

Knowledge of the Self-Control Benefits of High-Level Versus Low-Level Construal

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Research indicates that inducing high-level construal (processing that highlights invariant, essential features) relative to low-level construal (processing that highlights idiosyncratic, peripheral features) promotes self-control (Fujita & Carnevale, 2012). In the present work, we investigate to what extent people recognize the self-control benefits of high-level construal, and explore the consequences of this knowledge. Studies 1 and 2 provide initial evidence that individuals are aware that high-level relative to low-level construal promotes self-control in the dieting domain. Studies 3 and 4 find that individual differences in this knowledge predict self-control success outcomes (i.e., body mass index) among those who are motivated by dieting goals. Examining academics as a domain of self-control, Study 5 demonstrates that those with higher knowledge of construal level's impact on self-control earned higher end-of-semester grades to the extent that they were motivated to do well academically. Theoretical and practical implications of these findings are discussed.

Keywords: construal level theory, delay-of-gratification, linguistic categorization model, self-control

Locally available rewards frequently tempt people to act in ways that undermine their global goals and values. The presentation of hot pizza, for example, frequently leads dieters to ignore their weight-loss goals. A weekday get-together of friends may lead undergraduates to socialize rather than study. An impulsive shopper may struggle to resist the allure of a new pair of shoes in favor of saving for retirement. Every choice to resist the pizza, study rather than socialize, and save rather than spend requires self-control. Self-control dilemmas are motivational conflicts that pit global versus local motivational concerns (e.g., Ainslie, 1975; Baumeister & Heatherton, 1996; Fujita, 2011; Metcalfe & Mischel, 1999; Mischel, Shoda, & Rodriguez, 1989; Rachlin, 1995).

Successful self-control requires advancing the global over local concern. Successful dieters, for example, must prioritize their broader weight-loss concerns over the narrower desire to eat this pizza. Everyday self-control decisions like this can meaningfully impact health and life outcomes. Successful self-control is associated with enhanced mental and physical health, superior academic achievement, reduced delinquency, and healthier social relationships (e.g., Duckworth & Seligman, 2005; Moffitt et al., 2011; Tangney, Baumeister, & Boone, 2004). Spurred by the benefits and costs associated with self-control success and failure, respectively, researchers have sought to develop a clearer understanding of why some individuals succeed, whereas others stumble, in living up to their global goals and values.

Mischel and Mischel (1983) suggested that one critical factor in self-control is individuals' knowledge of what thought processes promote versus impair self-control. They demonstrated, for example, that younger children mistakenly believe that exposure to temptations and thinking about consumption enhances self-control. Older children, by contrast, correctly understand that occluding temptations and thinking about the nonappetitive features of stimuli promotes self-control. These knowledge differences predict age-related differences in children's delay-of-gratification (Mischel & Mischel, 1983), and individual differences in self-control among children with behavioral problems (Rodriguez, Mischel, & Shoda, 1989). Thus, knowledge of the processes that promote versus impair self-control may be an important antecedent to self-control success.

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Although the Mischel and Mischel (1983) findings have been very influential, what is surprising is how little attention subsequent work has paid to what people understand to be good versus bad for self-control. Research has illuminated a number of psychological factors that enhance or impair self-control including states of ego-depletion (e.g., Hagger, Wood, Stiff, & Chatzisarantis, 2010; Muraven & Baumeister, 2000), implementation intentions (e.g., Gollwitzer & Sheeran, 2006; Webb & Sheeran, 2003), cognitive load and working memory capacity (e.g., Hofmann, Schmeichel, & Baddeley, 2012), affect (e.g., Giner-Sorolla, 2001; Tice, Bratslavsky, & Baumeister, 2001), mindfulness (Papies, Barsalou, & Custers, 2012), distancing strategies (e.g., Ayduk & Kross, 2010), and construal level (Fujita, 2008; Fujita & Carnevale, 2012). Despite this extensive literature on what is beneficial versus detrimental to self-control, it is less clear to what extent people recognize these as sources of success versus failure (cf., Job, Dweck, & Walton, 2010).

In the present work, we address this apparent oversight in two ways. First, we examine whether individual differences in knowledge of self-control strategies extend beyond children with self-regulatory issues. Past research has focused on this group for which one might expect strategy knowledge to be especially impactful, as a lack of such knowledge may help to account for their relatively high frequency of behavior problems and general impulsiveness (Rodriguez et al., 1989). It remains an open question, however, whether knowledge plays a similar role in adults and in individuals without clear self-regulatory concerns. Relatively high functioning individuals may be more likely to know the appropriate strategies, such that any self-control failures they experience may stem from temporary or situationally constrained disruptions to strategy use rather than from a lack of knowledge. Alternatively, strategy knowledge may vary widely in general, and knowledge differences might thus predict self-control success versus failure even among adults without obvious self-regulatory difficulties.

Second, we focus specifically on knowledge of high-level construal (vs. low-level) as a critical psychological process that promotes self-control. Research suggests that high-level relative to low-level construal enhances self-control (Fujita, 2008; Fujita & Carnevale, 2012). We extend this work by examining the hypothesis that people recognize this, and that individual differences in this knowledge predict meaningful self-control outcomes.

Construal Level Theory

Construal level theory (CLT) explains how people think about events that are removed from direct experience; that is, those that are psychologically distant (e.g., Liberman & Trope, 2014; Trope & Liberman, 2010). When people directly experience an event, they can easily perceive detailed information about it. A challenge people must overcome is that specific details about psychologically distant events are typically unknown or subject to change. With increasing psychological distance, people must instead represent events based on information in memory.

To achieve this, CLT suggests that people engage in high-level construal—a representational process that highlights the abstract and essential elements of events while ignoring concrete and surface-level details. This process is functional because the abstract and essential features of events tend to be invariant and unlikely to change. As events become more proximal, people engage in low-level construal—

a representational process that highlights the concrete and incidental features of events that render them unique. By highlighting salient distinctive detail, low-level construal allows people to tailor their decisions and actions to the idiosyncratic demands of immediate circumstances. Thus, whereas high-level construal affords the ability to think about remote content, low-level construal promotes immersion into the here-and-now.

Research supports the assertion that psychological distance (vs. proximity) evokes high-level (vs. low-level) construal (for reviews, see Liberman & Trope, 2014; Trope & Liberman, 2010). People, for example, are more likely to describe psychologically distant versus proximal events using abstract versus concrete language (e.g., Fujita, Henderson, Eng, Trope, & Liberman, 2006; Semin & Smith, 1999). People also tend to identify psychologically distant actions in terms of the abstract ends (i.e., “why” aspects) they achieve rather than concrete means by which to execute them (i.e., “how” aspects; Fujita, Trope, Liberman, & Levin-Sagi, 2006; Liberman & Trope, 1998). Thus, psychological distance appears to influence systematically how people construe events.

Critically, these changes in construal level impact people’s judgments and decisions (Fujita, Trope, & Liberman, 2016; Trope & Liberman, 2010). Most relevant to the current paper are findings that demonstrate that high-level (relative to low-level) construal highlights the value of more global rather than local concerns, thus enhancing self-control. Those concerned about their weight, for example, preferred apples over candy bars when engaged in high-level rather than low-level construal (Fujita & Han, 2009; see also Carnevale, Fujita, Han, & Amit, 2015). High-level (vs. low-level) construal has also prompted sun tanners to acknowledge their skin cancer risk and seek out ways to improve their skin health (Belding, Naufel, & Fujita, 2015) and increased physical activity among those with the goal to exercise more (Sweeney & Freitas, 2014). High-level relative to low-level construal, moreover, reduces the tendency to prefer smaller, immediate over larger, delayed monetary rewards (e.g., Fujita, Trope, Liberman & Levin-Sagi, 2006; Malkoc, Zauberman, & Bettman, 2010). These and other findings suggest that high-level (vs. low-level) construal enhances self-control (for review, see Fujita & Carnevale, 2012).

CLT offers a unique perspective on self-control, suggesting that abstract transcendence of the particulars of the here-and-now promotes self-control (e.g., Fujita & Carnevale, 2012). Other perspectives highlight the role of emotionality in the link between abstraction and self-control (e.g., Metcalfe & Mischel, 1999; Rodriguez et al., 1989). Rodriguez and colleagues (1989) suggest, for instance, that abstract (vs. concrete) ideation enhances self-control by promoting cognitive reflection over emotional impulsiveness. CLT, however, maintains that construal can function independently of emotionality (Fujita & Carnevale, 2012; Trope & Liberman, 2010). Epstude and Forster (2011), for example, demonstrated that high- and low-level construal need not vary in emotionality, finding instead that low-level construal is associated with concrete feelings of lust whereas high-level construal is linked to more abstract, but equally emotional feelings of love. Carnevale and colleagues (2015) further showed that the effects of construal level on self-control remained after controlling for the emotionality of participants’ representations. Therefore, although emotionality may drive some effects of abstraction on self-control, research

on CLT suggests that abstraction can also promote self-control through means unrelated to emotionality.

The Present Research

CLT suggests that self-control is challenging because the psychological proximity of immediately available temptations fosters low-level construal. Successful self-control requires overriding this tendency to construe psychologically proximal decisions in low-level terms, and to engage instead in high-level construal. In the present paper, we examine to what extent people recognize the self-control benefits of high-level construal, and whether individual differences in this knowledge predict self-control outcomes. Those who recognize the self-control benefits of high-level construal—relative to those who do not—may be more likely to engage in high-level construal when presented with a self-control dilemma, and may therefore be more likely to succeed.

The suggestion that people might recognize the benefits of high-level construal for self-control may strike some as odd, given that psychological science has only recently revealed the role of construal level in self-control. However, research also suggests that people often know more than they can articulate or explain—a phenomenon referred to as tacit knowledge (e.g., Reber, 1989; Sternberg & Wagner, 1993; Wagner & Sternberg, 1985). Tacit knowledge is procedural in nature and generally learned through experience. Although rarely taught directly and formally, tacit knowledge distinguishes experts from novices and predicts real-world differences in occupational and other performance outcomes (Wagner & Sternberg, 1985). Self-control—as a learned skill or type of expertise—may require the acquisition of such knowledge. Although we do not rule out the possibility that some particularly self-aware individuals might be able to articulate the role of construal level in self-control to others, we believe that this knowledge is likely to be tacit for two reasons. First, outside of the behavioral sciences and related applications, self-control is rarely formally studied and taught. As such, many people may lack the conceptual language with which to describe, discuss, and teach each other about the benefits of high-level construal for self-control. Second, as practical knowledge, people may know what they must personally do to be successful at self-control. Without knowledge about the experiences of others, however, they may find it difficult to generate spontaneously what the critical factors are that lead to success versus failure. That is, without a comparison standard, it may be difficult to understand (and thus articulate) why some succeed versus fail and where the “breakdowns” can occur. This does not, however, preclude people from being able to recognize critical issues when they see them—to the extent that any response differs from their own, they can pinpoint it as a potential source of variance. People may understand and recognize the value of high-level construal (vs. low-level) for self-control, but the absence of conceptual language and lack of comparison standards can make it difficult for them to spontaneously put this knowledge into words.¹

We present the results of five studies adopting a variety of indirect means of assessing this knowledge, thus bypassing the issues outlined above. Studies 1 and 2 explore to what extent people recognize that high-level (vs. low-level) construal is beneficial for self-control. Studies 3, 4, and 5 assess whether differences in this knowledge of high-level relative to low-level construal's benefits for self-control predict meaningful self-control outcomes. Note that CLT as a theoretical framework only affords

comparative or relative conclusions. Construal level is a continuous dimension, ranging from low to high. Representations can be formed at any point on this abstraction continuum. As such, the claim that high-level construal promotes self-control is essentially the same as the claim that low-level construal undermines it. In keeping with this framework, all of the predictions we make in the present work are comparative. Specifically, we propose that people know that high-level, relative to low-level, construal promotes self-control, and that relative differences in this knowledge will predict corresponding differences in outcomes.

Study 1

One common method of assessing tacit knowledge involves presenting scenarios and allowing respondents to demonstrate their knowledge by selecting the best response from a set of options to each hypothetical situation described (e.g., Wagner & Sternberg, 1985, 1987). Accordingly, Studies 1 through 3 assess tacit knowledge by asking participants to respond to hypothetical self-control scenarios. To test whether people understand that high-level relative to low-level construal promotes self-control, Study 1 asked participants to imagine confronting a self-control conflict (or not). Participants imagined being presented with cookies, a situation that provides a strong temptation to eat (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998). Half imagined having an eating restraint goal (self-control condition), whereas the other half imagined having an eating enjoyment goal (control condition). Participants were then presented with abstract (high-level) versus concrete (low-level) statements that described how they might construe the taste test, and rated to what extent each would promote their respective goals of eating restraint versus enjoyment. As eating cookies would threaten eating restraint goals, to the extent that people tacitly recognize the self-control benefits of high-level (vs. low-level) construal, those in the self-control (vs. control) condition should report that the more abstract (vs. concrete) construals of the taste test would promote their restraint (vs. enjoyment) goals.

Method

Research ethics statement. The Ohio State University's Institutional Review Board approved all research reported in this paper (Studies 1–4: #2008B0195, “Antecedents and consequences of subjective construal;” Study 5: #2011B0069, “Psychological predictors of academic achievement”).

Participants. One hundred forty-two participants were recruited from Amazon's Mechanical Turk platform (50 female;

¹ Tacit knowledge differs from implicit lay theories—people's beliefs about the nature of their social worlds—in two key ways. First, people are generally able to articulate their lay theories when directly queried. By contrast, tacit knowledge represents procedural knowledge: people may not be able to articulate what they know. Second, there is often ambiguity about the validity of implicit lay theories. For example, some believe that intelligence is malleable whereas others believe that it is fixed (Dweck & Leggett, 1988), and both sides can marshal evidence in favor of their position. Similarly, some believe self-control is limited whereas others do not (Job et al., 2010), a debate that empirical data has failed to resolve (e.g., Hirt et al., 2016). Tacit knowledge, on the other hand, reflects whether one has learned the procedures that are most appropriate or effective for a given task (Wagner & Sternberg, 1985, 1987). Thus, the notion of tacit knowledge takes as a given that some knowledge is more valid than others.

mean age = 28.79) and received 40 cents for completing the study. A power analysis ($1 - \beta = .80$), assuming a medium effect size, indicated a minimum N of 64 per cell. We thus targeted about 70 participants per cell. No data were analyzed until data collection ceased.

Materials and procedure. Participants completed the study online. Participants could complete the survey from any device with Internet access. Location was restricted to the United States. They first imagined taking part in a marketing research cookie taste test. They were to eat at least one cookie, but the total number eaten would be up to them. Materials described the cookies as a new product designed to maximize taste at the cost of being unhealthy with 370 calories and 15 g of fat per cookie. To manipulate whether this situation represented a self-control conflict or not, participants were then randomly assigned to one of two goal conditions. Half of the participants imagined being worried about eating too many cookies during the taste test and thus concerned about eating restraint (self-control condition), whereas the other half imagined being concerned about maximizing enjoyment during the taste test (control condition). To facilitate elaboration of the scenario, all participants were asked to write a few sentences about what thought processes or ways of thinking they should use to meet their goal.

Participants were then presented with various statements that described how they might construe the taste test. These statements contained language that varied in abstraction, modeled on the Linguistic Categorization Model (LCM; *Semin & Fiedler, 1988*). The LCM proposes words can be sorted into four linguistic categories, from the most concrete to the most abstract (in order: descriptive action verbs, interpretive action verbs, state verbs, and adjectives). We created descriptions of the taste test that preferentially used more concrete language—that is, descriptive action verbs (“I will be tasting some cookies”)—versus more abstract language—that is, state verbs and adjectives (e.g., “I will try to be discerning when considering the cookies;” see *Table 1* for a complete list of items). Participants indicated to what extent each description of the taste test would help them achieve their goal on a 7-point scale (1 = *not at all*; 7 = *very much*). Finally, participants completed demographic questions (e.g., age, gender, English proficiency) and were debriefed, thanked, and dismissed.

Results and Discussion

We excluded four participants who were not native speakers of English from all analyses, given that our construal level measure required sensitivity to subtle differences in language. Helpfulness

ratings were analyzed using a 2 (condition: self-control vs. control) \times 2 (statement type: low-level vs. high-level) repeated measures ANOVA with statement type as a within-subjects factor and condition as a between-subjects factor. There was a main effect of condition such that those who were assigned to imagine being concerned about enjoyment ($M = 5.54, SD = 1.13$) rated all of the statements as more helpful overall in reaching their goal than did those who imagined being concerned about restraint ($M = 5.11, SD = 1.03$), $F(1, 136) = 5.34, p = .022$; 95% CI [.06, .79], $d = .40$. There was also a main effect of statement type such that high-level statements ($M = 5.68, SD = 1.27$) were rated as more helpful than low-level statements ($M = 4.96, SD = 1.43$), $F(1, 136) = 29.90, p < .001$; 95% CI [-1.00, -.45], $d = .51$.

Critically, goal condition appeared to impact differentially helpfulness ratings of low and high-level statements, $F(1, 136) = 15.50, p < .001$ (see *Figure 1*). For those concerned with enjoyment, there were no significant differences in helpfulness ratings of low-level statements ($M = 5.43, SD = 1.33$) and high-level statements ($M = 5.63, SD = 1.40$), $t(66) = 1.05, p = .298$; 95% CI [-.57, .18], $d = .15$. Among those concerned with restraint, high-level statements ($M = 5.72, SD = 1.14$) were rated significantly as more helpful than were the low-level statements ($M = 4.51, SD = 1.39$), $t(70) = 6.86, p < .001$; 95% CI [-1.56, -.86], $d = .95$. Analyzing the data as a function of statement type, there was a significant difference in helpfulness ratings of low level statements across conditions such that those concerned about enjoyment ($M = 5.43, SD = 1.33$) rated low-level statements significantly as more helpful than did those concerned about restraint ($M = 4.51, SD = 1.39$), $t(136) = 4.04, p < .001$; 95% CI [.47, 1.39], $d = .68$. High-level statements were not rated as any more helpful by those concerned about enjoyment ($M = 5.63, SD = 1.40$) than those concerned about restraint ($M = 5.72, SD = 1.14$), $t(136) = .37, p = .712$, 95% CI [-.51, .35], $d = .07$. Collectively, these findings provide preliminary evidence that people can recognize the benefits of high-level relative to low-level construal for self-control.

Still, it is possible that the construal measure in Study 1 has confounds. For example, perhaps despite our efforts, the more concrete, low-level statements were perceived as more emotional than the more abstract, high-level statements, and this difference in emotionality rather than construal level produced these effects. Perhaps too the statements differed in descriptiveness, which may have led participants to systematically choose one over the other under different conditions.

To address these concerns, we recruited 36 participants from Amazon’s Mechanical Turk platform (16 female; mean age = 36.31), who received 50 cents for completing the study. We first described the market research taste test scenario to all participants. We then asked them to rate each of the statements used in Study 1 on how accurately they described the taste test and how emotional each statement was. Specifically they were asked, “To what extent do each of the following seem like accurate statements about the market research taste test?” and “How emotional are each of the following statements about the market research taste test?” Participants rated each statement on a 7-point scale (1 = *not at all accurate/not at all emotional*; 7 = *extremely accurate/extremely emotional*). Results indicated that there were no differences in accuracy ratings between the concrete statements and the abstract statements, $t(35) = .59, p = .558$; 95% CI [-0.43, 0.24],

Table 1
LCM-Based Taste Test Descriptions

Concrete descriptions	I will be crunching on cookies I will be tasting some cookies I will be eating cookies I will be rating cookies on a scale
Abstract descriptions	I need to evaluate the cookies conscientiously I will try to be thoughtful about the cookies I will try to be discerning when considering the cookies I will think carefully about the cookies

Note. LCM = Linguistic Categorization Model.

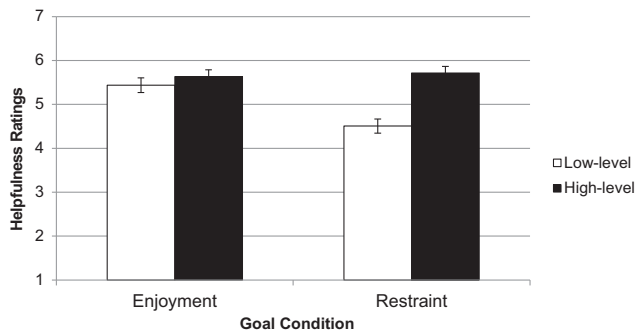


Figure 1. Interaction between goal condition and low-level versus high-level statement type predicting helpfulness ratings (Study 1). Error bars indicate standard error of the mean.

$d = .10$. Contrary to the claim that abstract relative to concrete statements might have been more emotional, it was the abstract statements that were rated as significantly more emotional ($M = 3.68$, $SD = 1.81$) relative to the concrete statements ($M = 3.14$, $SD = 1.85$), $t(35) = 2.36$, $p = .024$; 95% CI [0.07, 1.01], $d = .39$. Note this pattern of results is the opposite of what would be predicted from research suggesting that emotionality undermines self-control (e.g., Mischel et al., 1989; Rodriguez et al., 1989). Collectively, these results are inconsistent with the proposition that participants in Study 1 chose the more abstract statements because they believed they were more descriptive or less emotional than the concrete statements. These data thus bolster the argument that the effect demonstrated in Study 1 is specific to construal level.

Study 2

The most direct way to address concerns about potential confounds would be to replicate the results of Study 1 using a measure that is less open to alternative explanations. This was the goal of Study 2. In addition, Study 2 included a manipulation check to confirm that participants in the self-control condition indeed interpreted the hypothetical scenario as requiring more self-control than those in the control condition.

As in Study 1, participants were asked to imagine participating in a study in which they would be asked to consume cookies, and that they were concerned about restraint (self-control condition) versus enjoyment (control condition). We then asked participants to consider the goal pursuit implications of thinking about “how” one engages in an action and “why” one engages in an action. Previous research indicates that considering why one engages in an action is associated with high-level construal, whereas considering how one engages in an action is associated with low-level construal (e.g., Freitas, Gollwitzer, & Trope, 2004; Liberman & Trope, 1998). We predicted that participants concerned about restraint (vs. enjoyment) would report that thinking about why rather than how would more beneficial for their goal.

Method

Participants. One hundred forty-two participants were recruited from Amazon’s Mechanical Turk platform (71 female; mean age 35.61) and received 50 cents for completing the study. A

power analysis ($1 - \beta = .80$), assuming a medium effect size, indicated a minimum N of 64 per cell. We thus targeted about 70 participants per cell. No data were analyzed until data collection ceased.

Materials and procedure. Participants completed the study online (from any device with Internet access within the United States) and were presented with the same taste test scenario as in Study 1. As in Study 1, half of participants were asked to imagine that they had a goal to avoid eating too many cookies while the other half of participants were told to imagine that they had a goal to enjoy the cookies as much as possible. Participants were then presented with statements relating to why one eats cookies as well as how one eats cookies and were asked to assess the extent to which each way of thinking about the scenario would help them reach their goal. Specifically participants in the control condition were asked, “How much would thinking about WHY you eat cookies (or why you don’t eat cookies) help you to maximize your enjoyment of cookies in the taste test?” and “How much would thinking about HOW you eat cookies (or how you don’t eat cookies) help you to maximize your enjoyment of cookies in the taste test?” Those in the self-control condition were asked, “How much would thinking about WHY you eat cookies (or why you don’t eat cookies) help you to avoid eating too many cookies in the taste test?” and “How much would thinking about HOW you eat cookies (or how you don’t eat cookies) help you to avoid eating too many cookies in the taste test?” Note that the only difference between the high-level and low-level statements in both conditions was their use of the words “why” and “how.” Participants rated each statement on a 7-point scale (1 = *not at all helpful*; 7 = *extremely helpful*).²

As a manipulation check, we asked participants to rate on a 7-point Likert-scale their level of agreement to the question: “To what extent do you think participating in the taste test would have required you to exert willpower?” Participants then completed demographic questions and were debriefed, thanked, and dismissed.

Results and Discussion

We excluded five participants who were not native English speakers and three participants who indicated that they completed the study while doing other things on the Internet from all analyses. To gauge the effectiveness of our manipulation, we first compared whether the two conditions (self-control vs. control) differed on the extent to which participants reported that the taste test that they imagined would require exerting willpower. As expected, those in the self-control condition ($M = 3.66$, $SD = 1.10$) reported that the taste test would require significantly more willpower than those in the control condition ($M = 2.78$, $SD = 1.28$), $t(132) = 4.29$, $p < .001$; 95% CI [−1.29, −.47], $d = .74$. This suggests that our manipulation was indeed effective.

Helpfulness ratings were then analyzed using a 2 (condition: self-control vs. control) \times 2 (statement type: how vs. why) re-

²The order of these ratings was fixed, such that participants always completed the why item before the how item. In a related program of research in our lab, two experiments that employed a similar paradigm which fully counterbalanced these items revealed no evidence of order effects (Nguyen, Carnevale, Scholer, & Fujita, 2016).

peated measures ANOVA with statement type as a within-subjects factor and condition as a between-subjects factor. Unlike in Study 1, there was not a significant main effect of condition. Participants who imagined being concerned with restraint ($M = 4.26$, $SD = 1.12$) rated the statements overall as no more helpful than those who imagined being concerned with enjoyment ($M = 3.99$, $SD = 1.28$), $F(1, 132) = 1.78$, $p = .185$; 95% CI $[-.69, .13]$, $d = .22$. As in Study 1, there was a main effect of statement type such that the high-level why statements ($M = 4.61$, $SD = 1.84$) were rated as more helpful than low-level how statements ($M = 3.63$, $SD = 1.95$), $F(1, 132) = 18.05$, $p < .001$; 95% CI $[-.148, -.48]$, $d = .53$. Consistent with Study 1, goal condition appeared to impact differentially helpfulness ratings of why and how statements, $F(1, 132) = 29.33$, $p < .001$ (see Figure 2). To explore this interaction, we first examined the endorsement of why relative to how statements within each condition. For those concerned about enjoyment, there were no significant differences in helpfulness ratings of the why ($M = 3.85$, $SD = 1.84$) and how statements ($M = 4.12$, $SD = 1.90$), $t(66) = .80$, $p = .426$; 95% CI $[-.40, .94]$, $d = .14$. Among those concerned about restraint, the why statements ($M = 5.37$, $SD = 1.50$) were rated as significantly more helpful than the how statements ($M = 3.15$, $SD = 1.89$), $t(66) = 7.05$, $p < .001$; 95% CI $[-2.85, -1.59]$, $d = 1.30$. Next, we examined the effect of condition on the endorsement of each type of statement separately. This analysis revealed that there was a significant difference in helpfulness ratings of how statements across conditions such that those in the enjoyment condition ($M = 4.12$, $SD = 1.90$) rated how statements as significantly more helpful than did those in the restraint condition ($M = 3.15$, $SD = 1.89$), $t(132) = 2.96$, $p = .004$; 95% CI $[.32, 1.62]$, $d = .51$. There was also a significant difference in helpfulness ratings of why statements across conditions such that those in the restraint condition ($M = 5.37$, $SD = 1.50$) rated the why statements significantly as more helpful than did those in the enjoyment condition ($M = 3.85$, $SD = 1.84$), $t(132) = 5.25$, $p < .001$; 95% CI $[-2.10, -.95]$, $d = .91$.

Findings from Study 2 are consistent with those of Study 1 and indicate that people recognize the benefits of high-level construal for self-control. The consistency of these findings suggest that this effect is not dependent on any specific measure of construal. Because the statements varied only by the word “why” versus “how,” these findings control for a number of potential alternative explanations.

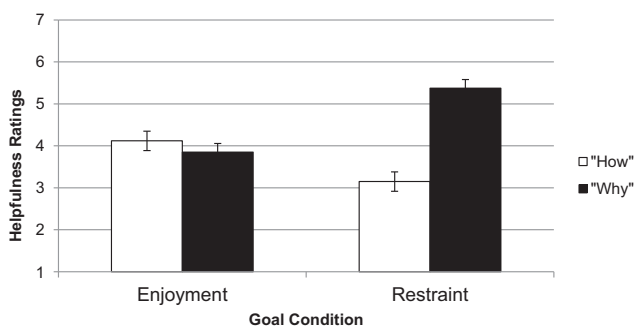


Figure 2. Interaction between goal condition and “how” versus “why” statement type predicting helpfulness ratings (Study 2). Error bars indicate standard error of the mean.

Study 3

Study 3 explored whether individual differences in knowledge that high-level construal promotes self-control predict self-control outcomes. All participants imagined that they had a goal to avoid eating too many cookies in an upcoming cookie taste test. As a measure of construal knowledge, they then rated how helpful various statements would be in reaching that goal. We then assessed dieting concern and diet-related self-control success. We predicted that those who understood that high-level (vs. low-level) construal promotes self-control would be more successful in maintaining a healthy weight, particularly among those for whom dieting represents a meaningful self-control domain (i.e., those motivated by dieting concerns).

Method

Participants. One hundred sixty-six introductory psychology students (77 females; mean age = 19.18) at The Ohio State University took part in this study in exchange for partial course credit. We used a time-based stop rule, collecting as much data as we could in 1 week. No data were analyzed before all data were collected.

Materials and procedure. All materials and procedures were conducted on the Internet and were identical to the self-control condition of Study 1. Participants could complete the study from any device with Internet access in any location they chose (within the United States). After indicating which statements would help them avoid eating too many cookies, to assess the relevance of dieting as a domain of self-control conflict, participants completed the restrained eating subscale of the Dutch Eating Behavior Questionnaire (van Strien, Frijters, Bergers, & Defares, 1986). This scale includes items such as “Do you take into account your weight with what you eat?” and has participants respond on a 5-point scale (1 = *never*; 5 = *very often*). Participants also reported their height and weight, from which we calculated body mass index (BMI) as a measure of success in the domain of dieting. Finally, participants provided demographic information (e.g., age, gender, English proficiency) and were thanked, debriefed and dismissed.

Results and Discussion

We excluded 14 participants who were not native English speakers from all analyses, as well as 16 participants who said they completed the study while doing other things on the Internet. We created an abstraction index whereby, participants’ mean ratings of the helpfulness of the concrete statements were subtracted from the mean ratings of the helpfulness of the abstract statements, such that those with higher scores rated the abstract statements as more helpful than the concrete statements for reaching their assigned goal ($M = .65$, $SD = 1.34$).³ Responses on the Dutch Eating Behavior Questionnaire (DEBQ) were averaged such that higher

³ Analyses that treated abstract versus concrete statement ratings as independent predictors produced an instance of Lord’s (1967) Paradox. As we were interested in the comparative difference between these measures rather than the effect of one statistically controlling for the other, use of the difference score in this context appears to be the most conceptually appropriate analysis.

scores indicate greater concern with dieting ($M = 2.78$, $SD = .82$, $\alpha = .92$). To address excessive skew, we also log-transformed all BMI scores.

We conducted a linear regression using dieting concern (DEBQ restrained eating subscale scores), abstraction index, and the interaction between these two variables to predict log-transformed BMI (see Figure 3). In general, those with higher dieting concern had higher BMI, $b = .04$, $SE = .02$, $p = .014$; 95% CI [.01, .08]. Those with higher scores on the abstraction index generally had lower BMI, $b = -.02$, $SE = .01$, $p = .040$; 95% CI [-.04, -.001]. Critically, as predicted, the impact of dieting concern on BMI was dependent on abstraction index scores, $b = -.05$, $SE = .01$, $p = .037$; 95% CI [-.05, -.001]. We first probed this interaction by examining the effect of abstraction scores on BMI for those with low and high dieting concern (i.e., -1 and $+1$ SD of the mean, respectively). Simple slopes analyses revealed that among those with lower dieting concern, there was no significant effect of abstraction score on BMI, $b = -.001$, $SE = .013$, $p = .966$; 95% CI [-.03, .03]. By contrast, among those with higher dieting concern, increases in abstraction scores were associated with decreases in BMI, $b = -.04$, $SE = .02$, $p = .006$; 95% CI [-.07, -.01]. Next, we probed this same interaction by examining the effect of dieting concern on BMI at low and high levels of abstraction (-1 and $+1$ SD of the mean, respectively). Among those with lower abstraction scores, increases in dieting concern were associated with higher BMI, $b = .08$, $SE = .03$, $p = .004$; 95% CI [.02, .13]. By contrast, among those with higher abstraction scores, this positive relationship between dieting concern and BMI was attenuated to statistical nonsignificance, $b = .01$, $SE = .02$, $p = .688$; 95% CI [-.03, .05]. These results support the prediction that individual differences in the knowledge that high-level construal benefits self-control can be used to predict self-control success (particularly among those who are motivated by the self-control conflict).

Study 4

As Study 3 used the same construal level measure as Study 1, it may be open to the same criticisms of potential confounds and

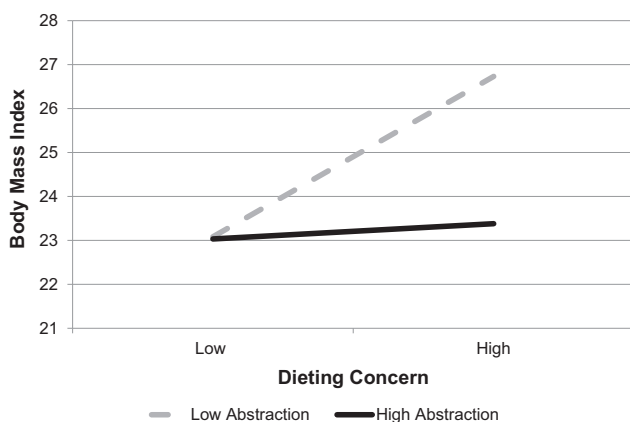


Figure 3. Interaction between dieting concern and abstraction index scores predicting BMI (Study 3). High and low values for both predictor variables represent $+1$ and -1 SD of the mean, respectively.

alternative explanations. To address these concerns, we conducted Study 4 using an implicit measure of construal level knowledge. If people recognize that high-level construal is beneficial for self-control, when faced with temptation, they should be more likely to engage in high-level rather than low-level construal to enhance their self-control. If this response is repeated over time, the concepts of temptation and high-level construal should become cognitively associated. In this way, the strength of association between temptation and high-level (vs. low-level) construal represents an indirect assessment of people's knowledge of the benefits of high-level construal for self-control. In Study 4, we assessed individual differences in the degree to which participants associated temptations with high-level relative to low-level construal. We then assessed dieting concern and diet-related self-control success. We predicted that those who more strongly associate temptations with high-level (vs. low-level) construal would be more successful in maintaining a healthy weight, particularly among those for whom dieting represents a meaningful self-control domain (i.e., those motivated by dieting concerns).

Method

Participants. Two hundred forty-seven introductory psychology students (118 females) at The Ohio State University took part in this study in exchange for partial course credit. As in Study 3, we used a time-based stop-rule. Because we were running during a term in which data collection proceeds more slowly, and because we anticipated a smaller effect size due to the use of an implicit measure of construal level knowledge, we extended our data collection to 3 months. No data were analyzed before all data were collected.

In an effort to ensure sufficient statistical power, we also attempted to implement procedures to recruit a higher proportion of participants with strong dieting concerns. As part of a mass prescreening survey completed by a subset of potential participants at the beginning of the semester, we asked three questions from the restrained eating subscale of the DEBQ: "Do you deliberately eat less in order not to become heavier," "Do you take into account your weight with what you eat," and "How often do you try not to eat between meals because you are watching your weight?" (1 = *never*; 5 = *very often*). After averaging responses to these three items, we sent targeted invitations to the top third of the distribution to participate in our study. These prescreened participants were scheduled during the same sessions as participants who did not complete the prescreening materials (the latter were recruited using standard procedures). Experimenters were blind to recruitment method.

Materials and procedure. As our implicit measure of construal level knowledge, we asked participants to complete a Single Category Implicit Association Test (SC-IAT; Karpinski & Steinman, 2006) in a laboratory. The SC-IAT uses participants' RTs to measure the strength of association between various concepts. In this task, participants were asked to categorize word stimuli such as "animal" versus "poodle" as categories versus examples, respectively, as quickly and as accurately as they could by pressing one of two labeled keys. Past research has shown that whereas high-level construal is associated with categorizing objects in broader superordinate categories, low-level construal is associated with categorizing objects in narrower subordinate categories (Fu-

jita, Trope, et al., 2006; Liberman, Sagristano, & Trope, 2002). Our use of the category labels “category” versus “example,” as well as the specific target stimuli, was modeled after Bar-Anan and colleagues (2006), who used similar materials to assess how strongly people associate various concepts with high-level and low-level construal, respectively. Participants were also presented with pictures of dessert stimuli (e.g., brownies, cheesecake, chocolate chip cookies) and asked to categorize them accordingly (i.e., as desserts) with a key press. Critically, the responses to these two categorization tasks were mapped onto the same set of keys. Thus, on half of the trials, category (high-level construal) and dessert (temptation) were mapped onto the same key, whereas on the other half, example (low-level construal) and dessert (temptation) were mapped onto the same key. Research suggests that people respond faster to the degree that two concepts mapped onto the same key are cognitively associated.

Following Karpinski and Steinman (2006), the SC-IAT consisted of two blocks. Each block consisted of 25 practice trials and 72 critical trials. In the first block, participants responded to dessert and category stimuli using the ‘5’ key on the number pad and to example stimuli using the ‘A’ key. To prevent response bias, the program presented stimuli in a 7:7:10 ratio so that correct responses did not favor the ‘A’ key or the ‘5’ key. Stage II of the SC-IAT was identical to the first, but with key pairings reversed, with category stimuli mapped onto the ‘5’ key and dessert and example stimuli mapped onto the ‘A’ key.

As in Study 3, participants then completed the restrained eating subscale of the DEBQ as a measure of dieting concern. They also reported their height and weight, from which we calculated body mass index (BMI) as a measure of self-control success in the dieting domain. Finally, participants provided demographic information (e.g., age, gender, English proficiency) and were thanked, debriefed, and dismissed.

Results and Discussion

We excluded 38 participants who were not native English speakers from all analyses, as well as 6 participants who reported impossibly low or impossibly high BMIs, and 23 participants who failed to complete all of the materials. Data from an additional five participants was lost due to computer program malfunction. To quantify performance on the SC-IAT, following Karpinski and Steinman (2006), we applied the d-score algorithm with a 400-ms penalty for incorrect responses to participants’ RTs. We coded blocks in which categories (examples) and dessert responses were paired as compatible (incompatible) blocks. Higher SC-IAT d-scores thus suggest a stronger tendency to associate temptations with high-level (rather than low-level) construal, which in turn suggests greater knowledge of the benefits of high-level construal for self-control. Responses on the DEBQ ($\alpha = .91$) were averaged such that higher scores indicate greater concern with dieting ($M = 2.55$, $SD = .90$). As in Study 3, to address excessive skew, we also log-transformed BMI scores.

Preliminary analyses revealed no effect of sample (whether participants were among the prescreened sample or not), nor did this variable interact with other variables of interest. As such, we report all analyses collapsing across this variable. Principally, we conducted a linear regression using dieting concern (DEBQ restrained eating subscale scores), SC-IAT d-scores, and the inter-

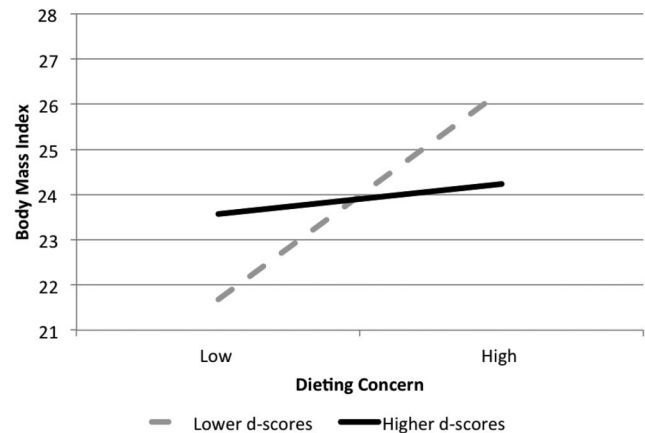


Figure 4. Interaction between dieting concern and SC-IAT d-scores predicting BMI (Study 4). High and low values for both predictor variables represent +1 and -1 *SD* of the mean, respectively.

action between these two variables to predict log transformed BMI (see Figure 4). In general, those with higher dieting concern had higher BMI, $b = .03$, $SE = .01$, $p < .001$; 95% CI [.02, .04]. Critically, as predicted, the effect of dieting concern on BMI was dependent on d-scores, $b = -.06$, $SE = .02$, $p = .003$; 95% CI [-.10, -.02]. We first probed this interaction by examining the effect of d-scores at low and high levels of dieting concern (-1 and +1 *SD* of the mean, respectively). Among those with lower dieting concern, the tendency to associate temptations with high-level rather than low-level construal (i.e., higher d-scores) predicted higher BMI, $b = .05$, $SE = .03$, $p = .044$; 95% CI [.001, .10]. By contrast, consistent with predictions, among those with higher dieting concern, the tendency to associate temptations with high-level rather than low-level construal (i.e., higher d-scores) predicted lower BMI, $b = -.06$, $SE = .03$, $p = .021$; 95% CI [-.12, -.01]. We then probed this same interaction by examining the effect of dieting concern on BMI at low and high d-scores (-1 and +1 *SD* of the mean, respectively). Among those who tended to associate temptations less strongly with high-level relative to low-level construal (i.e., lower d-scores), increasing dieting concern predicted higher BMI, $b = .05$, $SE = .01$, $p < .001$; 95% CI [.03, .07]. By contrast, this positive relationship between dieting concern and BMI was attenuated to statistical nonsignificance among those who tended to associate temptations more strongly with high-level relative to low-level construal (i.e., higher d-scores), $b = .01$, $SE = .01$, $p = .286$; 95% CI [-.01, .03]. These results replicate Study 3, suggesting that that individual differences in the knowledge that high-level construal benefits self-control can be used to predict self-control success (particularly among those who are motivated by the self-control conflict). Importantly, Study 4 replicated this effect using an implicit indicator of knowledge that circumvents many of the alternative interpretations that might have been raised in response to Study 3.

One difference between Studies 3 and 4 is the pattern of data among those who were low in dieting concern. Specifically, whereas there were no differences in BMI as a function of knowledge among those low in dieting concern in Study 3, those with high relative to low knowledge in Study 4 had higher BMI. It is not entirely clear to us how to interpret this apparent discrepancy. Our

theoretical framework does not make strong predictions about the behavior of those who do not experience a self-control conflict when presented with a given temptation. It may be a methodological artifact of using an implicit rather than explicit measure. Another possibility is that these individuals value hedonism over weight-loss, and experience a self-control conflict in the opposite direction of most others. That is, they might be tempted by social norms to eat less indulgent foods and must exert self-control to maintain their hedonism goals. We admit, however, that this is largely speculative.

Study 5

In Study 5, we attempted to replicate the findings in Studies 3 and 4 in a domain other than dieting, specifically academics. Undergraduates generated an academic self-control conflict in their own lives and described how they might overcome this conflict. To assess knowledge that high-level relative to low-level construal would promote self-control, we coded these written descriptions for level of abstraction using LCM coding schemes (Semin & Fiedler, 1988). Those with the tacit procedural knowledge that high-level construal benefits self-control should be those more likely to respond to reminders of a self-control conflict with more abstract, higher-level language. To assess the utility of this tacit knowledge, we then accessed student participants' grades (with their permission). Self-control is a key predictor of academic performance (e.g., Duckworth & Seligman, 2005, 2006), so we predicted that individuals who understood the benefits of high-level construal would demonstrate better self-control by earning higher grades, to the extent that they valued academic achievement.

Method

Participants. One hundred-thirty-four students (96 female; mean age = 20.98) in two sections of an introductory social psychology course (Psychology 3325) at The Ohio State University took part in this study in exchange for extra course credit. All students in the two sections were recruited, with sample size determined by the number who agreed to take part. No data were analyzed before data collection was complete.

Materials and procedure. Participants completed the study online, from any device with Internet access, in the week prior to their final exam in their introductory social psychology course. This time frame helped to ensure that participants would be aware of specific temptations that might interfere with their preparation for the exam, and that the exam was imminent enough that studying for it could present a relevant self-control conflict. Participants first listed upcoming assignments and exams in the course. They then generated activities, people or events that might tempt them away or distract them from studying and preparing for their exam. Participants were instructed to select one specific temptation and were prompted to write about it. Specifically, participants were instructed to "write a few sentences about what thought processes or ways of thinking you should use in order to overcome this obstacle and study effectively for your Psych 3325 exam."

After responding to this essay prompt, to assess the relevance of academics as a domain of self-control, Study 5 asked participants to report their motivation to do well in the course. The lure of a distraction from studying should represent a self-control conflict primarily to those who are motivated to perform well in their

courses. Two items assessed their motivation: "How important is it for you to do well in Psych 3325?" and "How valuable would it be for you to do well in Psych 3325?" Participants responded on a 7-point scale ranging from not at all to extremely. Participants then completed demographic questions (e.g., age, gender, English language proficiency). Finally participants were debriefed, thanked, and dismissed. To measure self-control success, course instructors provided final grades in the course with participants' consent.

Results and Discussion

The two items assessing academic achievement motivation were averaged to create an aggregate index (Cronbach's alpha = .81). To assess level of construal, two judges coded participants' written responses using the LCM (Semin & Fiedler, 1988). Specifically, judges categorized each predicate as belonging to one of four linguistic categories: descriptive action verbs (DAV; e.g., call), interpretive action verbs (IAV; e.g., study), state verbs (SV; e.g., love), or adjectives (e.g., honest). Following procedures used in past research (e.g., Fujita, Trope, et al., 2006; Semin & Smith, 1999), we calculated an abstraction score from these codes by multiplying the number of words in each category by 1, 2, 3, and 4 for DAVs, IAVs, SVs, and adjectives, respectively. We then divided that weighted score by the total number of coded predicates in each essay in order to control for response length. This formula results in LCM scores ranging from 1 to 4, with higher scores indicating greater use of abstract language (see Table 2 for examples of responses with low and high LCM scores). LCM scores were significantly correlated between the two judges, $r(116) = .72, p < .001$, Cronbach's alpha = .83. Discrepancies between the two judges were resolved through discussion to form a single index.

Eleven non-native English speakers were excluded from analyses, as well as 7 participants who indicated that they completed the study while doing other things on the Internet. We regressed final percent grade in the course on academic achievement motivation, LCM scores, and the interaction between these two variables using multilevel modeling, nesting participants within classroom (see Figure 5).⁴ Generally, those motivated to perform well in the course tended to earn higher grades, $\gamma = 1.66, SE = .80, p = .043$;

⁴ A similar analysis analyzing the effect of achievement motivation and LCM scores on final exam performance revealed a similar pattern of results, though the critical interaction was not statistically significant by conventional standards. Generally, those motivated to perform well in the course tended to earn higher final exam scores, though not significantly so, $\gamma = .01, SE = .01, p = .161$; 95% CI [-.01, .03]. There was no effect of LCM scores on final exam scores, $\gamma = .01, SE = .02, p = .522$; 95% CI [-.03, .05]. The interaction between academic motivation and LCM scores was directionally consistent with predictions, though not statistically significant, $b = .04, SE = .03, p = .122$; 95% CI [-.01, .09]. Simple slopes analyses revealed that among those with lower achievement motivation ($-1 SD$ of the mean), there was no relationship between LCM scores and final exam scores, $\gamma = -.02, SE = .03, p = .494$; 95% CI [-.09, .04]. By contrast, although not statistically significant, among those with higher achievement motivation ($+1 SD$ of the mean), LCM scores were positively associated with final exam scores, $\gamma = .05, SE = .03, p = .089$; 95% CI [-.01, .10]. A simple slopes analysis probing the same interaction as a function of LCM scores revealed that among those with lower LCM scores ($-1 SD$ of the mean), there was no relationship between achievement motivation and final exam scores, $\gamma = -.003, SE = .01, p = .799$; 95% CI [-.03, .03]. Among those with higher LCM scores ($+1 SD$ of the mean), by contrast, achievement motivation was positively associated with final exam scores, $\gamma = .03, SE = .02, p = .047$; 95% CI [.0004, .07].

Table 2

Example Responses of LCM Coded Essays

Example low LCM score essay	Turn off my phone, focus on my work at a study area like the library.
Example high LCM score essay	I should tell myself that school is more important and that it is a long-term investment in contrast to these distractions which are only temporary.

Note. LCM = Linguistic Categorization Model.

95% CI [.05, 3.24]. There was no effect of LCM scores on final grades, $\gamma = .24$, $SE = 1.58$, $p = .879$; 95% CI [-2.89, 3.37]. Critically, as predicted, the relationship between academic motivation and final grades was dependent on LCM scores, $\gamma = 4.07$, $SE = 2.00$, $p = .044$; 95% CI [.10, 8.04]. We first probed this interaction by analyzing the effect of LCM scores at low and high levels of achievement motivation (-1 and $+1$ SD of the mean, respectively). Among those with lower achievement motivation, there was no relationship between LCM scores and final grades, $\gamma = -3.37$, $SE = 2.55$, $p = .189$; 95% CI [-8.42, 1.68]. Among those with higher achievement motivation, those with higher LCM scores tended to receive higher final grades, albeit not at traditional levels of statistical significance, $\gamma = 3.85$, $SE = 2.19$, $p = .081$; 95% CI [-.49, 8.19]. To probe this same interaction further, we next explored the effect of achievement motivation at low and high LCM scores (-1 and $+1$ SD of the mean, respectively). This analysis revealed that among those with lower LCM scores, there was no relationship between achievement motivation and final grade, $\gamma = -.22$, $SE = 1.16$, $p = .850$; 95% CI [-2.51, 2.07]. By contrast, among those with higher LCM scores, those with higher achievement motivation earned higher final grades, $\gamma = 3.51$, $SE = 1.28$, $p = .007$; 95% CI [.98, 6.04]. These results are consistent with our prediction that when motivated to perform well, individual differences in the knowledge that high-level relative to low-level construal is beneficial for self-control predicts individual differences in self-control outcomes. Specifically, to the extent that individuals are aware that high-level construal promotes self-control, they perform better on self-control tasks when motivated to do so.

One might observe that among those low in academic achievement motivation, high relative to low knowledge of the self-control benefits of high-level construal led to poorer class performance. This finding in part conceptually replicates the higher BMI of those high relative to low in knowledge among those low in dieting concern in Study 4. We might speculate that for some students, the primary goal of their undergraduate career may be to enjoy the social opportunities provided by college rather than academic achievement. In these instances, enjoying the company of one's peers rather than studying may represent self-control success. To test this speculation, however, we require an assessment of participants' socializing relative to academic achievement goals—data which we did not collect in the present study. This question may be worth exploring in future research.

General Discussion

The present studies addressed the question of whether people understand the utility of high-level construal for self-control, and

whether individual differences in this knowledge are associated with individual differences in self-control success. Results from Studies 1 and 2 suggest that people do recognize the self-control benefits of high-level construal, indicating that high-level relative to low-level construal would allow them better to restrain themselves from indulging in short-term temptations. Studies 3, 4, and 5 further demonstrate that individual differences in knowledge about the self-control benefits of high-level construal can be used to predict individual differences in meaningful self-control outcomes. These findings suggest that one reason why people may fail in their self-control efforts is that they do not recognize the value of high-level construal as a means of overcoming temptations.

These studies are noteworthy in several respects. First, although researchers have only recently begun to document empirically the role of construal level in self-control (e.g., Fujita & Han, 2009; Fujita, Trope, et al., 2006), these findings indicate that lay individuals have some tacit knowledge of this relationship. Thus, high-level construal as a mechanism for enhancing self-control is not simply a lab-constructed phenomenon, but may instead reflect people's natural and spontaneous response to demands for self-control. Second, this research is among the first to adopt an individual differences approach to examine the role of construal level in self-control. By providing converging evidence that high level construal enhances self-control using a distinct methodological approach, this work further fortifies the evidentiary support for modeling self-control from a construal level perspective. Third, this work suggests that knowledge of the role that construal level plays in self-control may serve as a diagnostic indicator of a self-control liability. Researchers and practitioners may be able to use this information not only to identify those likely to struggle with self-control, but also to diagnose and target construal level as a specific area of deficiency to address with intervention attempts.

On the Use of Hypothetical Scenarios

Some might question our reliance on the use of hypothetical scenarios in Studies 1 through 3 (and to some extent all of our studies) to assess people's tacit knowledge of the self-control benefits of high-level relative to low-level construal. Although the

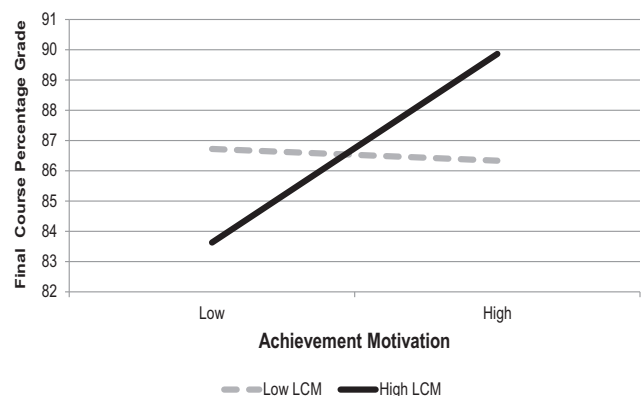


Figure 5. Interaction between achievement motivation and Linguistic Categorization Model score on final course percentage grade (Study 5). High and low values for both predictor variables represent $+1$ and -1 SD of the mean, respectively.

use of hypothetical scenarios is common in the tacit knowledge literature (e.g., Wagner & Sternberg, 1985, 1987), some might suggest that the artificiality of these measures may constrain some of the conclusions that we can draw from them. For example, actual as compared with imagined exposure to temptations is likely to activate more intense motivational and emotional responses that need to be controlled. Participants may underestimate how difficult it is to control these “hot” responses, leading to measurement error (the “hot-cold empathy gap;” Loewenstein, 2005; Nordgren, van der Pligt, & van Harreveld, 2007). The hypotheticality of these scenarios, moreover, may induce high-level construal (Wakslak, Trope, Liberman, & Alony, 2006). Both of these issues suggest that the use of hypothetical scenarios underestimates the true variability of people’s actual responses, potentially biasing effect size estimation. It is not entirely clear to us, however, in which direction this potential bias might be as restriction of range can lead to both underestimation and overestimation of effect sizes. This potential imprecision of our effect size estimate, moreover, should not lead one to question these results—the replication of the same effect across different domains and measures suggests a reliable effect. Instead, it suggests that when the precision of the effect size becomes more central to the aims of the current research program, one might explore this issue in a more systematic fashion.

Enduring Questions and Future Directions

Fishbach and colleagues have suggested that successful self-control requires first recognizing that a situation presents a self-control conflict, followed by a resolution of that conflict by prioritizing more valued long-term over short-term ends (Fishbach & Converse, 2010; Myrseth & Fishbach, 2009). The present studies examined whether people have the tacit knowledge that engaging in high-level construal benefits the latter challenge—the resolution of self-control conflicts after detection. There is research to suggest, however, that high-level construal also promotes the former challenge—recognition of self-control conflicts (Pick-Alony, Liberman, & Trope, 2014). An interesting future direction might be to explore to what extent people understand this additional self-control benefit of high-level construal.

Future research should also investigate how people come to learn the self-control advantage of high-level relative to low-level construal. One possibility is through trial-and-error learning. Research on implicit learning suggests that people may be able to engage in some types of contingency learning through direct experience, even in the absence of conscious, explicit recognition of those contingencies (Reber, 1989). Through repeated practice, people may come to learn that they are more likely to experience positive self-control outcomes when engaged in high-level as compared with low-level construal. An alternative possibility may be explicit instruction. Parents, for example, may teach children to step back and see the proverbial “forest” rather than the “trees” when exposed to temptation. Still another possibility is social modeling. When exposed to temptation, parents may also model behaviors that are correlated with engaging in high-level construal, such as physically distancing themselves from locally available rewards (e.g., Fujita, Henderson, et al., 2006; Henderson, Fujita, Trope, & Liberman, 2006). Finally, it is also possible that people logically deduce the self-control benefits of high-level relative to

low-level construal. Through logical reasoning, they may come to appreciate that whereas narrower and more specific construals (“I will copy this one answer from my friend’s test”) can promote indulgence, broader and more general construals (“I will be a cheater”) can promote restraint (Bryan, Walton, Rogers, & Dweck, 2011; Rachlin, 1995). Understanding the development of this knowledge is clearly an important future direction.

Another question that this research raises is to what extent this knowledge of the self-control benefits of high-level construal is domain-general versus domain-specific. Studies 3, 4, and 5, for example, examined this knowledge within the dieting and academic domains, respectively. One might ask whether knowledge in one domain, such as dieting, predicts knowledge in a different domain, such as academics. It may be that some individuals appreciate that the self-control benefits extend beyond a single domain whereas others do not. It is possible that this generalization of knowledge across domains underlies the domain generality versus specificity of self-control (e.g., Tsukayama & Duckworth, 2010).

A similar question concerns people’s understanding of the distinction between self-control and other types of self-regulation. Self-regulation refers broadly to the collection of processes that help people set, manage, and pursue their goals (e.g., Carver & Scheier, 1982; Mann, de Ridder, & Fujita, 2013). Self-control addresses a specific self-regulatory challenge: prioritizing larger-distal over smaller-proximal rewards (Fujita, 2011; Fujita & Carnevale, 2012). People, however, confront numerous other self-regulatory challenges, ranging from setting appropriate goals (i.e., those that maximize desirability and feasibility), planning and anticipating goal opportunities, and skillfully executing goal-directed behavior (Gollwitzer, 1990; Mann et al., 2013). Research reveals that although high-level construal relative to low-level construal is beneficial for self-control, it may interfere with other types of self-regulation (e.g., Buehler, Peetz, & Griffin, 2010; Freund & Hennecke, 2015; Schmeichel, Vohs, & Duke, 2011; Wakslak et al., 2006). For example, Wakslak and colleagues (2006) demonstrated that low-level rather than high-level construal was more beneficial for tasks requiring attention to specific details, like identifying features missing from an image (e.g., missing labels on cans in a grocery store). Similarly, Buehler and colleagues (2010) found that the attention to detail fostered through low-level construal helped people to overcome the planning fallacy, a prediction error in which people underestimate how long a task will take to complete (Kahneman & Tversky, 1979). Research in our lab has begun to investigate whether people are aware of these self-regulatory benefits of low-level construal, much as they are aware of the self-control benefits of high-level construal. Moreover, as high-level and low-level construal can each promote different types of self-regulation, the individuals most successful in attaining their goals may be those who are aware not only of the benefits of high-level construal, but also the benefits of low-level construal.

One might ask what relationship knowledge of the self-control benefits of high-level construal has with constructs such as intelligence. Research has documented an association between self-control and intelligence (e.g., Shamosh & Gray, 2008). One might suggest that strategy knowledge is simply a proxy for intelligence in our studies, and that people who are more intelligent are more

likely both to adopt high-level construal and to successfully exert self-control. Although we cannot directly refute this concern, the notion that intelligence is the sole driving force behind our effects seems less tenable in light of Studies 1 and 2. In those two experiments, people seemed remarkably sensitive to situations that called for self-control versus not, reporting that high-level construal would benefit self-control. An intelligence account also struggles to predict the findings from Study 4. It is unclear why more intelligent individuals would associate temptations more strongly with high-level relative to low-level construal in the absence of a construal level theoretic framework. It is still possible, however, that intelligence contributes to Studies 3 and 5; however, this possibility would not undermine the value of considering the role played by knowledge of high-level construal in self-control success. It is possible, for instance, that high-level construal is one mechanism through which intelligence works to improve self-control. Exploring the pathway linking knowledge that high-level construal enhances self-control with successful self-control outcomes could yield productive avenues for future research.

Beyond its implications for self-control, the present work also suggests novel directions for CLT research. People appear to understand the functional relationship between psychological distance and construal level, engaging in high-level construal when some psychological distance must be traversed (e.g., Liberman & Trope, 2014; Trope & Liberman, 2010). The present work suggests, however, that there may be individual differences in this knowledge, with important implications for construal-dependent evaluation, judgment, and decision-making. Given the important functional benefits of engaging in high-level construal to represent psychologically distant events, and engaging in low-level construal to represent psychologically proximal events, any systematic divergence from this functional pattern may lead to poor decisional and life outcomes. In keeping with this suggestion, preliminary research in our lab suggests that individual differences in the tendency to construe psychologically distant (near) events in high-level (low-level) terms appear to distinguish those with versus without depressive symptomology (Fujita, Darwent, Cheavens, & Lazarus, 2016). Future research might explore this issue in greater depth.

Toward a Fuller Understanding of What People Know of Self-Control

More broadly, the present research demonstrates that knowledge about the cognitive operations that are beneficial versus harmful to self-control can predict meaningful outcomes in populations beyond children (Mischel & Mischel, 1983; Rodriguez et al., 1989) and those with behavioral problems (Rodriguez et al., 1989). This demonstration suggests that investigating whether people understand that a given process will enhance versus undermine their self-control may be illuminative. Although we know much about what mechanisms and strategies are beneficial versus detrimental to self-control (e.g., Vohs & Baumeister, 2011), we know less about what people know about the efficacy of these processes. As self-control research extends beyond the lab to people's daily lives (e.g., Hofmann, Baumeister, Förster, & Vohs, 2012; Wilkowski & Ferguson, 2016), understanding what they know will be critical

to understanding fully what they do and why they do it. We encourage and look forward to future research embracing this approach.

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