
SCI^2		-.03		-.01		.02		-.02		-.03		.07
R^2	.34**	.34**	.34**	.34**	.48**	.48**	.47**	.47**	.16**	.16**	.16**	.16**
ΔR^2	.00	.00	.00	.00	.01**	.00	.00	.00	.00	.00	.00	.00

Note. SCS = Self-Control School; SCI = Self-Control Interpersonal; Self-Control variables were added to the regression equation after controls (gender, school, ethnicity, extraversion, agreeableness, openness, and neuroticism)); ΔR^2 denotes self-control variables over and above controls (and self-control main effects for squared terms)

Bonferroni corrected p-values:

* p < .004;

** p < .0008

Table 4

Effect size estimates of Self-Control variables on SWB from Study 1-3 using Integrative Data Analysis

	Positive Affect				Negative Affect				Life Satisfaction			
	Self Report		Teacher Report		Self Report		Teacher Report		Self Report		Teacher Report	
	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$
SCS	.14*	.15**	.08*	.09*	-.11**	-.11**	-.03	-.05	.17**	.17**	.07*	.08*
SCS^2		.01		.01		.01		-.02*		-.01		.01
R^{2a}	.36**	.36**	.31**	.31**	.42**	.42**	.40**	.40**	.22**	.22**	.19**	.19**
ΔR^{2a}	.06	.00	.01	.00	.03	.00	.01	.00	.03	.00	.00	.00
SCI	.11*	.11*	.03	.05	-.12**	-.13**	-.01	-.02	.11**	.11**	.04	.05
SCI^2		.01		.02		.00		.00		.00		.01
R^{2a}	.32**	.32**	.30**	.30**	.41**	.41**	.40**	.40**	.20**	.20**	.19**	.19**
ΔR^{2a}	.02	.00	.00	.00	.02	.00	.01	.00	.01	.00	.00	.00

Note. Values are unstandardized parameter estimates. SCS = Self-Control School; SCI = Self-Control Interpersonal; Self-Control variables were added to the regression equation after controlling for gender, ethnicity, extraversion, agreeableness, openness, and neuroticism; ΔR^2 denotes self-control variables over and above controls (and self-control main effects for squared terms)

[a] R^2 is a conditional R^2 which explains the proportion of variance explained by random and fixed factors

* $p < .05$;

** $p < .01$

Table 5

Standardized regression coefficients of Self-Control (self/teacher reports) variables on SWB from Study 4 (*n* = 1280)

	Positive Affect				Negative Affect				Life Satisfaction			
	Self Report		Teacher Report		Self Report		Teacher Report		Self Report		Teacher Report	
	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$
SCS	.27**	.27**	.12**	.11**	-.21**	-.20**	-.08	-.08	.19**	.19**	.12**	.12**
SCS^2		.01		-.03		.04		.03		.02		.01
R^2	.11**	.11**	.05**	.05**	.15**	.15**	.12**	.12**	.09**	.09**	.07**	.07**
ΔR^2	.07**	.00	.01**	.00	.04**	.00	.01	.00	.03**	.00	.01**	.00
SCI	.30**	.29**	.10*	.09*	-.25**	-.25**	-.06	-.06	.21**	.22**	.09*	.10*
SCI^2		-.04		-.04		-.01		.01		.02		.03
R^2	.12**	.12**	.05**	.05**	.17**	.17**	.11**	.11**	.10**	.10**	.06**	.06**
ΔR^2	.08**	.00	.01*	.00	.05**	.00	.00	.00	.04**	.00	.01	.00

Note. SCS = Self-Control School; SCI = Self-Control Interpersonal; Self-Control variables were added to the regression equation after controls (gender, school, and ethnicity); ΔR^2 denotes self-control variables over and above controls (and self-control main effects for squared terms)

Bonferroni corrected p-values:

* p < .003;

** p < .0006

Table 6

Standardized regression coefficients of Self-Control (ADT) variables on SWB from Study 4 (*n* = 300)

	Positive Affect		Negative Affect		Life Satisfaction	
	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$
Productivity	.00	.04	-.02	-.04	.13	.17
Productivity^2		-.08		.05		-.08
R^2	.07	.07	.14**	.14**	.09	.10
ΔR^2	.00	.00	.00	.00	.01	.01
Task Time	-.02	-.01	-.01	-.01	.12	.12
Task Time^2		-.16		.03		-.07
R^2	.07	.09	.14**	.14**	.09	.09
ΔR^2	.00	.02	.00	.00	.01	.00

Note. ADT = Academic Diligence Task; self-control variables (i.e., productivity and task time) were added to the regression equation after controlling for gender, school, and ethnicity; ΔR^2 denotes self-control variables over and above controls (and self-control main effects for squared terms)

Bonferroni corrected p-values:

* p < .003;

** p < .0006

Table 7

Standardized regression coefficients of Self-Control variables on SWB from Study 5 (*n* = 320)

	Positive Affect				Negative Affect			
	Self Report		DRM		Self Report		DRM	
	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$	$\beta_{Step\ 1}$	$\beta_{Step\ 2}$
SC	.34**	.33**	.11	.11	-.48**	-.47**	-.37**	-.37**
SC^2		.06		.04		-.06		.03
R^2	.16**	.17**	.08*	.08*	.32**	.33**	.23**	.23**
ΔR^2	.11**	.01	.01	.00	.22**	.01	.13**	.00
IMP	-.25**	-.24**	-.09	-.09	.32**	.32**	.28**	.28**
IMP^2		.02		-.03		-.02		-.03
R^2	.11**	.11**	.08*	.08*	.20**	.20**	.18**	.18**
ΔR^2	.06**	.00	.01	.00	.10**	.00	.08**	.00
DOG	.15	.15	.11	.11	-.26**	-.28**	-.24**	-.25**
DOG^2		.04		.01		-.10		-.05
R^2	.07	.07	.08*	.08*	.17**	.18**	.16**	.16**
ΔR^2	.02	.00	.01	.00	.07**	.01	.06**	.00
ADOG	.31**	.31**	.09	.09	-.26**	-.26**	-.24**	-.24**
$ADOG^2$		.11		.06		-.06		.03
R^2	.14**	.15**	.08*	.08*	.17**	.17**	.15**	.15**
ΔR^2	.09**	.01	.01	.00	.07**	.00	.05**	.00

Note. DRM = Day Reconstruction Method; SC = Self-Control; IMP = Impulsivity; DOG = Delay of Gratification; ADOG = Academic Delay of Gratification; Self-Control variables were added to the regression equation after controlling for gender, age, and ethnicity; ΔR^2 denotes self-control variables over and above controls (and self-control main effects for squared terms)

Bonferroni corrected p-values:

* p < .003;

** p < .0006

Table 8

Multilevel Models for testing the effects of self-control successes on momentary affective well-being from Study 6

		Momentary Affective Well-Being	
Fixed Effects		**Step 1**	**Step 2**
Level 2	$\overline{SCS}_j$ (γ_{01})	.08	.13**
	$\overline{SCS}_j^2$ (γ_{02})		.04
Level 1	$\left(SCS_{ij} - \overline{SCS}_j\right)$ (γ_{10})	.07**	.11**
	$\left[SCS_{ij} - \overline{SCS}_j\right]^2$ (γ_{20})		.03**
Variance Components			
Intercept Variance		.34	.34
SCS Slope Variance		.02	.02
R^{2a}		.24**	.24**
ΔR^{2a}		.05	.00

Note. n = 205 subjects (Level 2), n = 3192 events (Level 1), SCS = Self-Control Successes; self-control successes variables ($\overline{SCS}_j$; $\left(SCS_{ij} - \overline{SCS}_j\right)$) were added to the model after controlling for gender, age, nationality and personality; ΔR^2 denotes self-control variables over and above controls (and self-control main effects for squared terms)

[a] R^2 the conditional R^2, which explains the proportion of variance explained by random and fixed factors

* p < .05;

** p < .01