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# Overcoming the effects of sleep deprivation on unethical behavior: An extension of integrated self-control theory

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ABSTRACT

Previous research has used an ego depletion perspective to establish a self-regulatory model linking sleep deprivation to unethical behavior via depletion (Barnes, Schaubroeck, Huth, & Ghumman, 2011; Christian & Ellis, 2011; Welsh, Ellis, Christian, & Mai, 2014). We extend this research by moving beyond depletion to examine a more nuanced, process-based view of self-control. We draw on integrative self-control theory (Kotabe & Hofmann, 2015) to identify two critical moderators of the relationship between sleep and unethical behavior. Whereas prior research has focused mainly on the deleterious effects associated with depleted control *capacity* – such as sleep deprivation – we suggest that factors influencing control *motivation* and control *effort* are also an essential part of the self-regulatory process. First, we examine the role of control motivation, hypothesizing that a perceived sense of power moderates the relationship between sleep deprivation and depletion by motivating agentic, goal-directed action that mitigates the depleting effect of sleep deprivation. Second, we consider the role of control effort, hypothesizing that contemplation moderates the relationship between depletion and unethical behavior, such that depleted individuals are less likely to act unethically when contemplation is high. Three studies – one manipulating sleep deprivation in the lab and two using natural variation in sleep quality and quantity – suggest consistent support for our expanded model combining mediation and moderation, advancing self-regulatory research linking sleep deprivation to unethical behavior.

As the number of hours employees work per year has increased (National Institute for Occupational Safety and Health, 2004), so has the percentage of Americans reporting less than six hours of sleep per night (National Sleep Foundation, 2009). Sleep deprivation may lead to a number of negative consequences including impaired decision-making capacity (Harrison & Horne, 2000), reduced occupational safety (Barnes & Wagner, 2009), and increased abusive supervision (Barnes, Lucianetti, Bhave, & Christian, 2015). Lack of sleep affects the operation of the prefrontal cortex, which is involved in self-regulation (Durmer & Dinges, 2005; Jennings, Monk, & Van der Molen, 2003). Drawing on the concept of ego depletion (Baumeister et al., 1998), a number of studies have demonstrated that sleep deprivation increases unethical behavior through the depletion of the self-regulatory resources involved in self-control (Barnes, Schaubroeck, Huth, and Ghumman, 2011; Christian & Ellis, 2011; Welsh et al., 2014).

However, the depletion perspective currently taken by much of the sleep literature provides an incomplete understanding of the complexities of self-regulation (Lian, Yam, Ferris, & Brown, 2018). Originally, ego depletion was conceptualized both in terms of reduced capacity and willingness to exert self-control (Baumeister et al., 1998), but recent sleep-related research has generally focused on capacity and the broader self-regulation literature has often neglected to specify what the resource that is depleted might consist of. Drawing on integrative self-control theory (ISCT; Kotabe & Hofmann, 2015), we argue that this has obscured the importance of perceptual processes related to control *motivation* and behavioral processes associated with control *effort*. Extending previous research, we take a process-based approach to shed light on the relationship between sleep deprivation, depletion, and unethical behavior; suggesting that factors associated with control *motivation* and control *effort* operate as critical contingencies that expand our understanding of this phenomenon in ways that could not be extrapolated from the existing literature.

ISCT identifies three distinct components related to the exertion of control that are critical to self-regulation: control capacity, control motivation, and control effort. Each component is distinct from depletion which represents "potential control effort, or the multiplicative

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relationship between control motivation and control capacity" (Lian et al., 2018, p. 11). Whereas physiological interventions such as sleep deprivation influence control capacity, we argue that psychological factors influencing control motivation – motivational forces that effect the exertion of self-control – may moderate the effect of sleep deprivation on depletion. Specifically, we predict that a key psychological variable influencing control motivation is one's sense of power. Power is often viewed as corrupting (e.g., Kipnis, 1972). However, drawing on ISCT, we theorize that feeling powerful may help to cure rather than corrupt sleep-deprived individuals. We argue that a sense of power activates the behavioral approach system, triggering approach tendencies (Smith & Bargh, 2008) and increasing goal-directed motivation (Keltner et al., 2003) whereas a perceived lack of power reduces the motivation to expend self-regulatory resources (see Barkley, 1997a, 1997b; Davies & Parasuraman, 1982). In sum, because perceived power motivates agentic action toward one's higher order goals, it should operate as a source of control motivation that attenuates the relationship between sleep deprivation and depletion.

ISCT also suggests a more nuanced view of the ethical consequences of sleep deprivation. Behavioral interventions that influence control effort – the enactment process associated with control capacity and control motivation – may have substantial influence on the relationship between depletion and unethical behavior. Specifically, when control effort is high, the relationship between depletion and unethical behavior may be weakened. A key variable representing increased control effort is the level of contemplation involved in an ethical decision. Contemplation is a central feature of moral reasoning (Kohlberg, 1969; Piaget, 1932) and an antecedent of moral awareness (Jones, 1991). During ethical self-regulation, awareness of the tension between proximal desires and higher goals may be renewed with effort, even when depletion is high. Drawing on ISCT, we argue that effortful processing associated with contemplation will weaken the tendency to impulsively give into temptation and strengthen one's resolve to pursue higher order ethical goals.

In sum, we seek to extend the self-regulatory model of sleep deprivation and unethical behavior through an integration of critical contingencies drawn from ISCT. Specifically, we consider not only the importance of physiological resources associated with control capacity but also the interactive effects associated with perceptual factors that influence control motivation (sense of power) and behavioral interventions affecting control effort (contemplation). Our findings not only reveal important moderators that reduce the unethical consequences of sleep deprivation but also provide new theoretical insights that expand prior research grounded in ego depletion. Given the prevalence of sleep deprivation in modern society, we also offer practical implications for increasing ethical behavior among sleep-deprived individuals. The results of three studies generally support the developed moderated mediation model (see Fig. 1).

## 1. Sleep deprivation, depletion, and unethical behavior

ISCT identifies an intrapsychic conflict between one's desire and a higher order goal as the trigger that activates self-regulatory processes (Kotabe and Hofmann, 2015). An important higher order goal that most people possess is to be an ethical person (Mazar, Amir, & Ariely, 2008). However, in the context of ethics self-control is often required when this goal comes into conflict with a proximal desire; such as obtaining a beneficial outcome through ethically questionable behavior. Acting unethically can often profit individuals in the short term via financial rewards (Yam et al., 2014) or the hedonic pleasure gained from impulsive behavior (Loewenstein, 1996; Ruedy, Moore, Gino, & Schweitzer, 2013). As a result, individuals must exercise self-control to resist impulses to pursue immediate gratification. This desire-goal conflict in turn leads to the activation of self-regulatory mechanisms. The success or failure of the self-regulatory process depends on factors related to the exertion of self-control including control capacity, control motivation, and control effort (Kotabe and Hofmann, 2015).

Control capacity – the central component of ego depletion theories – represents the self-regulatory resources available to control the desire at hand (Kotabe and Hofmann, 2015). Such resources provide individuals with "the ability to override or change one's inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them" (Tagney, Baumeister, & Boone, 2004, p. 274). Yet, reduced control capacity will make it more difficult to resist short term gains in favor of long term benefits. This increases the likelihood of unethical conduct when confronted with an opportunity to maximize short term gain at the expense of one's ethical objectives (Gino et al., 2011). Evidence has consistently supported this notion, finding that reduced control capacity can lead to higher rates of cheating (e.g., Gino et al., 2011; Muraven, Pogarsky, & Schmueli, 2006), lying (e.g., Welsh, Ellis, Christian, and Mai, 2014), and stealing (e.g., Christian & Ellis, 2011).

Control capacity can be reduced by a number of factors (Lian et al., 2018). One of these is the amount and quality of sleep individuals receive. Sleep deprived individuals lack inhibition and regard for typical social conventions (Ghumman & Barnes, 2013; Horne, 1993) because the prefrontal cortex is crucial for exerting executive control over behavior (Durmer & Dinges, 2005; Jennings et al., 2003). For example, Drummond, Paulus, and Tapert (2006) found that two nights of total sleep deprivation led individuals to exhibit difficulty in suppressing inappropriate task responses. Others have found that damage to the ventromedial prefrontal cortex, which represents a region of the brain affected by sleep deprivation (Thomas et al., 2000), leads individuals to focus on immediate short-term gains rather than long-term benefits (Bechara et al., 1994). Putting the above components together, researchers have found support for a mediated model where sleep deprivation increases unethical behavior by reducing control capacity (Barnes et al., 2011; Christian & Ellis, 2011; Welsh et al., 2014). Yet the physiological effects associated with reduced control capacity represent only one component of the self-regulatory process. In this study, we seek to challenge and extend this self-regulatory model of sleep deprivation and unethical behavior through an integration of ISCT and an examination of the interactive effects associated with control motivation and control effort. We thus begin by hypothesizing the established mediated model linking sleep deprivation to unethical behavior via depletion and then build on this model through an integration of two critical moderators. We hypothesize:

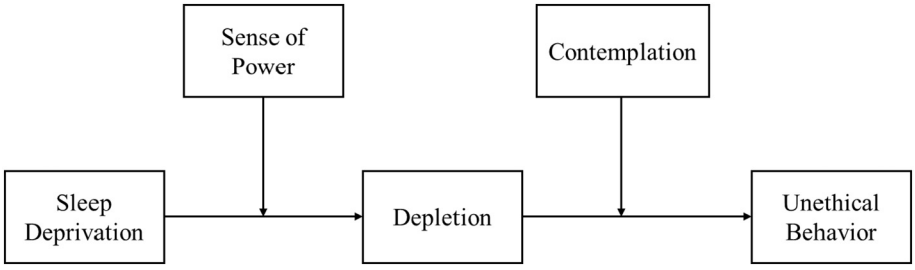


**Fig. 1.** Hypothesized model.

**Hypothesis 1.** Sleep deprivation will have a positive indirect effect on unethical behavior via depletion.

## 2. Control motivation, sense of power, and depletion

To date, the majority of research on depletion suggests that self-regulation can only be improved by directly influencing control capacity via physiological interventions such as breaks (e.g., Sonnentag, 2003; Trougakos, Hideg, Cheng, & Beal, 2014), or ingesting caffeine (Welsh et al., 2014). However, emerging evidence consistent with ISCT's discussion of control motivation suggests that self-regulatory resources can also be augmented by psychological perceptions. For example, Clarkson, Hirt, Jia, and Alexander (2010) found that perceptions of resource availability can affect self-regulation even when individuals are depleted from completing a draining task. The findings of Clarkson et al. (2010) suggest that the self-regulatory process is shaped not only by physiological factors associated with reduced control capacity but also by psychological variables. Similarly, Martijn, Tenbült, Merckelbach, Dreezens, and de Vries (2002) found that expectancies regarding self-control can moderate the effects of exertion on depletion. Specifically, motivating participants by challenging their expectation that self-control impairs subsequent performance attenuated the negative effects of a self-regulatory task. When incorporated with ISCT, the results of Clarkson et al. (2010) and Martijn et al. (2002) suggest that a sense of power, which activates concepts related to motivation and control over valued resources (Bargh et al., 1995), may moderate the effects of depleting activities on self-regulation. Sense of power frees individuals from constraints and allows them to act in more agentic ways (Dubois, Rucker, & Galinsky, 2015) which in some cases can promote self-interested unethical behavior (e.g., Fiske, 1993; Galinsky, Gruenfeld, & Magee, 2003; Galinsky, Magee, Inesi, & Gruenfeld, 2006). However, as we describe below, an increased sense of power creates other cognitive changes that may enhance control motivation.

In line with the auto-motive model (Bargh, 1990), a sense of power also results in systematic changes in cognition and behavior. In particular, sense of power is associated with executive functioning (Smith, Jostmann, Galinsky, & van Dijk, 2008). According to Smith and her colleagues, feeling that one may lack power "fundamentally alters cognitive functioning" (p. 441) and can reduce executive functioning. According to the behavioral approach theory of power, power activates the behavioral approach system, while lack of power activates the behavior inhibition system (Carver & White, 1994; Higgins, 1998; Keltner et al., 2003). Priming high power increases behavioral approach system strength (Smith & Bargh, 2008), and participants who sense that they are high in power are more likely to behave consistently with their personal values and standards (Chen, Lee-Chai, and Bargh, 2001).

Drawing from ISCT, sense of power represents a key perceptual variable that may influence control motivation. ISCT identifies control motivation and the related psychological processes associated with the aspiration to control one's desires as central to the self-regulatory process (Kotabe & Hofmann, 2015). A key component of control motivation is feeling motivated, competent, and effective (Kotabe & Hofmann, 2015). Individuals who believe that they lack control or are not interested in or able to pursue their higher order goal will experience reduced control motivation (Lian et al., 2018). Supporting ISCT, Smith et al. (2008, p. 442) identified "goal neglect" as the reason why low sense of power undermined executive functioning. In sum, activating the behavioral approach system via an increased sense of power makes individuals more goal-directed (Keltner et al., 2003). This is especially relevant from an ISCT perspective in terms of increasing control motivation directed toward a higher order goal. Because sense of power does not directly restore physiological resources consumed by sleep, we do not hypothesize a main effect of sense of power on depletion via increased control capacity. Instead, we argue that sense of power will have a moderating effect as increased control motivation will weaken the depleting effects of reduced control capacity due to sleep deprivation. Thus, we hypothesize the following:

**Hypothesis 2.** The relationship between sleep deprivation and depletion will be moderated by sense of power such that this relationship will be attenuated when sense of power is high.

**Hypothesis 3.** The mediated relationship between sleep deprivation, depletion, and unethical behavior will be moderated by sense of power such that this indirect effect will be attenuated when sense of power is high.

## 3. Control effort, contemplation, and unethical behavior

In addition to control capacity and control motivation, control effort represents the amount of mental energy invested in the self-regulatory process and plays a key role in the exertion of self-control (Kotabe & Hofmann, 2015). Whereas control capacity and control motivation interact to determine the availability of self-regulatory resources, control effort influences the degree to which these resources are then employed to shape subsequent behavior. Often, reductions in control capacity and control motivation will undermine control effort (Lian et al., 2018). However, interventions that increase control effort may be able to mitigate the negative effects stemming from low control capacity and/or control motivation.[1]

Because phenomena that reduce control capacity such as sleep deprivation reduce executive functioning and increase impulsivity, we suggest that contemplation may play an important role in terms of directly increasing control effort when individuals are confronted with enticing situations in which desire-goal conflict arises. Contemplation involves a form of mental deliberation and cognitive effort that both undergirds theories of moral reasoning (Kohlberg, 1969; Piaget, 1932) and stimulates moral awareness (Jones, 1991). Although there are some situations in which many people possess an initial impulse to behave prosocially (e.g., Rand, Greene, & Nowak, 2012) and certain contexts in which mental resources are misused to invent moral justifications (e.g., Bandura, 1986; Zhong, 2011), a review of the role of deliberation and contemplation in ethical decision making revealed that in tempting situations that require self-control, contemplative thinking is generally associated with ethical choices whereas impulsivity is associated with dishonesty (Bereby-Meyer & Shalvi, 2015). Indeed, moral reasoning requires moral awareness, which relies on the same resources that are tapped by regulatory depletion (Gino et al., 2011). Thus, when confronted with short term temptations to behave unethically, having low levels of control capacity may be counteracted by increased control effort in the form of conscious contemplation. As such, when depleted individuals face an ethical decision, contemplation should be more likely to foster ethical behavior than impulsivity.

Control effort in the form of contemplation may be especially relevant in contexts where control capacity is reduced because depleted individuals will find it much more difficult to muster the resources needed to engage in "effortful choice and active initiative" (Baumeister & Vohs, 2007, p. 2). Recent research has provided additional evidence of the need for control effort by demonstrating that sleep deprivation and the depletion of self-regulatory resources compromise moral awareness (Barnes, Gunia, & Wagner, 2015; Gino, Schweitzer, Mead, & Ariely, 2011). According to Barnes, Gunia, and Wagner (2015, p. 182) "in order to bring a moral issue into conscious moral awareness, people

[1] As Lian et al. (2018, p. 11) note, "ISCT distinguishes between *potential control effort*, or the multiplicative relationship between control motivation and control capacity that represents the maximum effort that could be expended, and *actual control effort*, or the actual amount of mental energy that an individual expends in battling a desire." Thus, measures of depletion capturing potential control effort are distinct from subsequent interventions that directly influence actual control effort.

must go through an effortful process of directing attention to the issue that is undermined by a lack of sleep." When applied to a self-regulatory context, the cognitive shortcuts taken by those who are sleep deprived may reduce moral awareness and prevent contemplation from occurring prior to ethical decision making. In such cases, a cognitive intervention or mental "speed bump" may be required to stimulate control effort via contemplation in order to override impulsive tendencies. For example, Gunia et al. (2012) found that providing participants with additional time for contemplation rather than requiring an immediate choice led to higher levels of honesty when provided with an opportunity for deception.

Extending these findings showing a positive direct effect between contemplation and ethical behavior, we suggest that contemplation may play a moderating role in terms of attenuating the relationship between depletion and unethical behavior. When control capacity is low, such as when individuals are sleep deprived, contemplation is unlikely to occur. To date, lab studies inducing depletion have typically utilized tasks that require very little contemplation when engaging in an unethical act, such as writing down a number (e.g., Gino et al., 2011) or hitting the 'send' button (e.g., Welsh et al., 2014). Although contemplation does not directly restore control capacity, it may nevertheless buffer the negative effects of reduced control capacity on subsequent unethicality for individuals who are sleep deprived. Thus, we expect that increasing contemplation will attenuate the effects of depletion on unethical behavior and weaken the mediated model linking sleep deprivation to unethical behavior, leading to the following hypotheses:

**Hypothesis 4.** The relationship between depletion and unethical behavior will be moderated by contemplation such that this relationship will be attenuated when contemplation is high.

**Hypothesis 5.** The mediated relationship between sleep deprivation, depletion, and unethical behavior will be moderated by contemplation such that the indirect effect will be attenuated when contemplation is high.

**Hypothesis 6.** The mediated relationship between sleep deprivation, depletion, and unethical behavior will be moderated by sense of power (stage 1) and contemplation (stage 2) such that the indirect effect will be strongest when both sense of power and contemplation are low.

## 4. Overview of studies

Sleep deprivation is a function of both sleep quality and sleep quantity, which exhibit parallel and additive effects on self-regulation (Barnes, 2012). To test the developed model, we first conducted a laboratory experiment manipulating sleep quantity followed by two additional studies measuring natural variation in sleep quantity and quality. The laboratory experiment provides support for the moderated mediation model by inducing sleep deprivation in a sample of undergraduate participants. The two additional studies provide evidence of the robustness of the model by relying on natural variation in sleep quantity and quality to independently test the effects of power and contemplation. Specifically, Study 2 tests the interactive effects of sleep quantity and quality and sense of power on depletion. Study 3 tests the interactive effects of sleep quantity and quality and contemplation on unethicality. Together, this design allowed us to test the interactive effects of control capacity with control motivation and control effort both independently and simultaneously across multiple samples. In these studies, we report all measures, manipulations and exclusions. The sample size in each was determined before any data analysis.[2]

[2] We used G*Power's (version 3.1; Faul, Erdfelder, Buchner, & Lang, 2009) "A priori: Compute required sample size — given α, power, and effect size" analysis for *F* tests with ANOVA for main effect and interactions to calculate the minimum required sample size. (*footnote continued*) With an average effect size of 0.30 observed in previous studies using similar experimental designs (Barnes et al., 2011 [effect size = 0.33]; Christian & Ellis, 2011 [effect size = 0.30]; Welsh et al., 2014 [effect size = 0.28]), we set the power level at 0.80 and α at 0.05 level. Results indicated a minimum sample size of 140 participants, a threshold we exceeded in Study 1 in order to obtain adequate power. Similarly, we exceeded the required minimum sample of 99 participants in Study 2 and 52 participants in Study 3.

## 5. Study 1 methods

### 5.1. Participants and design

This study was conducted in a laboratory setting using 160 undergraduate students from a large public university in the United States.[3] The average age of participants was 22.1 (*SD* = 4.29) and 46% were female. Participants were 52.5% Caucasian, 21.9% were Hispanic/Latino, 15.5% were Asian/Asian American, 5.8% were African-American, 3.2% were Native American, and 1% reported Other. Participants were recruited for the study through an online sign-up system. During the initial recruitment process, potential participants were not informed of the purpose of the study. We administered a survey through the online system screening potential participants for cigarette use because spending a night without smoking might have had effects on irritability associated with nicotine withdrawal. The screening survey also assessed any physical and psychological problems that might increase risk (e.g., sleep disorders, heart problems, anemia, epilepsy, brain damage, or clinically diagnosed psychological disorders). Participants were randomly assigned to one of the two sleep conditions and were told that the study dealt with sleep and decision making and they could withdraw at any time during the experiment. We then utilized a 2 (sleep deprivation vs. no sleep deprivation) × 2 (high sense of power vs. low sense of power) × 2 (high contemplation vs. low contemplation) factorial design and randomly assigned participants to conditions. The recruitment, screening, payment, and procedures were all based on the protocols developed by Christian and Ellis (2011) and Welsh et al. (2014). Participants received course credit and earned monetary compensation for performance on the experimental tasks. Additionally, participants in the sleep-deprivation condition were paid $60 for their willingness to stay up all night. As suggested by Christian and Ellis (2011), we did not inform participants of the payment schedule for those in the other condition to minimize potential equity issues.

### 5.2. Procedures

Consistent with Christian and Ellis (2011), Harrison and Horne (1999), and Welsh et al. (2014), we conducted the study over 2 days with sleep deprivation manipulated on the night of Day 1 and participants in both groups completing the experimental tasks at 9:00 am on Day 2. At 8:30 am on Day 2, all participants (both sleep deprivation and non-sleep deprivation) were served breakfast prepared by the experimenter. At 9:00 am, all participants were brought to the laboratory and assigned to computer terminals located in separate carrels. At this time the sense of power manipulation was introduced. Following the sense of power manipulation, participants completed the depletion measure and manipulation checks. Participants then received information from the experimenter regarding an ethics task adapted from Gneezy (2005), where the contemplation manipulation was introduced. Following the manipulation, participants were provided with ample time to make their decision. After completing the Gneezy (2005) task, participants were debriefed and paid. To avoid rewarding deception, all participants received the maximum amount of $5 for completing the Gneezy (2005) task.

[3] There were exactly 20 participants in each condition of this study. The results from sensitivity analyses conducted using G*Power indicated that with 8 experimental conditions and 160 participants in the sample, we needed to observe an effect size of 0.28 or higher to maintain a power level of 80% or above. Based on similar studies manipulating sleep deprivation, attainment of such an effect size was reasonable.

### 5.3. Measures

#### 5.3.1. Depletion

We measured depletion using the 25-item state ego depletion scale (Ciarocco, Twenge, Muraven, & Tice, 2007). Sample items included "I feel like my willpower is gone" and "I feel drained" (1 — *strongly disagree* to 7 — *strongly agree*; $\alpha = 0.97$).

#### 5.3.2. Unethical behavior

Similar to Welsh et al. (2014), we used a task adapted from Gneezy's (2005) "deception game," which involves the allocation of $7 between two parties. Participants were instructed that they would be assigned to either a Sender Role or a Decider Role. They were further told that individuals in the Decider Role would choose between two options, but that only those in the Sender Role would be provided information about the monetary values associated with each option. As in previous research, participants were led to believe that they were playing against another randomly selected participant, but all participants were assigned to the Sender Role and played against a computer in order to allow control over the outcomes.

Participants were informed that there were two potential options. Option A pays the Sender $2 and the Decider $5, whereas Option B pays the Sender $5 and Decider $2. Upon receiving this information, participants were instructed to send a message to the Decider before that person made his or her decision. Participants could send a truthful message (Message 1) to the Decider, "Option A will earn you more money than Option B," or a lie (Message 2), "Option B will earn you more money than Option A." Previous research has shown that most participants (over 80%) believe that their partner will believe the message that they send (Cohen, Gunia, Kim, & Murnighan, 2009; Gneezy, 2005). In accordance with previous research, unethical behavior was based on whether participants sent a lie or a truthful message.

### 5.4. Manipulations

#### 5.4.1. Sleep deprivation

Following Christian and Ellis (2011) and Welsh et al. (2014), several days prior to the study, participants in the sleep deprivation condition received an e-mail instructing them to prepare for the study by getting normal sleep (at least 7 h) for at least two nights before the study and to wake up no later than 9:00 am the day before the study to ensure at least 24 h of sleep deprivation. In addition, they were instructed not to take naps on the day before the study, to not bring food or beverages to the study, to not drink alcohol or caffeinated products the day before the study, and to arrange for someone to pick them up at the end of the study. A similar e-mail was also sent to participants in the non-sleep deprivation condition except that these participants were instructed to get at least 7 h of sleep rather than receiving the instruction report to the laboratory for the sleep deprivation manipulation. Participants in the sleep deprivation condition arrived at the laboratory at 11:00 pm and stayed awake during the entire night. Participants were confined to two classrooms and a workroom area and were permitted to play board games, watch movies, surf the Internet, read, work on homework, or eat the provided snacks. Two research assistants monitored the participants during the night to ensure that all participants stayed awake and followed the set rules. This manipulation which physiologically reduces self-regulatory resources is consistent with reduced control capacity.

#### 5.4.2. Sense of power

Participants were first instructed to complete a leadership questionnaire and a series of computerized decision making tasks for approximately 30 min. They were then directed to a screen with a loading icon and a message stating, "Please wait. Your responses are being processed." After 10 s, participants were automatically led to the next page where the sense of power manipulation was presented. Participants received the following message, "Based on your responses to the previous questionnaire and tasks, you are a high [low] power individual. On the upcoming tasks, we will assign you to a high [low] power role, in which you will have control over various task resources." This procedure manipulating sense of power was adapted from Jordan et al. (2011; see also Galinsky, Gruenfeld, & Magee, 2003).[4] This manipulation in which a perceptual change related to sense of power was induced is consistent with control motivation.

#### 5.4.3. Contemplation

Contemplation was manipulated on the Gneezy (2005) task, in which participants were led to believe that they were randomly paired with another participant to complete an interactive decision task. In the high contemplation conditions, after participants read the instructions and the information regarding the payouts, participants were instructed to type the message that they wanted to send in a text box. In the low contemplation condition, after participants read the instructions and the information regarding the payouts, participants were instructed to simply type "1" (the truthful message) or "2" (the deceptive message) to indicate which message they intended to send in the text box. However, in the high contemplation condition the task was designed in such a way as to evoke higher levels of contemplation when deciding whether to engage in unethical behavior. Specifically, the text box was prepopulated with the truthful message ("I would like to send Message 1 to my partner. Message 1 states that Option A will earn you more money than Option B"), thereby allowing participants to simply click 'submit' to send this message. In contrast, to send the deceptive message participants had to erase the prepopulated text and then manually enter the exact sentence "I would like to send Message 2 to my partner. Message 2 states that Option B will earn you more money than Option A". We believed that this would encourage participants to spend more time on this decision and to think carefully about their decision to send the deceptive message, which is indicative of high contemplation (see Gunia, Wang, Huang, Wang, & Murnighan, 2012). The task was designed such that copying and pasting was disabled thus preventing any shortcuts to circumvent manually entering the text. This manipulation in which a behavioral intervention changing the amount of self-control directed effort that participants engaged in is consistent with control effort.[5]

## 6. Study 1 results

### 6.1. Manipulation checks

#### 6.1.1. Sense of power

Similar to Jordan et al. (2011), participants were asked to indicate the extent to which they agreed with the following four items regarding how they felt about the role they would have in the following tasks on a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*): "I feel powerful," "I feel comfortable being in charge," "I feel that I am influential," and "I feel capable of exerting control." Reliability for these items was adequate ($\alpha = 0.80$), and they were averaged to form a sense of power index. As expected, individuals assigned to the high power condition reported a higher sense of power ($M = 3.84$, $SD = 0.65$) than those in

[4] Galinsky and colleagues (Galinsky, Gruenfeld, & Magee, 2003; Jordan, Sivanathan, & Galinsky, 2011) manipulated power by assigning participants to the role of a vice-president (powerful), or a low-level manager (powerless), upon completion of the leadership questionnaire.

[5] We conducted two additional supplemental studies exploring the relationship between our measures and manipulations and control capacity, control motivation, and control effort that are included in an online supplemental section.

the low power condition ($M$ = 3.43, $SD$ = 0.83), $t_{158}$ = 3.46, $p$ = .001, $d$ = 0.55) indicating that the manipulation of sense of power was effective.[6]

#### 6.1.2. Contemplation

In both the high contemplation and low contemplation conditions, those participants who chose to send the truthful message were only required to click a button to make their choice whereas sending the deceptive message in the high contemplation condition forced participants to take a considerably longer amount of time to manually type in the required text in order to send this message. As expected, we found that sending the deceptive message took considerably longer in the high contemplation condition ($M$ = 329.06 s, $SD$ = 203.49) as compared the low contemplation condition ($M$ = 218.33 s, $SD$ = 179.99; $F_{1,64}$ = 5.46, $p$ = .02, $d$ = 0.57) a result likely due at least in part to the amount of time required to type the full text of the deceptive message. As predicted, we also found that sending the truthful message took significantly longer in the high contemplation condition ($M$ = 314.14 s, $SD$ = 200.92) as compared to the low contemplation condition ($M$ = 227.99, $SD$ = 165.66, $F_{1,92}$ = 4.98, $p$ = .03, $d$ = 0.60) even though participants only needed to click a button to send the truthful message in both the low contemplation and high contemplation conditions.[7] The additional time spent in the high contemplation condition to perform a physically equivalent task suggests that the desired manipulation was achieved in which participants spent significantly more time in contemplation before making their decision.[8]

**Table 1**
Means, standard deviations, and correlations among Study 1 variables.[a]

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. Sleep deprivation[b] | – | – | – | | | | |
| 2. Sense of power[b] | – | – | 0.00 | – | | | |
| 3. Contemplation[b] | – | – | 0.00 | 0.00 | – | | |
| 4. Depletion | 3.87 | 1.24 | 0.70** | −0.17* | 0.00 | – | |
| 5. Unethical behavior[b,c] | 0.41 | 0.49 | −0.08 | −0.08 | −0.13 | 0.15† | – |

[a] $n$ = 160.
[b] The correlations between Variables 1 through 3 and Variable 5 are tetrachoric.
[c] Unethical behavior coded as 0 = being honest, 1 = being unethical.
* $p$ < .05.
** $p$ < .01.
† $p$ < .10.

### 6.2. Hypotheses tests

Means, standard deviations, and correlations among the variables of interest are included in Table 1. Before testing the moderating effects, we tested the indirect effect of sleep deprivation on unethical behavior via depletion using Preacher and Hayes's (2008) approach. As recommended by Hayes (2013), we estimated the indirect effects using unstandardized coefficients and utilized bootstrapping procedures with 10,000 resamples to place 95% confidence intervals around the estimates of the indirect effects. Bootstrapping procedure provides evidence of mediation if the bias-corrected 95% confidence interval (CI) does not include zero. Supporting Hypothesis 1, results indicated a significant indirect effect of sleep deprivation on unethical behavior through depletion (*indirect effect* = 1.30, *Boot SE* = 0.39, 95% CI = 0.62, 2.12).

Hypothesis 2 predicted that sense of power would moderate the relationship between sleep deprivation and depletion such that a high sense of power would attenuate the effect of sleep deprivation on depletion. The results of a two-way analysis of variance indicated a significant interactive effect between sleep deprivation and sense of power on depletion ($F_{(1, 156)}$ = 5.66, $p$ = .02, $\eta_p^2$ = 0.04). As shown in Fig. 2, a high sense of power attenuated the effect of sleep deprivation on depletion ($M$ = 4.36, $SD$ = 1.15) as compared to a low sense of power ($M$ = 5.10, $SD$ = 0.66, $t_{78}$ = 3.53, $p$ = .001, $d$ = 0.79). In contrast, when participants were not sleep deprived, there was not a significant difference in mean depletion levels between those with a high sense of power ($M$ = 2.96, $SD$ = 0.75) and those with a low sense of power ($M$ = 3.05, $SD$ = 0.79, $t_{78}$ = 0.54, $p$ = .59, $d$ = 0.12). Thus, Hypothesis 2 was supported.

Hypothesis 3 predicted that the mediated relationship between sleep deprivation, depletion, and unethical behavior would be significantly attenuated when sense of power was high. Moderated mediation occurs when the strength of the mediated effect depends on the level of a third variable (Preacher, Rucker, & Hayes, 2007). To test stage

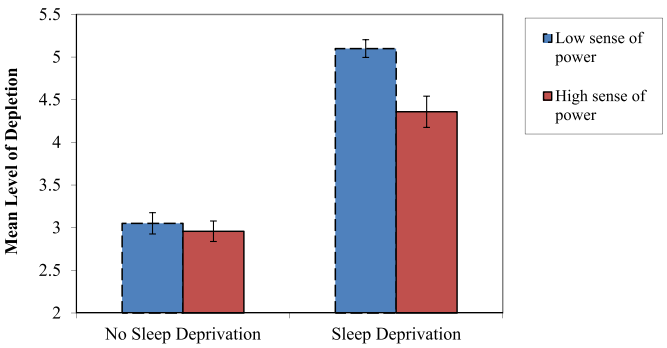


**Fig. 2.** The effects of the interaction between sleep deprivation and sense of power on depletion in Study 1. Error bars represent ± 1 *SE*.

[6] In order to ensure that our manipulation of sense of power was operating in the intended fashion, we collected additional data from a sample of 86 undergraduate students using procedures mimicking the non-sleep deprivation conditions in the original laboratory setting. Participants completed the same leadership questionnaire and series of computerized decision making tasks. They were told that based on their responses they were being assigned to either a high or low power role and then completed a 10-item measure of sense of power. This measure was developed by Morrison, See, and Pan (2015) and contains 10 power-related adjectives (e.g., in-control, in-charge, influential, etc.). Results indicated that participants felt more powerful in the high power condition ($M$ = 5.30, $SD$ = 0.95) than in the low power condition ($M$ = 3.68, $SD$ = 1.31, $F_{1,85}$ = 43.25, $p$ < .001, $d$ = 1.42). To further confirm we were indeed manipulating sense of power, we also measured participants' self-esteem and mood. For self-esteem, we used a 20-item scale from Heatherton and Polivy (1991). For mood, we used the 16-item Brief Mood Introspection Scale (BMIS). Results indicated that there were no significant differences between the two power conditions on self-esteem ($F_{1,85}$ = 1.05, $p$ = .31) or mood ($F_{1,\ 85}$ = 0.01, $p$ = .92), indicating that our power manipulation did not substantially affect participants' self-esteem or mood.

[7] The instructions page informed participants about the nature of this paired decision task and that they would be placed in the role of either the Sender or the Decider. However, at this point participants were not told what role they were placed in or what the payouts would be. Consequently, the time spent on this instructions page is not reflected in the time spent on the task. Next, participants proceeded to a page where they were informed regarding the role that they were assigned to. They also received information related to the payouts as well as the two messages that they were able to send. Participants were instructed to read all of this information (held constant across conditions) before making their decision at the bottom of the page. This explains why participants on average took several minutes to complete this task.

[8] To examine whether our manipulation of contemplation in terms of time spent on this task actually influenced participants' perceived degree of contemplation, we recruited a separate sample of 107 undergraduate participants, gave them an identical set of instructions, and introduced the same manipulation of contemplation. Immediately after completing the task, we asked participants rate their agreement with four items assessing the degree of contemplation related to their decision on this task. A sample item was "Before sending a message, I engaged in a great deal of contemplation" (1 — *strongly disagree* to 7 — *strongly agree*, α = 0.89). As expected, mean contemplation was higher in the high contemplation condition ($M$ = 4.74) than in the low contemplation condition ($M$ = 4.14, $t_{105}$ = 2.21, $p$ = .03, $d$ = 0.43). We also asked participants to rate their agreement with four items assessing the degree of impulsivity associated with their decision on this task. A sample item was "I sent the message quickly with little thought" (1 — *strongly disagree* to 7 — *strongly agree*, α = 0.88). As expected, mean impulsivity was higher in the low contemplation condition ($M$ = 3.96) than in the high contemplation condition ($M$ = 3.21, $t_{105}$ = 2.78, $p$ < .01, $d$ = 0.54).

one moderated mediation, we used Model 7 in the SPSS PROCESS macro developed by Hayes (2013). Following Preacher et al.'s (2007) recommendation, we computed the estimates, standard errors, and significance values of the conditional indirect effects for sleep deprivation across high and low levels of sense of power. Specifically, we estimated the conditional indirect effect of sleep deprivation on unethical behavior through depletion for both high and low sense of power using unstandardized coefficients and bootstrapping with 10,000 resamples to place 95% confidence intervals around estimates of the indirect effects. Evidence of moderated mediation exists if the estimates of the indirect effects transmitted through the mediator variable are significantly different across levels of the moderator variable as indicated by a significant interaction (Preacher et al., 2007). Moderated mediation can occur either when there is a significant interaction effect in which mediation exists at some levels of the moderator but not at others, or when mediation effects are present at multiple levels of the moderator, but these effects are significantly stronger or weaker across levels (Edwards & Lambert, 2007; Preacher et al., 2007). Results indicated that the indirect effect of sleep deprivation on unethical behavior through depletion was significantly attenuated when sense of power was high (*indirect effect* = 1.06, *Boot SE* = 0.34, 95% CI = 0.52, 1.84) as compared to when sense of power was low (*indirect effect* = 1.55, *Boot SE* = 0.48, 95% CI = 0.71, 2.56). This is indicated by the significant interaction between sleep deprivation and sense of power ($B = -0.65$, $SE = 0.27$, $t = 2.38$, $p = .02$) and the significant index of moderated mediation (*index* = −0.49, *Boot SE* = 0.28, 95% CI = −1.17, −0.07). Thus, Hypothesis 3 was supported.

Hypothesis 4 predicted that contemplation would attenuate the effect of depletion on unethical behavior. The results of a logistic regression indicated a significant interactive effect between depletion and contemplation on unethical behavior ($z = -2.65$, $p = .01$). As shown in Fig. 3, the slope of the effect of depletion on unethical behavior was positive and significant when contemplation was low ($B = 0.56$, $SE = 0.19$, $z = 2.89$, $p < .01$) and negative but non-significant when contemplation was high ($B = -0.11$, $SE = 0.20$, $z = -0.55$, $p = .58$). Hypothesis 4 was thus supported.

Hypothesis 5 predicted that the mediated relationship between sleep deprivation, depletion, and unethical behavior would be attenuated by contemplation. To test stage two moderated mediation, we used Model 14 in SPSS PROCESS (Hayes, 2013). Specifically, we estimated the conditional indirect effect of sleep deprivation on unethical behavior through depletion with both high and low contemplation using unstandardized coefficients and bootstrapping with 10,000 resamples to place 95% confidence intervals around estimates of the indirect effects. The indirect effect of sleep deprivation on unethical behavior through depletion was significantly reduced when contemplation was high (*indirect effect* = 0.70, *Boot SE* = 0.50, 95% CI = −0.25, 1.72) as compared to when contemplation was low (*indirect effect* = 1.71, *Boot SE* = 0.46, 95% CI = 0.90, 2.68), as indicated by the significant interaction between depletion and contemplation

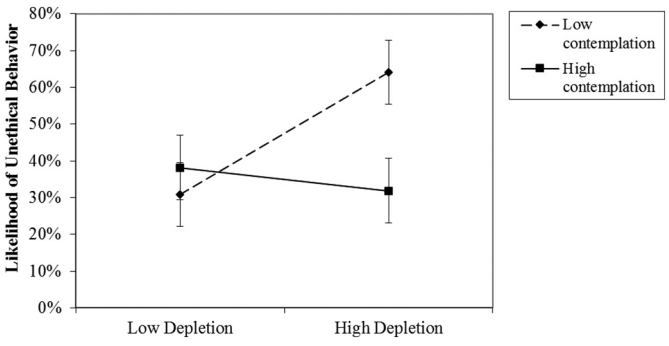


**Fig. 3.** The effects of the interaction between depletion and contemplation on unethical behavior in Study 1. Error bars represent ± 1 *SE*.

($B = -0.59$, $SE = 0.29$, $z = -2.05$, $p = .04$) as well as the significant index of moderated mediation (*index* = −1.01, *Boot SE* = 0.52, 95% CI = −2.06, −0.01). Therefore, Hypothesis 5 was supported.

Finally, we tested the full model as predicted by Hypothesis 6 with depletion mediating the effects of sleep deprivation on unethical behavior, sense of power moderating the effects of sleep deprivation on depletion, and contemplation moderating the effects of depletion on unethical behavior. We used Model 21 in SPSS PROCESS with a logistic model of estimation (Hayes, 2013) and estimated the conditional indirect effect of sleep deprivation on unethical behavior through depletion with both high and low sense of power and with both high and low contemplation using unstandardized coefficients and bootstrapping with 10,000 resamples to place 95% confidence intervals around estimates of the indirect effects. As shown in Tables 2 and 3, we found significant interactions between sleep deprivation and sense of power in predicting depletion ($B = -0.65$, $SE = 0.27$, $t = -2.38$, $p = .02$) and between depletion and contemplation in predicting unethical behavior ($B = -0.59$, $SE = 0.29$, $z = -2.05$, $p = .04$), providing evidence of moderated mediation at two different points along the causal chain. Supporting Hypothesis 6, the condition in which both sense of power and contemplation were low produced the strongest indirect effect (*indirect effect* = 2.03, *Boot SE* = 0.58, *95% CI* = 1.04, 3.25). Thus, these findings supported our hypothesized model.[9]

## 7. Study 1 discussion

Study 1 provides support for the hypothesized moderated mediation model by manipulating sleep deprivation, sense of power, and contemplation in a controlled environment. Our findings demonstrated that sense of power and contemplation attenuated the indirect effect of sleep deprivation on unethical behavior via depletion. Consistent with ISCT, we found that control capacity (sleep deprivation), control motivation (sense of power), and control effort (contemplation) all played important roles in terms of understanding the ethical consequences of sleep deprivation. To replicate and extend these findings, we conducted two follow up studies.

## 8. Study 2 methods

### 8.1. Participants and design

This study was conducted with a sample of 172 participants recruited through Amazon Mechanical Turk. The average age of participants was 36.8 (*SD* = 10.6), and 51% were female. The sample consisted primarily of working adults with 66.9% employed full-time, 10.5% employed part-time, 11.0% self-employed, and 11.6% currently unemployed. Participants first reported their sleep quality, sleep quantity, and sense of power. We then had participants complete several filler scales to add a degree of separation prior to our assessment of depletion. Following the filler scales, participants reported their level of depletion. The entire study lasted approximately 20 min and participants received $3 for their participation.

### 8.2. Measures

#### 8.2.1. Sleep quality

We measured sleep quality by asking participants how well they slept last night on a 5-point scale (1 — *not well at all* to 5 — *extremely well*; Westerberg et al., 2010).

#### 8.2.2. Sleep quantity

We measured sleep quantity by asking participants to report the number of hours they slept last night (Monk et al., 1994).

[9] All results remained significant when controlling for demographic information.

**Table 2**
Coefficient estimates for the moderated mediation model for unethical behavior.

| Variable | First stage (dependent variable = depletion) | | | | | | Second stage (dependent variable = unethical behavior) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Step 1 | | | Step 2 | | | Step 1 | | | Step 2 | | |
| | *B* | *SE* | *t* | *B* | *SE* | *t* | *B* | *SE* | *Wald* | *B* | *SE* | *Wald* |
| Constant | 3.21 | 0.12 | 26.85** | 3.05 | 0.14 | 22.41** | | | | | | |
| Sleep deprivation | 1.73 | 0.14 | 12.49** | 2.05 | 0.19 | 10.64** | | | | | | |
| Sense of power | −0.42 | 0.14 | −3.02** | −0.09 | 0.19 | −0.48 | | | | | | |
| Sleep deprivation × sense of power | | | | −0.65 | 0.27 | −2.38* | | | | | | |
| Constant | | | | | | | −2.19 | 0.71 | 9.44** | −3.22 | 0.92 | 12.20** |
| Sleep deprivation | | | | | | | 1.66 | 0.53 | 9.77** | 1.57 | 0.54 | 8.45** |
| Depletion | | | | | | | 0.75 | 0.22 | 11.99** | 0.99 | 0.26 | 14.75** |
| Contemplation | | | | | | | 0.52 | 0.34 | 2.37 | −1.77 | 1.17 | 2.31 |
| Depletion × contemplation | | | | | | | | | | −0.59 | 0.29 | 4.20* |
| $R^2$/Total Nagelkerke $R^2$ | | 0.51 | | | 0.53 | | | 0.14 | | | 0.17 | |
| $\Delta R^2$/Δ Nagelkerke $R^2$ | | | | | 0.02 | | | | | | 0.03 | |
| $\Delta F/\Delta\chi^2$ | | | | | 5.66* | | | | | | 4.33* | |

*Note.* $N = 160$. Unstandardized regression coefficients are reported. In the first stage of the moderated mediation model, $R^2$, $\Delta R^2$, and $\Delta F$ are reported; in the second stage, Total Nagelkerke $R^2$, ΔNagelkerke $R^2$, and $\Delta\chi^2$ are reported.
* $p < .05$.
** $p < .01$.

**Table 3**
95% confidence interval (CI) results for the conditional indirect effects on unethical behavior.

| Condition | Indirect effect | SE | *Boot LL 95% CI* | *Boot UL 95% CI* |
|---|---|---|---|---|
| Low power, low contemplation | 2.03 | 0.58 | 1.04 | 3.25 |
| Low power, high contemplation | 0.84 | 0.60 | −0.28 | 2.09 |
| High power, low contemplation | 1.39 | 0.41 | 0.70 | 2.28 |
| High power, high contemplation | 0.57 | 0.41 | −0.18 | 1.43 |

*Note.* Unstandardized regression coefficients are reported. Bootstrap sample size 10,000. LL = lower limit; UL = upper limit.

### 8.2.3. Sense of power

We measured sense of power with Morrison, See, and Pan's (2015) 10-item scale. Sample items included "I feel powerful" and "I feel influential" (1 — *strongly disagree* to 7 — *strongly agree*; α = 0.93).

### 8.2.4. Depletion

As in Study 1, we measured depletion using the 25-item state ego depletion scale (Ciarocco et al., 2007; 1 — *strongly disagree* to 7 — *strongly agree*; α = 0.98).

### 8.2.5. Reward sensitivity

Sense of power has been linked to increased reward sensitivity (Keltner et al., 2003). Therefore, we measured participants' reward sensitivity in order to examine potential alternate explanations for our findings. Specifically, we used the 5-item BAS reward responsiveness scale (Carver & White, 1994; 1 — *strongly disagree* to 7 — *strongly agree*; α = 0.89).

### 8.2.6. Positive and negative affect

We assessed positive and negative affect to ensure that our findings were associated with the theorized mechanisms related to control capacity, control motivation, and control effort rather than being driven by affective processes. We used the short form measure of the PANAS-X scale to assess participants' affect with 5 items capturing positive affect and 5 items capturing negative affect (Mackinnon et al., 1999; Watson & Clark, 1994; 1 = *very slightly or not at all*; 7 = *extremely*; α = 0.88; 0.94).

**Table 4**
Means, standard deviations, and correlations among Study 2 variables.[a]

| Variable | M | SD | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| 1. Sleep quality | 3.32 | 1.01 | – | | | |
| 2. Sleep quantity | 6.85 | 1.45 | 0.47* | – | | |
| 3. Sense of power | 4.81 | 1.28 | 0.21* | 0.01 | – | |
| 4. Depletion | 2.93 | 1.31 | −0.25* | −0.11 | −0.56* | – |

[a] $n = 172$.
* $p < .05$.

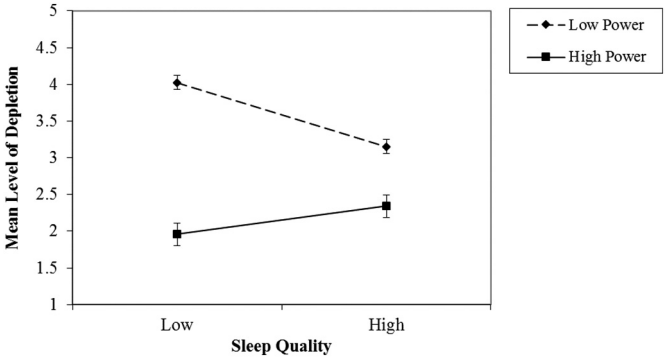


**Fig. 4.** The effects of the interaction between sleep quality and sense of power on depletion in Study 2. Error bars represent ± 1 *SE*.

## 9. Study 2 results

Means, standard deviations, and correlations among the variables of interest are included in Table 4. We tested the interaction between sleep quality and sense of power on depletion and found a significant interaction ($t_{170} = 4.25$, $p < .001$, $d = 0.65$). As show in Fig. 4, simple slopes revealed that sense of power attenuated the effects of low sleep quality on depletion. Specifically, when sense of power was low, reduced sleep quality led to increased depletion ($t_{167} = -4.38$, $p < .001$, $d = -0.68$), but when sense of power was high this effect was attenuated ($t_{162} = 1.61$, $p = .11$, $d = 0.25$). We also tested the interaction between sleep quantity and sense of power on depletion and found a significant interaction ($t_{170} = 3.02$, $p < .01$, $d = 0.46$). As

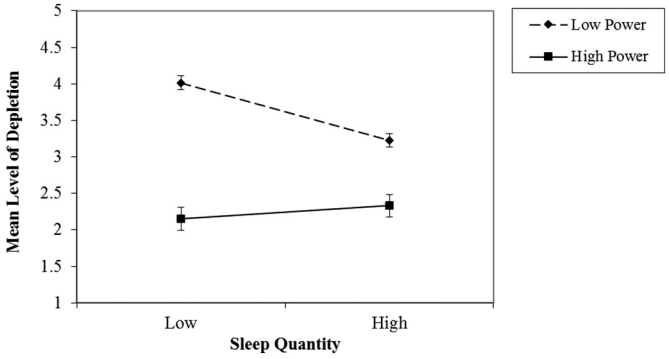


**Fig. 5.** The effects of the interaction between sleep quantity and sense of power on depletion in Study 2. Error bars represent ± 1 *SE*.

show in Fig. 5, simple slopes revealed that sense of power also attenuated the effects of low sleep quantity on depletion. Specifically, when sense of power was low, reduced sleep quantity led to increased depletion ($t_{167} = -3.32$, $p < .01$, $d = -0.51$), but when sense of power was high this effect was attenuated ($t_{162} = 0.83$, $p = .41$, $d = 0.13$). Our results were robust to the inclusion of reward sensitivity, positive and negative affect, and demographics as controls. Thus, following recommendations for the appropriate use of statistical controls (Becker, 2005; Carlson & Wu, 2012), we did not retain any of these variables in the final analyses.

## 10. Study 2 discussion

Study 2 provides additional evidence that a high sense of power can attenuate the relationship between sleep deprivation and depletion. Specifically, we found evidence of a significant interaction between sense of power and both sleep quality and sleep quantity in terms of attenuating depletion. These findings with a non-student sample outside of the laboratory provide added support for our model. Consistent with ISCT, depletion appears to be influenced not only by factors that affect control capacity such as low sleep quality and quantity, but also by factors that influence control motivation such as sense of power.

## 11. Study 3 methods

### 11.1. Participants and design

This study was conducted as a computerized experiment with random assignment. We recruited 118 individuals from the participant pool at the business school of a large public university and Amazon Mechanical Turk to complete the study online.[10] The average age of participants was 29.6 (*SD* = 10.6), and 35% were female. Participants first reported their sleep quality and quantity. The manipulation of contemplation was then introduced.[11] We then measured unethicality by providing participants with an ethics-related managerial decision making scenario. The entire study lasted approximately 20 min. Undergraduates recruited from the participant pool received course credit for their participation and participants who did not receive course credit were paid $3 for their participation.

### 11.2. Manipulations and measures

#### 11.2.1. Sleep quality

As in Study 2, we measured sleep quality by asking participants how well they slept last night on a 5-point scale (1 — *not well at all* to 5 — *extremely well*; Westerberg et al., 2010).

#### 11.2.2. Sleep quantity

As in Study 2, we measured sleep quantity by asking participants how many hours they slept last night (Monk et al., 1994).

#### 11.2.3. Contemplation

We manipulated contemplation by providing participants with a managerial decision making task from Gino and Ariely (2012). Participants were instructed to put themselves in the role of Steve, an operations manager at a firm that produces pesticides and fertilizers for lawns and gardens. Steve knows that a certain toxic chemical is going to be banned in a year. As a result, the chemical is extremely cheap right now and can be bought and used immediately to make a substantial profit. In the low contemplation condition, participants were instructed simply to read and respond to this scenario. In the high contemplation condition, we instructed participants to engage in a few minutes of contemplation prior to responding. Specifically, participants were told to focus their attention on this task for the next few minutes as they thought about what to do. We then gave participants a minimum of 3 min to engage in contemplation before they were able to respond to the scenario. During this period, we provided participants with a text box and asked them to record some of the things that they were thinking about regarding this task. Once the decision making task was over, we asked participants how much contemplation they had engaged in when making their decision with four items. Sample items included "When completing this task, I engaged in a great deal of contemplation" and "When completing this task, I thought carefully about what to do" (1 — *strongly disagree* to 7 — *strongly agree*; α = 0.93). As expected, participants in the high contemplation condition reported engaging in higher levels of contemplation ($M = 4.44$, $SD = 1.44$) than their counterparts in the low contemplation condition ($M = 2.63$, $SD = 1.36$, $t_{116} = 7.01$, $p < .001$, $d = 1.30$).

#### 11.2.4. Unethical decision making

Following the contemplation manipulation, participants were asked to respond to this decision. Specifically we asked participants, "If you were Steve, how likely is it you would use this chemical while it is still legal?" We assessed unethicality based on participants reporting the likelihood that they would use this toxic chemical while it was still legal (1 — *not at all likely* to 7 — *very likely*).

#### 11.2.5. Positive and negative affect

As in Study 2, we assessed positive and negative affect to ensure that our findings were associated with the theorized mechanisms related to control capacity, control motivation, and control effort rather than being driven by affective processes using the short form measure of the PANAS-X scale (Mackinnon et al., 1999; Watson & Clark, 1994; 1 = *very slightly or not at all*; 7 = *extremely*; α = 0.89; 0.92).

## 12. Study 3 results

Means, standard deviations, and correlations among the variables of interest are included in Table 5. As predicted, we found a significant interaction between sleep quality and contemplation on unethical decision making ($t_{116} = 2.10$, $p = .04$, $d = 0.39$; see Fig. 6). A test of the simple slopes revealed that when sleep quality was low, contemplation trended toward a reduction in unethicality ($t_{60} = 1.80$, $p = .07$, $d = 0.46$), however when sleep quality was high, contemplation had a smaller effect ($t_{56} = -1.26$, $p = .21$, $d = -0.34$). We did not find evidence of a significant interaction between sleep quantity and contemplation on unethical decision making ($t_{116} = 0.38$, $p = .70$, $d = 0.07$). Our results were robust to the inclusion of positive and negative affect and demographics as controls. Thus, following recommendations for the appropriate use of statistical controls (Becker,

[10] There was not a significant difference between these groups in terms of our dependent variable of unethical decision making.

[11] There were 61 participants in the high contemplation condition and 57 participants in the low contemplation condition.

**Table 5**
Means, standard deviations, and correlations among Study 3 variables.[a]

| Variable | M | SD | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| 1. Sleep quality | 3.16 | 0.99 | – | | | |
| 2. Sleep quantity | 6.69 | 1.35 | 0.38* | – | | |
| 3. Contemplation | – | – | −0.12 | −0.07 | – | |
| 4. Unethicality | 3.34 | 2.21 | 0.08 | −0.04 | −0.14 | – |

[a] $n = 118$.
* $p < .05$.

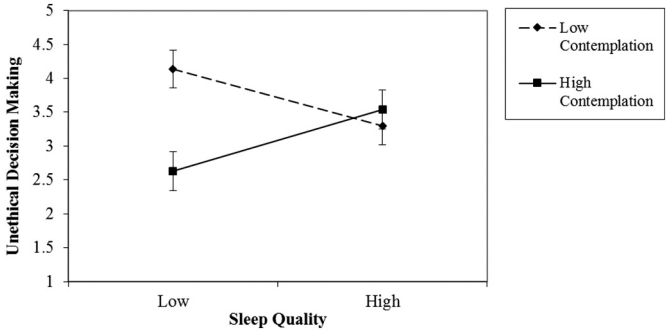


**Fig. 6.** The effects of the interaction between sleep quality and contemplation on unethical decision making in Study 3. Error bars represent ± 1 *SE*.

2005; Carlson & Wu, 2012), we did not retain any of these variables in the final analyses.

## 13. Study 3 discussion

Study 3 provides additional evidence regarding the role of contemplation in attenuating the link between sleep deprivation and unethical behavior. By using natural variation in sleep quality, we demonstrated that contemplation has the potential to impact ordinary individuals who may have slept poorly but were not completely sleep deprived. However, we did not find evidence of an interaction between sleep quantity and contemplation on unethical decision making. Barnes et al. (2015) similarly reported significant effects associated with sleep quantity but not sleep quality and suggested one reason is that natural variation in sleep quantity is limited. Indeed, less than 20% of our sample was sleep deprived based on the threshold of less than 6 h established by Christian and Ellis (2011). We thus encourage future research examining both sleep quality and sleep quantity rather than relying on only one of these constructs to capture sleep deprivation.

## 14. General discussion

Research has consistently found that sleep deprivation leads to increased unethical and deviant behavior, due to decrements in self-regulatory resources (Barnes et al., 2011; Christian & Ellis, 2011; Welsh et al., 2014). Despite early theorizing indicating that depletion involves both reduced capacity and willingness to exert self-control (Baumeister et al., 1998), most empirical studies have emphasized the physiological effects of sleep in terms of diminished control capacity while ignoring psychological factors such as sense of power and effortful interventions such as contemplation. Through an integration of ISCT, we move beyond ego depletion to examine a more nuanced, process-based view of self-control. Specifically, we identified two critical contingencies associated with control motivation and control effort that shape the self-regulatory process. Drawing on control motivation, our results indicated that sense of power moderated the effects of sleep deprivation on depletion, such that a high sense of power mitigated the negative effect of sleep deprivation. Drawing on control effort, we found that contemplation moderated the effects of depletion on unethical behavior by mitigating the negative effect of depletion. As a result, the mediated model linking sleep deprivation, depletion, and unethical behavior was weaker for individuals with a high sense of power who engaged in higher levels of contemplation. We believe that our results can add to several different streams of research in the literature.

A number of studies have shown that powerful people tend to act in a self-interested, agentic fashion (e.g., Galinsky et al., 2003; Galinsky, Magee, Inesi, & Gruenfeld, 2006), which would suggest that power does indeed corrupt and powerful people may be more likely to act in an unethical manner. However, there are a number of cognitive changes that occur when people believe that they possess high levels of power, some of which can be beneficial in certain situations. Specifically, our integration of the power literature with ISCT indicated that high sense of power increases control motivation thereby attenuating the depleting effect of reduced control capacity due to sleep deprivation. We feel that our results have important implications for the power literature. For example, powerful individuals may similarly feel buffered against the effects of other activities that can reduce control capacity such as long work hours or stressful working conditions. As a result, they may be less likely to engage in unethical behavior. Practically, this would suggest that those who feel powerful in the positions they occupy may be better able to handle particularly difficult and depleting tasks at work.

Extending ISCT, our results build on emerging evidence suggesting that the self-regulatory process can be augmented by psychological perceptions. Several studies have shown that self-regulation can be optimized or enhanced by increasing perceived – rather than actual – resource availability, or by altering one's expectation that self-regulatory depletion is deleterious (Clarkson et al., 2010; Martijn et al., 2002). In this sense, research is beginning to extend beyond the ego depletion framework to suggest that psychological factors associated with control motivation also play a central role in terms of self-regulation. Our study is the first to show that sense of power can reduce the depletion effect. In the workplace, a leader who makes an employee feel powerful when assigning him or her a depleting task may help to increase control motivation thereby creating a buffer against the deleterious effects of depletion whereas a boss who undercuts the power of a subordinate may exacerbate this person's susceptibility to depletion by reducing control motivation.

Regarding task type, researchers are confident enough of the link between depletion and unethical behavior to suggest that using different types of unethical tasks would only serve to strengthen the effects of depletion on unethical behavior (Gino et al., 2011). Our findings suggest that there might be more to the picture than meets the eye. Theory and research in the self-regulation literature indicates that depletion can make individuals more susceptible to acting on their impulses. In such cases, additional control effort is necessary to align one's behaviors with higher order goals. For depleted individuals, interventions increasing contemplation may be critical to reversing the deleterious effects associated with reduced control capacity. In practice, interventions that stimulate contemplation may be beneficial for employees who are sleep deprived or depleted. For example, a supervisor with sleep deprived subordinates might regularly remind them to think carefully about their decisions and might give them extra time to do so rather than forcing them to make rushed and potentially impulsive choices. Or, a supervisor might explicitly build contemplation into the decision making process by asking employees to briefly explain certain decisions and their associated rationales to the supervisor before proceeding. People similarly benefit by recognizing that when they are worn down, it might be better to take some time to deliberate on important decisions and “sleep on it” before deciding. Additionally, our findings related to sleep quality suggest that contemplation is important not only for individuals experiencing an entire night of sleep deprivation but even for individuals suffering from reduced sleep quality on a given day.

Additionally, other effortful interventions that could influence control effort should be considered in future research. Based on ISCT,

there is no reason to believe that the effects of control effort would be limited to operationalizations associated with contemplation. Other interventions that cause an individual to engage prefrontal brain systems in a more effortful way might have similar effects. In contrast, interventions that lead individuals to want to save their effort for upcoming tasks might have an opposite effect in terms of control effort. As Lian et al. (2018) recently observed, there is currently very little research on factors associated with control effort and additional research is needed in this area.

We also think that psychological variables that are potentially related to depletion present interesting opportunities in terms of influencing control motivation. For example, recent research has demonstrated that enacting justice can be both depleting and replenishing depending on the type of justice enacted. Similarly, being the recipient of various forms of fair or unfair treatment may have depleting or replenishing effects. The motivating effect of performance goals may also influence one's control motivation. Although some research has shown a dark side associated with goal setting (Schweitzer, Ordóñez, & Douma, 2004), from an ISCT perspective certain goals may actually increase ethical behavior when faced with temptation by enhancing control motivation.

Although this study manipulated two key moderators based on ISCT, measuring individual differences as boundary conditions of this mediated model represents an important direction for future research. For example, individuals high on moral attentiveness or moral identity might be more likely to engage in contemplation. Those with a strong internal locus of control might experience a stronger sense of power when making ethics-related decisions. Similarly, individual differences associated with self-regulation such as contentiousness, or trait mindfulness might buffer against the negative effects of depletion. Additionally, certain contextual factors may play an important role in influencing constructs related to ISCT. For example, our studies involved tasks that were not particularly threatening to participants. However, sense of power might operate differently in a threatening environment in which the vigilance and monitoring by those with a low sense of power is high. In sum, examining the moderating role of certain individual differences and contextual factors represents an important future direction for research examining the ethical consequences of sleep deprivation.

Another route that could yield interesting theoretical development in the area of sleep science and research on self-regulation is related to the measurement of degradation over time. In Study 1, we brought participants into a controlled environment and used research assistants to ensure that they remained awake (following the protocols of Christian & Ellis, 2011 and Welsh et al. 2014). However, methodologies employing sleep actigraph devices, psychomotor vigilance tests, and repeated sleepiness measures may shed additional light on the trajectory of resource degradation. In terms of sleep deprivation, research shows that neurocognitive performance and psychomotor skills degrade up to a point as sleep loss increases (e.g., Belenky, et al., 2003; Durmer & Dinges, 2005). Not only would studies of this nature shed light on the trajectory of degradation — for example, does depletion occur incrementally, is there a tipping point, or does it compile exponentially — but it would provide insight into the timing of potential remedies and interventions for restoration at critical points.

Finally, we should note that our work is not without limitations. Although we conducted multiple studies with different samples, manipulations, and measures to increase the robustness of our findings, each study possessed certain limitations. Specifically, we relied on reported sleep quality and quantity in Study 2 and Study 3 rather than manipulating sleep deprivation. In Study 3, we found a significant effect associated with sleep quality but not sleep quantity. Based on similar studies measuring both sleep quantity and sleep quality, it appears that effects are often stronger for sleep quality than for sleep quantity (e.g., Barnes, Gunia, & Wagner, 2015) and we encourage future research to explore the similarities and differences associated with measures of sleep quality and sleep quantity. Additionally, our focus in these studies was to test the effects of sleep deprivation with each moderator to shed additional light on the distinct components of ISCT rather than focusing on moderated mediation models associated with depletion as we did in Study 1. Nevertheless, the findings of Study 2 and Study 3 provide added support to our laboratory experiment by suggesting that these results may be relevant to regular individuals and not merely those who are completely sleep deprived. Another limitation of our work involved our manipulation of sense of power in Study 1. Although we modeled our manipulation after past work (e.g., Jordan et al., 2011), we recognize that such manipulations cannot capture the high sense of power felt by individuals such as presidents or CEOs. Very high levels of power might further strengthen our findings related to power, or it is also possible that future research might identify a curvilinear effect associated with sense of power such that at very high levels of power (such as among top management teams) the effects of power begin to cut in the opposite direction. Additionally, in an online supplemental study we found a significant relationship between reported sense of power and control motivation, as well as a non-significant relationship that trended in the expected direction between manipulated sense of power and control motivation. Controlling for control capacity and control effort in a regression strengthened this effect and suggested that the manipulation of sense of power developed by Jordan et al. (2011) may not be completely clean with regard to related constructs. We encourage future research to further examine the relationship between sense of power and control motivation using additional measures and manipulations. In terms of our contemplation manipulation in Study 1, we followed previous research in using time spent on a decision as an unintrusive and objective proxy for contemplation. However, future research might use fMRI technology to examine the extent to which different manipulations of contemplation explicitly activate areas of the brain associated with cognition and deliberation.

## 15. Conclusion

Sleep has been implicated as an important driver of unethical behavior due to the depleting effects of deprivation. Our study supports this general conclusion, but suggests that, while control capacity is important, control motivation and control effort need to be included if we wish to paint a more complete picture of the self-regulatory effects of sleep on unethical behavior. In doing so, our work highlights the importance of considering power and contemplation in the ethical decision-making process. While power may corrupt in its direct effects on unethical behavior, it can also buffer against the effect of sleep deprivation on depletion. While depletion creates problems for spur-of-the-moment unethical decisions, depletion is less problematic for those with a high sense of power who thoughtfully contemplate their actions. We hope that our findings will encourage future research extending ISCT through an illumination of the critical boundary conditions associated with the self-regulatory model of sleep and unethical behavior.

## Open Practices

The studies in this article earned the Open Data badge for transparent practices. Data for the studies are available at https://data.mendeley.com/submissions/evise/edit/rh22h25sw7?submission_id=S0022-1031(17)30623-6&token=3639d213-5e0d-437d-af76-0023d5b2081a.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jesp.2018.01.007.

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