Higher Trait Self-Control Is Associated with Less Intense Visceral States

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Abstract

Trait self-control correlates with desirable outcomes including physical and psychological well-being and is thought to facilitate the formation of effective habits. Visceral states, including internal drives that motivate specific behaviors, have been found to undermine self-control. The current study tested the hypothesis that individuals higher in trait self-control experience less intense and a lower likelihood of visceral states and explored possible mediators. We found that trait self-control negatively correlates with responses to one-shot measures of hunger, fatigue, experiencing stress, and experiencing the common cold. Reports of recent sleeping and eating behavior mediated some of these relationships, consistent with the idea that healthful behaviors help individuals higher in trait self-control minimize visceral states. This research supports emerging perspectives on trait self-control's contributions to positive outcomes.

Keywords: trait self-control, visceral states, health behaviors

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Trait self-control has been linked to numerous positive outcomes, including better academic achievement, more satisfying interpersonal relationships, less crime and drug use, and less aggressive behavior (DeWall, Finkel, & Denson, 2011; Packer, Best, Day, & Wood, 2009; Tangney, Baumeister, & Boone, 2004). It is commonly assumed that the benefits of high trait self-control result from greater willpower, or inner resources for overriding predominant response tendencies, but this assumption increasingly appears to be incorrect. Rather, accumulating evidence suggests that high trait self-control contributes to desirable outcomes by facilitating healthy habits and enabling individuals to avoid temptations rather than by overcoming temptation with effortful control (e.g., de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Galla & Duckworth, 2015; Hofmann, Baumeister, Förster, & Vohs, 2012; cf. Schmeichel & Zell, 2007). We sought to extend research on trait self-control by examining the relationship between trait self-control and the experience of visceral states.

Visceral states refer to motivated states, including drives such as hunger and thirst, that motivate specific behaviors (Loewenstein, 1996). Visceral states often undermine the pursuit of long-term goals. For example, the experience of hunger may motivate individuals to break their diets, and more generally hunger has been found to undermine success at several forms of self-control both in the laboratory and in the field (Gailliot, 2013; Salmon, Fennis, de Ridder, Adriaanse, & de Vet, 2014). Sleep deprivation (i.e., fatigue) has also been found to undermine self-control, such as by increasing caloric intake and leading individuals to neglect health- and weight-control reasons for choosing foods to eat (Nedeltcheva et al., 2009; Wells & Cruess, 2006). Experiencing acute stress has also been found to undermine self-control, leading individuals to choose tastier and less healthy items (Maier, Makwana, & Hare, 2015). Minor

illnesses such as the common cold may also be associated with visceral states, including malaise, fatigue, and pain. These aversive states are thought to cause persons to prioritize momentary needs over long-term goals (Loewenstein, 1996).¹

Given that trait self-control promotes the formation of effective habits and otherwise contributes to desirable outcomes, and given that visceral states can undermine success at self-control and long-term goal pursuit, we hypothesized that individuals higher in trait self-control experience less intense hunger and fatigue and lower likelihood of cold and stress. Further, we explored the possibility that trait self-control predicts good behavioral habits, specifically behaviors related to eating and sleeping, which in turn may help to explain reduced visceral states. Evidence for mediation would support the view that trait self-control contributes to positive outcomes (i.e., less intense visceral states) in part by fostering more healthful behaviors.

Prior Evidence that Trait Self-Control Relates to Visceral States

A handful of prior studies have considered relationships between trait self-control, as assessed by Tangney et al.'s (2004) Trait Self-Control Scale (TSC), and visceral states. For example, some research found no relationship between trait self-control and self-reported average sleep duration (Barber, Grawitch, & Munz, 2013), though other studies have found significant (but weak) relationships between trait self-control and reports of average sleep duration and frequency of experiencing fatigue (Kroese, de Ridder, Evers, & Adriaanse, 2014; Kroese, Evers, Adriaanse, & de Ridder, 2016). Additionally, research has found a small negative correlation between trait self-control and reports of acute physical symptoms such as sore throat and sneezing (Boals, vanDellen, & Banks, 2011). Perhaps the most studied visceral state-related variable in relation to trait self-control is stress. Some research has found a moderate negative correlation between trait self-control and perceived stress or psychological strain (Barber,

Grawitch, & Munz, 2013; Boals et al., 2011), whereas other research has found small or null relationships (Barber & Munz, 2011; Hofmann et al., 2014). All told, prior research hints at small negative relationships between trait self-control and a variety of different visceral states.

Trait self-control may negatively relate to the experience of visceral states for at least three reasons. First, individuals higher in trait self-control may be more adept at avoiding the experience of visceral states by better managing their behavior (e.g., through healthy habits; Hofmann, Baumeister, Förster, & Vohs, 2012). For example, individuals higher in trait self-control may avoid hunger by dutifully planning their meals and engaging in regular snacking behavior that may forestall hunger pangs. Second, individuals who experience more intense visceral states may report having lower trait self-control as a consequence of routinely experiencing (and perhaps indulging) strong drive states. Finally, some third variable(s) may account for the relationship between trait self-control and visceral states. In the current study, we favored the first possibility (i.e., that individuals higher in trait self-control better manage their behavior to avoid visceral states) and extended beyond previous research by examining many visceral states in a very large sample of participants.

The Current Study

Consistent with emerging norms and recommended practices in psychological science (e.g., van 't Veer & Giner-Sorolla, 2016), we [preregistered](#) our primary hypotheses prior to data analysis, and in the results reported below we clearly differentiate between confirmatory and exploratory analyses. Given previous research finding small relationships between trait self-control and the experience of visceral states and behaviors associated with the regulation of visceral states (e.g., Hofmann et al., 2014; Kroese et al., 2014; Kroese et al., 2016), we expected to observe small effects of trait self-control. We thus combined several studies to create one large

sample that afforded over 99% power to detect small relationships ($r = .10$). Specifically, we combined all studies completed in our laboratory across a five-year span that fulfilled two criteria: a) included the TSC measure (Tangney et al., 2004) and b) included a set of questions assessing the experience of visceral states and visceral-state-related behaviors (e.g., “How hungry are you right now?”, “How many hours of sleep did you get last night?”). The aggregated studies yielded a nonbiased estimate of the relationships between trait self-control and the experience of the visceral states.

Method

Participants

The final sample included responses from $N = 5598$ undergraduate students (after exclusions, see below). Most of the students were female (3591 women, 1977 men; 30 provided no response). The mean age was 18.93 years old ($SD = 1.36$). The racial composition of the sample was as follows: Caucasian (58.7% of the sample), White Hispanic or Latino (17.5%), Asian (6.6%), and Black/African American (5.7%), and other categories (6.8%); 4.7% of the sample did not report their race.

Materials and Procedure

Extant data were compiled from studies conducted by our laboratory between the years 2011-2016. Data were collected in a variety of settings including laboratory-based studies ($n = 16$), classroom-based studies ($n = 2$), and online studies ($n = 7$). We combined data from all studies over that timespan ($N = 25$) that included the TSC measure (Tangney et al., 2004) and questions about participants' current visceral states.²³

The brief (13-item) version of the TSC includes items such as “I have a hard time breaking bad habits” (reverse-scored) and “I am able to work effectively toward long-term

goals.” Participants responded to items using a scale from 1 = *Not at all* to 5 = *Very much*. The internal consistency of the scale was acceptable and in line with previous research (Cronbach’s $\alpha = .84$, as compared to α s = .83 and .85 in Tangney et al., 2004).

The visceral states questions assessed current hunger, fatigue, stress, and presence of minor illness. Specifically, participants reported how hungry they were from 1 = *not hungry* to 7 = *hungry* and how tired they were from 1 = *not tired* to 7 = *tired*. Participants also reported whether or not they had experienced extreme stress that day (*Yes* or *No*) and if they were currently experiencing a cold (*Yes* or *No*). We also asked participants to report the amount of time since they had last eaten and how much sleep they had obtained the previous night. Data supporting the findings of this study can be [found](#) on the Open Science Framework (Baldwin, Schmeichel, Garrison, Finley, & Crowell, 2018).

As delineated in our preregistration document, for exploratory purposes we also included responses on the Approach Avoidance Temperament Questionnaire (Elliot & Thrash, 2010) and the BIS/BAS Scales (Carver & White, 1994) if they were also administered in the relevant studies. These variables are not the focus of the current research question so they are not reported here.⁴

Results

We identified univariate outliers (i.e., scores greater than 3 *SDs* from the sample mean) and excluded them from analyses. Specifically, we excluded outliers on TSC scores ($n = 5$) from all analyses. We also excluded outliers on hours since last eaten ($n = 65$) and hours of sleep ($n = 56$) from analyses including these variables. The dataset included no outliers on hunger or fatigue. A total of 7 studies did not include a question asking participants if they were currently experiencing a cold. Further, participants occasionally skipped items, and we deleted responses

that appeared to be entered incorrectly or were otherwise nonsensical (e.g., responses that included two or more numbers when only one number was required; < 1% of all responses). For these reasons degrees of freedom vary across tests reported below.

We began by assessing the correlations between trait self-control and the visceral states. Then we assessed the relationships between trait self-control and reported eating and sleeping behavior, respectively, before exploring the extent to which reported eating and sleeping behaviors mediated the relationship between trait self-control and the visceral states. We then repeated these analyses controlling for time of day and time of semester. Lastly, we explored the extent to which sex of participant correlated with our outcome variables and moderated the relationships between visceral states and trait self-control. The results regarding participant sex, which do not change the major conclusions of this work, are presented in the Supplemental Materials.

Correlations between Trait Self-Control and the Visceral States

Table 1 includes descriptive statistics of the major variables and the correlations among them. To illustrate the experience of visceral states at high and low levels of trait self-control, Table 2 depicts predicted values at low ($-1.5 SD$) and high ($+1.5 SD$) levels of trait self-control calculated from the regression equations relating each variable to trait self-control scores.

Trait self-control was negatively related to self-reported hunger, $r(5583) = -.05, p < .001$, 95% CI $[-.08, -.02]$, and fatigue, $r(5584) = -.09, p < .001$, 95% CI $[-.12, -.06]$. Further, point-biserial correlations indicated that trait self-control was negatively related to currently experiencing the common cold, $r(3539) = -.04, p = .008$, 95% CI $[-.07, -.01]$, and to having experienced stress earlier that day, $r(5578) = -.06, p < .001$, 95% CI $[-.09, -.03]$. These results support our hypothesis that trait self-control is associated with less intense (hunger and fatigue)

(Table 1 about here)

(Table 2 about here)

We reasoned that the time of day students participated in a study could influence hunger and fatigue, so we explored the relationships between time of day and trait self-control and the visceral states variables, respectively. Time of day was not correlated with trait self-control, $r(5570) = -.01, p > .250$, nor with subjective fatigue, $r(5558) = -.01, p > .250$. However, time of day was correlated with hunger, $r(5557) = -.04, p = .001$, such that students who participated later in the day were less hungry. Point-biserial correlations indicated that time of day also correlated with having experienced stress that day, $r(5558) = .11, p < .001$, such that participants later in the day were more likely to have reported having experienced stress. Time of day did not relate to experiencing the common cold, $r(3521) = -.001, p > .250$.

Further, we explored relationships between the time of semester students participated in the study and trait self-control and the visceral states variables, respectively. Specifically, we explored the relationships between time of the semester during which students participated (scaled from 1 = *first month of the semester* to 5 = *last month of the semester*), excluding summer participants due to varying summer course lengths, with trait self-control and the visceral states variables. Time of semester correlated with trait self-control, $r(5476) = -.07, p < .001$, such that participants higher in trait self-control participated in studies earlier in the semester. Time of semester also correlated with hunger, $r(5463) = .04, p = .001$, and fatigue, $r(5465) = -.04, p = .01$; participants tended to experience more hunger and less fatigue later in the semester. Time of semester did not correlate with experiencing a cold, $r(3421) = .01, p > .250$, but it did correlate with having experienced stress that day, $r(5459) = -.07, p < .001$, such that participants

were less likely to report having experienced extreme stress later in the semester.

Given the correlations involving time of day and time of semester, we conducted additional analyses to test our core hypothesis controlling for these variables. When controlling for time of day and time of semester, trait self-control continued to correlate both with hunger, $r(5452) = -.05, p = .001, 95\% \text{ CI } [-.08, -.02]$, and with fatigue, $r(5452) = -.10, p < .001, 95\% \text{ CI } [-.13, -.07]$. Point-biserial correlations indicated that trait self-control also continued to correlate with experiencing the common cold, $r(3415) = -.04, p = .011, 95\% \text{ CI } [-.07, -.01]$, and with having experienced stress that day, $r(5452) = -.06, p < .001, 95\% \text{ CI } [-.09, -.03]$. In sum, individuals higher in trait self-control felt less hungry and less fatigued and were less likely to experience colds and stress throughout the day and semester.

Correlations between Trait Self-Control and Reported Health Behaviors

As seen in Table 1, trait self-control was positively related to the number of hours of sleep participants reported getting the night before the study, and negatively related to time since last eaten. Thus, consistent with our predictions, individuals higher in trait self-control ate more recently and obtained more sleep the previous night than did individuals lower in trait self-control.

We also explored relationships between the health behaviors and time of day and time of semester, respectively. Time of day correlated with both hours since participants last ate, $r(5472) = -.14, p < .001$, and hours of sleep the night before, $r(5473) = .04, p = .001$, such that those who participated later in the day ate more recently prior to the study and obtained more sleep the previous night. Time of semester correlated with time since last eaten, $r(5377) = .10, p < .001$, and hours of sleep, $r(5381) = -.05, p = .001$, suggesting that later in the semester participants ate more recently prior to the study and obtained less sleep the previous night. We

then calculated partial correlations between trait self-control and health behaviors controlling for time of day and time of semester. Trait self-control continued to correlate with both the number of hours since participants last ate, $r(5371) = -.04, p = .001, 95\% \text{ CI } [-.07, -.01]$ and hours of sleep obtained the previous night, $r(5375) = .06, p < .001, 95\% \text{ CI } [.03, .09]$. Hence, throughout the day and semester, individuals higher in trait self-control consumed food closer in time to their studies and got more sleep prior to their studies.

Exploratory Mediation Analyses

Insofar as trait self-control contributes to more healthful behavioral habits, we would expect the relationship between trait self-control and hunger to be mediated by time since participants last ate. We used the PROCESS macro (version 2.16.1, Hayes, 2013) in SPSS (Model 4) with 5,000 bootstrap iterations to explore this mediation hypothesis. As seen in Figure 1, trait self-control had a direct effect on hunger, $c = -.13, 95\% \text{ CI } [-.21, -.06]$, and an indirect effect on hunger through hours since last eaten, $ab = -.06, 95\% \text{ CI } [-.10, -.03]$. When controlling for time since last eaten, the relationship between trait self-control and hunger became non-significant, $c' = -.07, 95\% \text{ CI } [-.14, .0002]$. These results suggest that hours since last eaten substantially explains the negative relationship between trait self-control and hunger.

When controlling for time of day and time of semester, trait self-control continued to have a direct effect on hunger, $c = -.13, 95\% \text{ CI } [-.21, -.05]$, and an indirect effect through hours since last eaten, $ab = -.06, 95\% \text{ CI } [-.09, -.03]$. Thus, individuals higher in trait self-control reported less hunger, and having eaten more recently prior to participating in the study mediated this relationship.

We also explored the indirect effect of trait self-control on fatigue through hours of sleep. As seen in Figure 2, trait self-control had a direct effect on fatigue, $c = -.23, 95\% \text{ CI } [-.30, -.17]$,

and an indirect effect on fatigue through hours of sleep, $ab = -.06$, 95% CI $[-.08, -.03]$. The relationship between trait self-control and fatigue remained significant when hours of sleep was taken into account, $c' = -.18$, 95% CI $[-.24, -.12]$. Further, when controlling for time of day and semester, trait self-control still had a direct effect on fatigue, $c = -.24$, 95% CI $[-.31, -.17]$, and an indirect effect through hours of sleep, $ab = -.06$, 95% CI $[-.08, -.03]$. Thus, more sleep helped to account for some but not all of the reduced levels of fatigue among individuals with higher trait self-control.

Discussion

Visceral states such as hunger, stress, and fatigue are known to undermine success at self-control (Loewenstein, 1996). The current study found that individuals higher in trait self-control experience less intense and lower presence of visceral states. More specifically, higher trait self-control was associated with lower levels of hunger and fatigue and lower prevalence of the common cold and extreme stress. Moreover, these relationships remained when we controlled for time of day and time of semester at which the variables were measured. Hence, higher trait self-control reliably correlates with lower intensity and lower presence of several visceral states.

We also found that higher trait self-control correlates with having eaten more recently and having slept more the previous night. These findings fit with prior evidence that individuals higher in trait self-control adopt healthy habits (e.g., Galla & Duckworth, 2015). We then explored the hypothesis that those health-related behaviors mediate the relationships between trait self-control and their associated visceral states. They did. Trait self-control was associated with lower hunger in part because participants higher in trait self-control ate more recently. And trait self-control was associated with less fatigue in part because participants higher in trait self-control tended to sleep more the previous night. These findings are consistent with the idea that

trait self-control facilitates more healthful behaviors that mitigate the experience of visceral states.

Implications

The current findings extend research on trait self-control in several ways. First, we found evidence that trait self-control is associated with reports of the common cold, suggesting that individuals high in trait self-control may be less likely to report minor illness at a single time point. We also found that individuals high in trait self-control were less likely to report having experienced extreme stress. These results support prior evidence that individuals high in trait self-control experience fewer acute physical symptoms and report lower levels of perceived stress (Boals et al., 2011). They are also consistent with prior findings that high trait self-control facilitates structuring one's life in order to avoid negative consequences (Gillebaart & de Ridder, 2015; Hofmann et al., 2012). The current findings also extend research examining relationships between trait self-control and fatigue. Prior studies have found that individuals high in trait self-control experience daytime fatigue on fewer days (Kroese et al., 2014; Kroese et al., 2016). Similarly, we found that individuals higher in trait self-control reported less fatigue upon arriving at the laboratory to participate in our studies.

The current findings add to research on trait self-control also by linking subjective states and behavior. Prior studies have found that individuals lower in trait self-control sleep less relative to individuals higher in trait self-control (Kroese et al., 2014; Kroese et al., 2016). Likewise, we found that individuals lower in trait self-control tended to obtain less sleep, and further we observed that sleep mediates the relationship between trait self-control and the experience of fatigue. Thus, individuals higher in trait self-control likely behaved in a way that helped to minimize fatigue—they likely got more sleep. This is important because fatigue is

known to undermine task performance and goal achievement (e.g., Perkinson-Gloor, Lemola, & Grob, 2013). The association between trait self-control and sleep may thus play a role in other positive outcomes beyond the subjective experience of fatigue, although more research is needed to verify this possibility.

We found a similar pattern regarding hunger and eating behaviors. Individuals lower in trait self-control tended to experience more hunger partly because they had not eaten as recently as individuals higher in trait self-control. This finding suggests that high trait self-control may facilitate more regular food consumption, leading to less hunger. Prior research has found that individuals higher in trait self-control have weaker desires for unhealthy foods and consume them less (Adriaanse, Kroese, Gillebaart, de Ridder, 2014; Haynes, Kemps, & Moffitt, 2016), so we speculate that the more recent eating reported in the current study among individuals higher in trait self-control involved relatively healthy foods. It may also be that more regular food consumption among those higher in trait self-control reduces desire for unhealthy foods in part by reducing hunger. Insofar as hunger influences self-control and rational decision making (e.g., Anderberg et al., 2016; de Ridder, Kroese, Adriaanse, & Evers, 2014), the association between trait self-control and food consumption may carry consequences beyond a reduction in hunger, although additional research is needed to test this hypothesis. On the basis of the current findings we can conclude that students higher in trait self-control report sleeping and eating behaviors that correlate with less intense visceral states.

The relationships between trait self-control and visceral states in the current study were consistently negative, and this pattern held across each and every visceral state we measured. Therefore, the effects of trait self-control generalize across several visceral states. It may be worthwhile to consider the impact of visceral states when assessing other consequences of trait

self-control. Given that individuals high in trait self-control tend to experience less intense visceral states, and given that visceral states influence behaviors in a number of domains such as controlling prejudice (e.g., Gailliot, 2013) and selecting foods to eat (e.g., Wells & Cruess, 2006), it may be the case that trait self-control predicts downstream consequences on behavior by reducing visceral states. For example, individuals with higher trait self-control may experience less intense visceral states, which in turn may improve performance in a number of domains.

Limitations

The correlations observed in the current study were small, with the largest trait self-control-visceral state relationship being $r = -.09$. The statistical significance of small correlations is determined by sample size, and the current study featured a very large sample. But these associations were predicted in advance, they were consistent across all the visceral states variables we measured, and the relationships were robust to variations in time of day and time in the semester. Further, we assessed the visceral states in single-item snapshots taken essentially at random points in participants' lives. Given that numerous factors contribute to feelings of fatigue and hunger and to experiencing stress and minor illness, it is perhaps not surprising that the trait self-control effects were small. Indeed, prior research had led us to expect small correlations. But even small effects may add up to have larger impacts over time. Consider, in Table 2, the predicted values of hours of sleep for individuals higher versus lower in trait self-control. On any given night we would expect a person low in trait self-control to sleep about 20 minutes less than a person high in trait self-control. Over the span of a week, this adds up to a two-hour difference in sleep duration—an accumulation of sleep debt that may have consequences for health and behavior (e.g., Banks & Dinges, 2007).

Given the possible accumulation of consequences associated with individual differences in trait self-control, one crucial direction for future research is to consider more extended time spans by repeatedly assessing visceral states over time. Such longitudinal research would further elucidate the relationships between trait self-control and the experience of visceral states and beyond. Relatedly, future research could investigate the consequences of regularly experiencing stronger versus weaker visceral states. Although the observed relationships in the current research were small, it may be that the influences of visceral states on behavior also accumulate over time. This accumulation could ultimately result in larger effects of visceral states on behavior, health, performance, and psychological well-being.

The current study was correlational and cross-sectional in nature, which limits any causal conclusions we can draw from the findings. We have focused on the influence of trait self-control on visceral states, but we cannot rule out the possibility that differences in visceral states influence responding on the trait self-control scale. For example, it may be that individuals infer from experiencing more intense visceral states that they have low trait self-control. Nor can we rule out the possibility that some unmeasured third variable drives the observed relationships between trait self-control and the visceral states. However, aspects of our analyses hint at the view that trait self-control influences visceral states rather than the reverse. For example, we found that behaviors associated with the regulation of visceral states mediate the relationships between trait self-control and the intensity of visceral states across the day and the semester, and this pattern is consistent with prior evidence that trait self-control influences health behaviors. And other evidence converges with current findings to suggest that trait self-control influences visceral states rather than the reverse. For example, one study found that visceral states have no impact on responses to some self-control-related scales (Bartholdy, Cheng, Schmidt, Campbell,

& O'Daly, 2016). Still, we cannot definitively say that trait self-control drives these relationships.

Longitudinal studies that involve an intervention to increase self-control would help to test the causal relationships between trait self-control and visceral states.

The current study and results relied on participants' self-reports, which may be problematic insofar as individuals are poor or unwilling reporters of their traits and states. And we would expect the constructs we measured to share common method variance, which could have inflated the correlations we observed. Further, the self-control measure (i.e., the TSC) may elicit socially desirable responding—previous research has found a moderate positive relationship between trait self-control and social desirability (Tangney et al., 2004)—but it is less clear to what extent social desirability impacts responses to the visceral states questions. Additionally, participants responded to a variety of question and response formats, including Likert scales, yes/no response, and free response, and participants completed studies across different research settings (i.e., in the laboratory, in the classroom, and online), further reducing concerns about inflated correlations due to common method variance. One other limitation is that the current study sampled primarily first-year college students, so the extent to which the findings generalize to older individuals and non-college student populations remains unknown. Future research should test older and more diverse communities to establish the generalizability of the current findings.

Conclusion

Perspectives on trait self-control have begun to shift away from a focus on effortful self-control to include more automatic or habitual behaviors in domains such as eating and sleeping (e.g., avoiding unhealthy foods and bedtime procrastination). However, prior research has not directly assessed the relationships between trait self-control and the subjective experience of

visceral states. The current research found that trait self-control is negatively associated with the presence and intensity of several visceral states, and exploratory analyses suggested that sleep- and eating-related behaviors mediate some of the relationships. Trait self-control thus is associated with health-related behaviors that have protective effects against adverse subjective experiences including hunger, fatigue, stress, and minor illness.

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Table 1

Intercorrelations among Trait Self-Control, Visceral States, and Health Behaviors

	1	2	3	4	5	6	7
1. Trait Self-Control	-	-.05**	-.09**	-.04**	-.06**	-.05**	.06**
2. Hunger		-	.13**	.02	-.02	.45**	-.04**
3. Fatigue			-	.10**	.21**	-.002	-.37**
4. Cold				-	.02	.03	-.02
5. Stress					-	-.07**	-.13**
6. Hours Since Last Ate						-	.03*
7. Hours Sleep							-
Mean	3.20	3.11	3.70	11.6%	33.0%	4.10	6.85
SD	0.65	1.89	1.65	88.4%	67.0%	4.02	1.65

Note. Values for cold and stress in the Mean and *SD* rows are reported as the percentage of answers that were “yes” and “no,” respectively. * $p < .05$, ** $p < .01$.

Table 2

Predicted Values of Visceral States and Health Behaviors at High and Low TSC

Variable	Low TSC 1.5 <i>SD</i> below mean	High TSC 1.5 <i>SD</i> above mean	Predicted Value at Low TSC	Predicted Value at High TSC
TSC	2.23	4.18	--	--
Hunger	--	--	3.25	2.97
Fatigue	--	--	3.93	3.47
Last Ate (Hr)	--	--	4.40 (4 hr 24 min)	3.81 (3 hr 49 min)
Sleep (Hr)	--	--	6.70 (6 hr 42 min)	7.00 (7 hr)

Note. Response scale for TSC: 1 – 5. Response scale for hunger and fatigue scales: 1 – 7.

Participants gave free responses to the last ate and sleep items.

Figure 1. Unstandardized regression coefficients for the relationship between trait self-control and hunger as mediated by hours since participants last ate. As reported in the text, the relationships remained statistically significant when controlling for time of day and time of semester. The total effect of trait self-control on hunger is reported in parenthesis. $*p < .01$.

Figure 2. Unstandardized regression coefficients for the relationship between trait self-control and fatigue as mediated by hours of sleep the previous night. As reported in the text, the relationships remained statistically significant when controlling for time of day and time of semester. The total effect of trait self-control on fatigue is reported in parenthesis. $*p < .01$.

¹ Hunger and fatigue are widely regarded as visceral states that motivate specific behaviors. For the current study we also considered stress and the common cold to be visceral states, though skeptics may suggest that stress and the common cold are not visceral states in the classical sense (i.e., states that motivate specific behaviors). We maintain that, at the least, stress and the common cold are associated with visceral states and we refer to them as visceral states throughout this article.

² In approximately half of these studies participants completed the TSC scale prior to reporting their visceral states ($K = 12$).

³ In a majority of these studies participants completed the visceral states questions prior to any experimental manipulations ($K = 16$) and the trait self-control scale after experimental manipulations ($K = 14$).

⁴ Findings are available upon request.