Positive and Negative Interaction Effects of Assigned Conscious Goals and Primed Subconscious Goals on Task Performance and a Mediating Role of Cognitive Load

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Abstract

Filtering out what is needed for adaptive self-regulation in the present is irreplaceable in the hustle and bustle of modern organizations. The capacity of this type of cognitive processing, however, is limited because it developed slowly in evolutionary terms. Elevated employee cognitive load in the workplace, juxtaposed against the fact that human conscious capacity adapts at a snail's pace, creates a paradox to be conceptually reconciled. Alignment of these convergences presents a practical challenge for managers. An open-loop created by dissonance between increasing cognitive load and limited human conscious capacity is unlikely to be closed by reducing demands or simplifying mental processes. To maintain a competitive advantage, cognitive automation of employee processing is needed in organizations now more than ever.

Said differently, the future may bring brain-boosting power via artificial designer-minds, where brains are upgraded with genetic modifications or with 3D-printing of Bio-bots that have younger brain components. The effectiveness of blending human minds with artificial "intelligence" in organizations, however, is untested, to say nothing of it being morally questionable. Theoretically, it is unclear why organizations spend so much attention and dollars on artificial processing of information when human processing of copious capacity is staring them in the face. That is, across three experiments (N = 748), I find that subconscious goals not only improve performance, but they do so without consuming limited mental resources. Thus, subconscious processing can remedy this paradox to provide a competitive advantage at no cost.

Apropos, I build on the first empirical attempt to connect goal theory and priming of subconscious goals by Stajkovic, Locke, and Blair (2006) and push this theory forward by examining the following research questions. First, are there positive and negative interaction effects of congruent and incongruent conscious and subconscious goals on performance? Second, do congruent subconscious goals reduce cognitive load relative to conscious goals? Do incongruent subconscious goals increase it? Third, is cognitive load a mediating mechanism of interaction performance effects? Taken together, findings from these three experiments reveal that cognitive "savings" can be garnered with congruent subconscious goals, but subconscious goals can also cause goal derailment if they are incongruent with conscious pursuits.[1]

[1] The format of this dissertation follows American Psychological Association Publication Manual, sixth edition. Any deviations from it are due to University of Wisconsin-Madison dissertation formatting rules.

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Contents

Chapter 1: Introduction

Increased Cognitive Load at Work and Need for New Theory Development

Wrenching changes confront contemporary organizations (Zedeck, 2010). Because these changes require an unparalleled makeover, employees increasingly fear if they can handle it all (Stajkovic, Lee, Greenwald, & Raffie, 2015). Simply put, work is more cognitively complex than it was 30 years ago (Dirsmith, Covaleski, & Samuel, 2015). Job responsibilities that were once unidimensional are now multifaceted (Bhattacharya, Gibson, & Doty, 2005). An emphasis on short-term competitive goals has shorted the gap between technological innovation and its organizational adaptation (Cappelli, 2006; Docherty, Forslin, Shani, & Kira, 2002), requiring new skills to handle new technology (see Cappelli, 2012, for a review of the skills gap).

Many of these emerging demands at work are novel, complex, and require high levels of information processing. Consequently, they are epitomized in tasks that require high levels of cognitive-processing, which increases cognitive load (van Iddekinge, Aguinis, Mackey, & DeOrtentiis, 2018). Increased need for information processing puts pressure on cognitive processing to gauge, allocate, and reallocate resources for optimal performance (Galy, Cariou, & Mélan, 2012; Stajkovic et al., 2015; van Merrienboer & Sweller, 2005). These increased demands can lead to greater accomplishments; but at a certain point people get "…maxed out, overloaded, and finally burned out" (Gustafson, 2005, p. 64). This can lead to anxiety, anger, depression, and exhaustion (Swenson, 2003). Scant research has addressed how to theoretically reconcile elevated cognitive load caused by the increased cognitive complexity of modern jobs (Dahlke & Sacket, 2017) with the simple biological fact that human cognitive capacity adapts at a snail's pace (Postle, 2015). Failure to reconcile this dilemma at work of "Keep up and go into overload. Don't keep up and be let go" (Gustafson, 2005, p. 64), can have costly consequences.

Extant research. Research has examined task attributes as antecedents of cognitive load attributes (e.g., Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Ganster, 2005), as well as several behavioral remedies. These include reducing task switching (if/where possible), receiving less ambiguous and clearer feedback, as well as less negative feedback (supposing managers are cognizant of these preferences), and diminishing the frequency of interruptions (if structurally possible) (DeShon, Brown, & Greenis, 1996). These solutions appear relatively straightforward.

Yet, research continues to show that elevated cognitive load in employees leads to their excessive risk aversion (Benjamin, Brown, & Shapiro, 2013), impulsive behavior (Getz, 2013), unethical choices (Gino, Schweitzer, Mead, & Ariely, 2011), gender stereotyping (van Boven & Robinson, 2012), and impaired judgement (Duffy & Smith, 2014; Sprenger et al., 2011). Given these pervasive negative effects of cognitive load on a host of outcomes, a skeptic may conclude that theories of cognitive load are not being used, not being used properly, or are not working.

What is left unanswered? Extant research on cognitive load at work does not theoretically account for the notion that "Motivational factors play an important role in the allocation of cognitive resources…" (Wood, Bandura, & Bailey, 1990, p. 184). Motivation at work is often represented by a set of cognitive processes pertaining to goals (Kanfer & Chen, 2016), where "a goal is a regulatory mechanism for monitoring, evaluating, and adjusting one's behavior" (Locke & Latham, 2009, pp. 19-20). A goal to which an employee is committed positively affects many outcomes at work (Locke & Latham, 2013; Wright, O'Leary-Kelly, Cortina, Klein, & Hollenbeck, 1994). These findings are one of the most supported in OB research. A survey of business professors rated goal-setting theory first in importance, scientific rigor, and usefulness out of 73 theories (Miner, 2003). Some scholars have even suggested that setting goals is so fundamental to the human way of thinking, that the circumvention of – set a goal and then act – should be considered a violation of rational thinking (Burgeois, 1980).

However, the juxtaposition of goal pursuit and cognitive load in the workplace has created an open theoretical paradox described next.

Theory contribution of this dissertation. In organizations, it is widely agreed that conscious goals are one of the important predictors of work behavior (Locke & Latham, 2002). Goal-setting theory (henceforth, goal theory) conceptualizes goal pursuit as critical in determining what information is attended to, how it is interpreted, and how it is acted on (Audia, Kristof-Brown, Brown, & Locke, 1996; Locke 1982; Locke & Latham, 2004). Although goals are hardly dispensable regulators of performance, when more conscious goals are set, cognitive load increases and can result in poor performance (Kanfer & Ackerman, 1989; Kanfer, Ackerman, Murtha, Dugdale, & Nelson, 1994). This is because goals rely on conscious processing, which is in short supply in the repertoire of human capacities (Bandura, 2001).

That is, even when goals are congruent, multiple conscious goals tax cognitive resources. Prior research has shown that as more resources are directed toward one conscious goal, less remain for other conscious goals (Campion & Lord, 1982; Carver & Scheier, 1981; Kanfer et al., 1994; Kanfer & Kanfer, 1991; Latham & Locke, 1991). Demands on cognitive resources are increased when goals are in conflict, such as when employees pursue multiple goals (Ivancevich 1974, 1976), when a goal is to work simultaneously on several tasks (Erez, Gopher, & Arazi, 1990; Schmidt, Kleinbeck, & Brockmann, 1984), and when new goals differ from prior ones (Erez, Early, & Hullin, 1985). This is because goal deliberations elevate congitive load; the more goals to contemplate, the more draining pursuit becomes. Thus, new theory solutions are needed.

Though valuable, the predictive ability of conscious goals is limited to the extent to which they capture the dynamic processes underlying human cognition (Bargh, 1990; Neisser, 1967). For example, how much conscious control do organizational members have over their behaviors in the workplace? This question has sparked research in social psychology but has garnered less attention in management literature (Latham, Stajkovic, & Locke, 2010). To question the level to which employees control their thoughts and behavior implies that other cognitive agents of control are possible (George, 2009).

Research in social psychology has shown that conscious guidance is not required to regulate all goals, as goal-directed behavior can be automated via priming of subconscious goals (Bargh, 1990). Priming occurs when a situational feature of an environment activates a mental representation of a goal, which automatically triggers goal-directed behaviors that unfold without conscious assistance (Locke, 2015). When goal pursuits are automated (e.g., autopilot, cruise control), it creates considerable functional value because it saves on scarce attentional resources. These resources can then be redirected to activities where they are irreplaceable, e.g., handling unexpected lay-offs. Drawing from this literature, I examine if and how the interaction between primed subconscious and assigned conscious goals affects both cognitive load and performance.

Building on findings in social psychology, research on priming subconscious goals in organizational behavior (OB) has demonstrated that subconsciously primed goals can impact work-related behaviors (Stajkovic, Latham, Sergent, & Peterson, 2018). This research has relied from its inception (see Stajkovic & Locke, 2004) on goal-setting theory (Locke & Latham, 2002) juxtaposed with Bargh's (1990) auto-motive model to guide hypothesis development, research design, and empirical testing. Yet, relying only on these two theories assumes that employee's subconscious goals are formed and activated in the same way as assigned or self-set goals and pursued in the same way as conscious goals (Bargh & Chartrand, 2002). I suggest that this view of automated goal pursuit in organizations is too limited and requires further theory-building nuance. For example, although OB research has demonstrated a relationship between primed subconscious goals and performance, and has begun to evidence mediators and moderators, we still know very little about the boundary conditions of the interactive effects of primed subconscious and assigned conscious goals on employee cognitive load at work.

I proceed as follows. First, I describe how subconscious goals are formed and primed into automatic behaviors (Bargh, 1990). Because priming subconscious goals can both strengthen and weaken task performance (Shantz & Latham, 2009, 2011; Stajkovic, Locke, & Blair, 2006, 2007), I next advance an organizationally-relevant conception of automatic goal pursuit. In particular, I focus on the positive and negative interaction effects of assigned conscious goals and primed subconscious goals on task performance and a mediating role of cognitive load.

Chapter 2: Theory Development

Early Research on Subconscious Associations

Freud (1893, p. 171) suggested that mental associations, such as those between events, objects, and behaviors, can reside in the subconscious; perceptions are first conscious, but then get organized and stored in the subconscious according to their associations with specific context (Breuer, 1895). Why do we store associations in the subconscious? On the one hand, “Nothing which we have once mentally processed can be entirely lost” (Scholy, 1893, p. 409). This is because neural connections among synopses have been formed (Postle, 2015), and, unless they are physically destroyed (see Corkin, 2013), they remain. On the other hand, the conscious mind is too limited to store all human experiences, nor is it meant as a repository (Bargh, 2014).

Instead, there is a constant flow of information between the conscious and subconscious, (James, 1890; Locke, 2015). Although this notion is not new, empirical validation of related theories were not conducted until the early 1980s for at least three reasons. First, general public opinion of Freud’s ideas was misconstrued as a bit devious. As Mills (2004, p. 10) describes:

> One reason why Freud generated such emotive contention is that he shatters our cherished ideals – what we hold most dear … Freud ultimately threatens us with knowledge of ourselves – what we wish to know nothing about at all…

Second, the theoretical dominance of behaviorism (Skinner, 1939; Watson, 1913) as a more scientific approach to human behavior modification was emphasized. Third, early OB (then called Industrial and Organizational Psychology) research focused on more immediately useful tools such as attitude assessments, motivation surveys, and organizational interventions such as designing pay systems and setting goals, among others (Latham et al., 2010).

The Auto-Motive Model

Central to goal pursuit is the assumption that goals are mentally represented as desired end-states (Locke & Latham, 1990) that are encoded and stored in a body of structured knowledge (Bargh & Gollwitzer, 1994; Kruglanski et al., 2002). Knowledge structures represent networks of interrelated concepts and propositions at varying levels of specificity that are organized according to their functional associations (Aarts & Dijksterhuis, 2000; Abelson, 1979; Shah & Kruglanski, 2003). Therefore, goals are directly linked in memory with their facilitative behaviors, as well as with contextual representations of environmental features in which they are frequently pursued (Bargh, 1984). Consequently, goals can be automatically activated when these features are encountered in the environment again (Bargh, 1990). Activation of the goal representation results in preparation and implementation of the associated goal-directed action (Bargh, 1990). This process occurs automatically and without conscious intent or awareness.

For example, a professor may frequently pursue a goal to deliver knowledge in the classroom. Several behaviors may facilitate this pursuit, including lecturing about a relevant topic, projecting one's voice, and observing students' reactions. As the professor repeatedly pursues this goal, the association between the goal (e.g., to deliver knowledge), behaviors (e.g., observing students' reactions), and environment (e.g., classroom) becomes automated and stored in the professor's subconscious. Subsequently, by simply walking into the classroom the goal to deliver knowledge is primed into subconscious activation. This results in automatic preparation and self-regulation over the related behaviors. Despite the professor's full awareness that s/he is engaged in these behavioral acts, the mental processes that caused the behaviors unfold without awareness. Importantly, it is not the cue (i.e., classroom) that causes the behavior; the cue merely primes a mental representation of a goal. It is the mental representation of the goal that then automatically triggers and adaptively guides goal-directed behavior (c.f., Miller, Galanter, & Pribram, 1960).

Routes from subconscious goals to behavior. The two fundamental components of priming subconscious goals include, a) memory associations among a goal, cue, and behaviors, and b) the assumption that when primed, the subconscious goal adaptively guides behavior without the employee being aware of its influence. Importantly, the goal is "subconscious" not because it can never become a conscious goal, but because when its mental representation in memory is primed, it does not become conscious. Returning to the prior example, when the professor enters the classroom, the mental representation of the goal "to deliver knowledge" does not rise to consciousness; it remains in the subconscious sphere of the mind where it is primed into behavioral action. For this reason, it is called a primed subconscious goal.

Whether a subconscious goal is effective in guiding behavior depends on the availability of specific action for goal attainment (Dijksterhuis et al. 2007). When only one behavior facilitates the primed subconscious goal, e.g., wearing headphones to drown out noise, this is straightforward. One-to-one relationships between facilitative means and goals, however, are rare. Thus, it is consequential to outline how subconscious goals and related behaviors become associated in memory. Drawing from Bargh (1990), I describe three routes by which goals, behaviors, and cues at work can be associated in memory and primed into action.[2]

Chronic goal pursuit*.* Chronic pursuit of a goal with the same means in the same general setting (e.g., self-presentational goal at work meetings) can be activated by generic features of the environment (Bargh, 1990; Dijksterhuis, Chartrand, & Aarts, 2007; Kay, Wheeler, Bargh, & Ross, 2004). Therefore, as employees self-set goals or supervisors assign them, over time, behaviors necessary to attain those goals become linked in memory with the goal. When these frequently assigned goals are primed, the automatic behavior that ensues will depend on the strength of its connection to the goal (Aarts, Verplanken, & Knippenberg, 1998; Kruglanski et al. 2002; Markman & Brendl, 2000; Srull & Wyer, 1986). Direct, repeated practice with a specific

[2] My focus herein is on goals related to task performance. For a review of findings on other types of primed subconscious goals, see Appendix A.

means strengthens its connection to the goal and makes it more likely that the habituated behavior will unfold when the goal is primed (Bargh, 1990; Ouellette & Wood, 1998).

Goal contagion. Research in social psychology has demonstrated that individuals can automatically adopt and pursue a goal that is implied by another person's behavior (Aarts, Gollwitzer, & Hassin, 2004). This is because people perceive action in terms of goals it implies, and this process can unfold subconsciously (Aarts et al., 2004). Thus, repeated assignment of goals is not required for goals to be primed (Hassin, Aarts, & Ferguson, 2005). Interacting with or observing others can create a subconscious association between a goal implied by their behavior and features of the social interaction (Aarts et al., 2004). These goals are less tied to situational features and are more closely associated with the goal representations relevant to the observed behavior (Bargh, 1990). This makes it possible for subconscious goals to guide behavior under relatively novel conditions (Dijksterhuis et al., 2007). Said differently, goal contagion is the automatic adoption and striving towards a goal that others are perceived to be pursuing. Subconscious associations between goals, cues, and behaviors created through contagion could lead individuals to pursue goals of which they are unware, for better or worse.

This possibility carries positive and negative consequences. On the one hand, consider a new employee who observes a diligent, hard-working co-worker striving to achieve efficiency goals. This observation can lead to subconsciously associating the implied goal (e.g., efficiency), the observed action (e.g., diligence), and the cue (e.g., coworker). Thus, when the new employee interacts with this colleague, the implied goal is activated (Shah, 2003a). On the other hand, consider an employee who observes a colleague cutting corners to achieve aggressive sales goals. This could result in the employee creating an association between sales goal and unethical behaviors, such that working near this person results in automatic actions to cut corners. The worst part is that the employee is not even aware s/he has subconsciously adopted the goal. For this reason, this route from primed subconscious goal to behavior could perpetuate unwanted behaviors in the workplace in pursuit of misaligned individual goals and company goals.

Goal contagion also complicates the study of subconscious goals and performance as subjectively constructed goal associations are difficult to empirically examine. To illustrate, imagine a photo of a hiker reaching the top of a mountain. A researcher might use this photo in an experiment with the intent of activating an achievement goal, which at first appears reasonable. If, however, participants lack chronic pursuit of achievement in this setting, and instead, they have perceived hiking to be linked with injuries, the photo may activate a very different behavioral pattern than the one intended. This demonstrates one reason that methodological rigor and precision in design are paramount in priming research (Bargh, 2012).

Goal reinforcement. Personal consequences for achieving or failing to achieve one's goal may be greater or lesser than for another goal, and rewards may be more immediate or more distal. For example, employees who pursue a goal related to creativity but are not reinforced for creative behaviors may be less likely to create a subconscious creativity goal. Similarly, if an employee pursuing a goal to network is not reinforced immediately for related behaviors, but instead is reinforced at a later time, the employee may be less likely to create an association in memory between a goal to network and the related behaviors. For this reason, reinforcement of behaviors associated with goals could moderate which goals are ultimately associated with behaviors in the subconscious. Similarly, salience of norms, which are "socially shared beliefs representing links between specific situations and normative behaviors" (Dijksterhuis et al., 2007, p. 106), can create subconscious associations because goals that are related to norms are socially recognized and reinforced in the workplace. Because these goals are socially constructed, there is no prerequisite of chronic pursuit for them to be effectively primed (Bargh, 1990; Sperber, 1990). Research has demonstrated that the effectiveness of priming normative goals depends on the immediate relevance of the normative behavior. For example, Aarts and Dijksterhuis (2003) instructed some participants to visit the library and then primed all participants with a library photo. The photo only primed the subconscious goal into action for those who had been assigned a library goal.

Cues that prime subconscious goals. Research on subconscious goals in social psychology classifies priming cues into three categories: behavioral, situational, or social (Bargh, 2013). The type of cue that primes a subconscious goal depends on the route via which the goal-to-behavior link was created. For goals created through chronic pursuit, the behaviors associated with the goal are most likely to be primed by situational cues; it is the environment in which the goal is frequently pursued that becomes associated with it in memory (Bargh, 1990). For example, consider a customer-service organization that frequently assigns service representatives a goal to resolve complaints in a timely manner. An employee who repeatedly pursues this goal by talking faster may find that, over time, even when this goal is not assigned, features of the environment, such as the presence of the phone, prime it into automatic action. Thus, the employee talks faster without realizing that this behavioral pattern was activated and guided by the subconscious goal.

Conversely, subconscious goals created through goal contagion are not linked with specific features of the environment, but instead are encoded during social interactions and observation of behaviors. For this reason, social and behavioral cues are most likely to prime subconscious goals created through goal contagion. Subconscious goals created through reinforcement are most likely to be primed by behavioral cues. This is because the reinforcer is attached to a desired behavior, not to a specific context or social interaction. Recent research on money priming (Vohs, Mead, & Goode, 2006) demonstrates that it is also possible for the reinforcer itself to prime a subconscious goal. In particular, priming money, either through money-related words or photos, automatically activates thoughts and behaviors that people have subconsciously associated with money in the past. Therefore, an employee who is frequently reinforced with money may subconsciously associate money (the reinforcer) with the subconscious goal and related acts.

Taken together, behavioral, social, and situational cues in the workplace can become associated with goals through chronic goal pursuit, goal contagion, or goal reinforcement. When encountered, these cues prime a subconscious mental representation of the associated goal. This leads to automatic behaviors linked with the goal. The strength of the prime to activate a subconscious goal is likely to differ among these three routes (Bargh, 1990). Ostensibly, employees work five-days a week (260 days out of the year less paid time off); therefore, behavioral and situational features associated with the work environment are more established in memory. Conversely, subconscious goals linked with behavior through goal contagion are likely to depend to a higher degree on applicability and accessibility of related goals during social interactions or observation of others' behavior. Thus, observed behavioral acts are expected to be relevant to several different subconscious goals. How the perceiving employee encodes the subconscious goal-to-behavior association will, therefore, depend on relative accessibilities of potentially related goals during the interaction/observation (Bargh, 1990).

Regarding specific cues in the work environment, any type of social interaction, behavior, or situational cue is capable of priming a subconscious goal. Here, I will briefly review several cues relevant to the work that have been shown to prime goals in prior research.

Kay et al. (2004), in three studies, found that pictures of business objects such as pens, men's and women's suits, dress shoes, and a boardroom table primed a subconscious goal to compete and led to people perceiving an ambiguous situation to be less about cooperation compared to people exposed to neutral pictures. Additionally, people shown pictures of these objects made more selfish choices that involved financial stakes. In a follow-up study, the authors invited half of the participants to an experimental room and sat them down at an oval boardroom table. They were given executive style pens and the protocols were administered out of a black leather briefcase. The other participants completed the experiment in a neutral setting. The study found that participants primed with the business objects offered less money to their counterparts in the cooperation game compared to those in a neutral setting. Another recent example of a situational cue in the workplace shown effective to prime a subconscious goal is embedding prime words into business communication. Specifically, Stajkovic et al. (2018) embedded achievement words in an email sent by the CEO to half of his employees on Monday. The others received a similar email without the prime words. Employees who were primed with a subconscious achievement goal outperformed the neutral group, on average, over one week.

Social cues that can lead to goal contagion were evidenced in a series of studies conducted by Aarts, Hassin, and Gollwitzer (2004). In these studies, participants who read stories about others subconsciously adopted the goal of the character in the story. This led to behaviors such as increased effort and persistence, and it increased helping behavior. This suggests that through interactions and story-sharing with coworkers, employees can adopt goals implied by the stories they hear. Shah (2003b) further evidenced that a social prime capable of priming a subconscious goal is seeing the face or name of a significant other. In five studies, participants were subliminally primed with the name of their significant other, which they provided prior to the experiment. The greater the number of goals associated with this person, the less likely it was that the individual invoked any one goal strongly. Extrapolating this to the workplace, if employees have multiple goals associated with one coworker, interacting with or observing the person is less likely to prime any one goal subconsciously associated with him/her.

A critical postulate still missing in this conception of automatic organizational behavior is the consideration of how subconscious goals interact with assigned conscious goals. Said differently, employees rarely operate in a vacuum devoid of conscious intentions. Therefore, a key difference between theories of automaticity in social psychology and the theory presented herein is recognition that primed subconscious goals are unlikely the sole regulators of employee behavior. Instead, these goals interact with consciously set or assigned goals to influence employee behavior (Stajkovic et al., 2006). Whether this interaction will lead to positive or negative behaviors depends on the content of the two goals, described next.

Hypothesis Development

Goal-setting theory. The core tenets of goal-setting theory have been empirically supported over the last five decades and are described in detail elsewhere (see Locke & Latham, 2015). Core findings are as follows. An assigned goal that is specific and difficult leads to better performance than vaguely expressed goals such as "do your best." Difficult goals lead to better performance than easy goals. Variables such as feedback increase subsequent performance only if they lead to setting a specific, difficult goal. Four boundary conditions of these relationships have been documented: sufficient task knowledge or ability, goal commitment, feedback that shows progress in relation to the goals, and the availability of resources needed for goal attainment. Mediators of the goal-performance relationship include choice, effort, persistence, and a strategy for goal attainment (Locke, 2000). Goal acceptance is a moderator of the relationship between goal difficulty and task performance, such that the relationship is positive and linear for accepted goals (Erez & Kanfer, 1983; Erez, Earley, & Hulin, 1985; Erez & Zidon, 1984; Renn, 1998).

Hypothesis 1: Assigning a difficult conscious goal will improve performance.

People can pursue various goals, and goal-setting theory addresses four types: performance, learning, behavioral, attitudinal, and primed (Latham & Seijts, 2016). Performance goals are set for a level of desired proficiency. They should only be set when employees can attain them. On novel, complex tasks a learning goal should be set. A learning goal shifts attention from attaining a target to discovery of processes, procedures, and strategies for mastery. Not all goals can be expressed as a performance outcome nor do they require learning (e.g., being ethical). In this instance, behavioral goals should be set. A fourth type of goal is attitudinal, such as stay positive.

Subconscious and conscious goals: Insights from research in OB. To fully appreciate the dynamics of goal pursuit in the workplace, a theory of automatic organizational behavior must consider the simultaneous influence of conscious and subconscious goals on employee behavior. To conceptualize this interaction, I draw on research comparing the effects of primed subconscious and conscious goals that has concluded the following:

> … once activated, the [subconscious or primed] goals operate to guide subsequent cognition and behavior in the same way that consciously held goals do, all without the individual's awareness of the goal's guiding role (Chartrand & Bargh, 2002 p. 15).

Literature in in social psychology suggests that when achievement goals are primed, attention is directed toward goal-relevant items (Moskowitz, 2002) and responses are more positive in terms of mood, self-esteem, and evaluation (Riketta & Dauenheimer, 2003). Priming achievement goals is linked to better performance, and this effect persists even after a period of delay (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). Similarly, research has shown that priming achievement four days prior to administering an exam still resulted in a positive priming effect on performance (Lowery, Eisenberger, Hardin, & Sinclair, 2007). This suggests that priming achievement goals can generate enduring effects, similar to the motivational properties of conscious goals (Bargh et al., 2001). The prime-to-performance effect of these goals has been replicated in numerous studies (e.g., Ciani & Sheldon, 2010; Dennis, Bhagwatwar, & Minas, 2013; Engeser, 2009; Hart & Albarracín, 2009; Légal & Meyer, 2009;

Oikawa, 2004), but it has also failed replication attempts in social psychology studies (e.g., Greenlees, Figgins, & Kearney, 2014; Harris, Coburn, Rohrer, & Pashler, 2013).

In OB studies, however, the effects of primed achievement goals have been consistently replicated. Specifically, Stajkovic, Locke, and Blair (2006) conducted the first experiment to examine the effect of both primed and consciously set achievement goals on performance following Locke and Latham's (2004) recommendation to I-O psychologists to examine subconscious motivation (see also Stajkovic & Locke, 2004). The authors hypothesized that there would be a significant interaction between primed subconscious and assigned conscious goals on performance. These authors used the scrambled sentence task (see Bargh & Chartrand, 2000) to prime a goal by embedding achievement words into sentences. The priming task either activated an achievement goal or no goal (control). A conscious goal was manipulated at three levels: easy, do best, and difficult. The combination of subconscious and conscious goals yielded both a main and interactive effect on a commonly used performance task in goal research.

With call-center employees working on a fundraising task, Shantz and Latham (2009) conducted a field replication of the Stajkovic et al. (2006) experiments. Building on this, Latham, Stajkovic, and Locke (2010) proposed a program of research on subconscious goals in I-O psychology. Shantz and Latham (2011, p. 3) conducted two more studies in call centers and concluded that "… the two goals together have a greater effect on performance than either one alone." Latham and Piccolo (2012) replicated these performance effects using data over an entire work week. Stajkovic, Latham, Sergent, and Peterson (2018) further replicated the positive effect of a primed achievement goal in a for-profit business organization. Employees in the subconscious goal group performed 15% more effectively and 35% more efficiently than those in the control group over a 5-day workweek. In each of these cases, the primed subconscious goals was congruent, i.e., aimed at the same outcome, as an assigned conscious goal.

Hypothesis 2: Priming a subconscious goal that is congruent with a conscious goal will have a direct positive effect on performance.

Hypothesis 3: A congruent subconscious goal and difficult conscious goal will have a positive interaction effect on performance.

Chen and Latham (2014) demonstrated the importance of differentiating between primed learning and primed performance goals. To test their hypothesis, the authors replicated a prior experiment (Winters & Latham, 1996) that had demonstrated differential effects of consciously set performance versus learning goals on performance. However, instead of setting goals consciously, as had been done in the prior study, the authors primed these two types of goals. The learning goal was primed with a photograph of Rodin's *The Thinker,* and the performance goal was primed with a photograph of an athlete winning a race. The original pattern of results was replicated; only the primed learning goal enhanced performance when acquisition of knowledge was required for successful completion of the task.

Extending this line of inquiry, Ganegoda, Latham, and Folger (2016) conducted three experiments to compare the effect of conscious and primed fairness goals on negotiation behavior. The authors found that a primed fairness goal produced identical effects to an assigned fairness goal, and that justice saliency mediated the effect of the primed fairness goal. Next, Latham, Brcic, and Steinhauer, (2017) examined choice and effort as mediators of the subconscious goal-to-performance effect. The prime in the first experiment was a photograph of a person lifting 20, 200, or 400 lbs. Participants who were primed with the difficult goal (i.e., individual lifting 400 lbs.) exerted more physical effort when pressing a digital weight scale than those who were primed with a moderate or easy goal. In the second experiment, those primed with a difficult goal consciously set a more difficult goal for a subsequent task than those who were primed with an easier goal. The pattern of results indicated that priming difficult goals led to higher performance. Conscientiousness moderated the priming effect and a self-set goal partially mediated it. Thus, individuals who were more conscientious were more likely to set difficult conscious goals that led to higher performance when they were primed with a goal.

Unlike the studies reviewed above, which all examined positive effects of subconscious and conscious goals in concert, Stajkovic, Locke, and Blair (2007) tested performance outcomes when conscious and subconscious goals were in conflict. Before a proofreading task, participants were primed with either a speed or accuracy goal and were also assigned one of these goals. When priming was successful, conflicting goals undermined performance compared to when these two goals were congruent. I posit that this occurred because when a conscious and subconscious goal are active but incongruent, greater strains are placed on resources to self-regulate the concurrent demands of both goals. This increases cognitive pressure and results in tradeoffs made toward each goal. In other words, because self-regulatory activities underlying these goals differ, resources must be divided to meet the demands of both goals. When less resources are available to conscious pursuits, subsequent behavior is undermined. I elaborate on this reasoning in the next section.

Hypothesis 4: Priming a subconscious goal that is incongruent with a conscious goal will have a direct negative effect on performance.

Hypothesis 5: An incongruent subconscious goal and do best conscious goal will have a negative interaction effect on performance.

Subconscious goals and cognitive load. Thus far, I have explained how subconscious goal-to-behavior associations are formed, stored in memory, and activated with priming, but the mechanism through which primes affect behavior is much less understood. Said differently, prior studies have advanced the field greatly, but how subconscious goals operate and interact with conscious goals to affect performance is incompletely understood. Stajkovic et al. (2006)

discussed four possible mechanisms through which these goals interact: motivation, task focus, goal commitment, and cognitive resource allocation. Similarly, Chen and Latham (2014) suggested that subconscious goals may facilitate motivation or reduce cognitive load, but these mechanisms were not tested. Latham et al. (2017) tested implicit motivation as a mechanism of goal priming but found no support for mediation.

Thus, "presumably the mediator of priming, if it is not a subconscious motive, is a brain process" (Locke, 2015, p. 412). In other words, when a cue activates the mental representation of a goal, the representation influences behavior not because it contains information that is used in ongoing progress, but because it puts mental processes into motion (Bargh, Green, & Fitzsimons, 2008). Assessments of feasibility and desirability are then automatically calculated (Custers & Aarts, 2005a, 2005b, 2010). If feasible, instrumental mental actions are prepared (Custers, Eitam, & Bargh, 2012), and if a reward signal is attached to the subconscious goal, it "will lead to the allocation of resources to those actions, which translates the prepared action into overt behavior" (Custers et al., 2012, p. 242). The statement that the subconscious goal will "lead to the allocation of resources" implies that subconscious goals require allocation of cognitive resources. Yet, whether cognitive resources are taxed by primed subconscious goals has yet to be examined. Some scholars assert that after behavior has been automated to operate without awareness, it no longer necessitates allocation of cognitive resources (Webb & Sheeran, 2003). Conversely, others have argued that the limited availability of cognitive resources is a property of all goal pursuits, including subconscious goals (Kruglanski et al., 2002). From this vantage point, even subconscious goals should consume limited cognitive resources, adding to overall cognitive load. I reconcile these opposing views below, but before I do, here is more background on each view.

Attention-free processing. Stajkovic et al. (2006) suggested that priming goals may enhance performance because it frees up space in conscious memory. This explanation is consistent with the premise of Cognitive Load Theory (CLT), which claims that as behavior is automated through repetition, working memory capacity is freed for other activities (van Merriënboer & Sweller, 2005). From this perspective, if the automatic system knows how to respond, behavior can be activated and carried out effortlessly (Aarts & Dijksterhus, 2000; Bargh & Barndollar, 1996; Shah, Friedman, & Kruglanski, 2002; Webb & Sheeran, 2003). Fishbach, Friedman, and Kruglanski, (2003) provided evidence in support of this view. They found that under induced, high cognitive load performance declines were not differentially influenced by subconscious goals. This suggests that subconscious goals do not increase cognitive load. Instead, this finding supports the explanation by Stajkovic et al. (2006, p. 1174):

> … subconscious priming may free up space in the conscious memory; thus, more of its capacity can be dedicated to performance, other pressing demands of the task, or both. . . Simply, the conscious mind is not limitless, and the more of it that is readily available, the better the performance.

According to this view, an answer to the question: "How can a person pursue multiple goals despite the limited resources of the executive function?" (Masicampo & Baumeister, 2011, p. 2), is to use priming. Despite nearly 15 years since Fishbach et al. (2003) was published, to my knowledge it remains the only study to evidence that subconscious goals operate "resource free."

Limited mental resources. Marien, Custers, Hassin, and Aarts (2012, p. 412) found the opposite effect. Namely, these authors concluded the that "… unconscious and conscious goals both operate on a platform that usurps mental resources." Their explanation was that priming goals automatically triggers mental processes into motion. Once triggered, however, these processes still require cognitive resources to execute goal-directed behaviors (Bijleveld, Custers, & Aarts, 2009; Custers et al., 2012; Custers & Aarts, 2010; Pessiglione et al., 2007; Zedelius, Veling, & Aarts, 2011). This reasoning is grounded in the fundamental allocation property of goals, where allocation of cognitive resources comprises a "constant-sum" game (Kahneman, 1973; Kruglanski et al., 2002; Navon, 1984). In short, this theory posits that as more resources are directed to one goal, less remain to pursue other goals (Barrouillet, Bernardin, Portrat, Vergauwe, & Camos, 2007; Baumeister, Bratslavsky, Muraven, & Tice, 1999; Cocchini, Logie, Della Sala, & Baddeley, 2002). Accordingly, behavior guided by conscious pursuits could be impaired when other subconscious goals are primed (Marien et al., 2012).

Adaptive self-regulation. These contrasting views can be reconciled by considering the principle of least necessary input (Kukla, 1972). This principle holds that it is not adaptive to allocate less nor more cognitive resources to a calibrated activity level than objectively needed. Applying this to priming of subconscious goals, instead of a static view in which priming must either operate resource free or usurp limited resources, I propose a dynamic theory is needed to understand the mechanisms of the subconscious and conscious goal interaction.

Similar to the resource allocation model (e.g., Kanfer & Ackerman, 1989), I theorize that the amount of cognitive resources devoted to performance is determined by the intensity and breadth of self-regulation activities needed for successful performance. Without self-regulation, behaviors are guided by impulses, inclinations, and innate tendencies (Lord & Levy, 1994). Through self-regulation, cognitive resources are gauged, allocated, and recalibrated given activity demands (Carver & Scheier, 1981; Higgins, 2000, 2005; Powers, 2005; Simon, 1967). Adaptive self-regulation, a hallmark of human functioning, allocates the objectively "correct" amount of resources to a calibrated activity level for optimal functioning (Kukla, 1972).

Therefore, when goal pursuit involves both a primed subconscious and assigned conscious goal, the allocation of cognitive resources will be determined by the content of the two active goals. If the two goals are congruent, demands on resource allocation will be reduced. This is because resources needed to initiate, plan, and execute action to attain the goal are allocated by the assigned conscious goal. Therefore, when a congruent subconscious goal is primed, there is no need for resource consumption as the self-regulatory activities are the same as those put in place by the conscious goal. Accordingly, the subconscious goal aids performance without increasing overall cognitive load. Formally stated, my hypotheses are as follows:

Hypothesis 6: When a conscious and subconscious goal are congruent, the subconscious goal will operate "resource-free" by not consuming mental resources.

Hypothesis 7: Cognitive load will mediate the positive interactive performance effects generated by a congruent conscious goal and primed subconscious goal.

Attempts to adaptively self-regulate, however, can go awry (Baumeister & Heatherton, 1996; Baumeister, Heatherton, & Tice, 1994). Although a departure from adaptive self-regulation can be foreseeable and uncontrollable (e.g., diagnosis of terminal illness), it often occurs unexpectedly and uncontrollably. Unexpected, subtle interferences with adaptive self-regulation were initially recognized in research on decision-framing biases and risk preferences (Tversky & Kahneman, 1973, 1974, 1981, 1986). More recently, research has examined causes of "predictably irrational" behaviors (see Ariely, 2009), the role of nudges in influencing poor decision-making (see Thaler & Sunstein, 2008), and the effects of seemingly irrelevant distractions on questionable moral conduct (Gino, Shu, & Bazerman, 2010).

Extending this to goal pursuit, Stajkovic, Locke, and Blair (2007) found that when a subconscious goal is incongruent in content with a conscious goal, performance suffers compared to performance guided by only the conscious goal. This is because greater strains are placed on resources to self-regulate concurrent demands of both goals, resulting in cognitive tradeoffs made toward each goal (Gustafson, 1995, p. 77). Said differently, because self-regulation activities for goal attainment are different (i.e., the aim of the incongruent goals is different; e.g., speed vs. accuracy), limited cognitive resources must now be divided to meet the demands of both goals. Therefore, when an incongruent subconscious goal is primed, I posit that it will necessitate an allocation of mental resources to initiate and adaptively guide behavior governed by the subconscious goal (Bargh et al., 2001). Division of mental resources puts greater demands on cognitive capacity, increasing cognitive load and hindering performance.

Hypothesis 8: When a conscious and subconscious goal are incongruent, the subconscious goal will consume limited mental resources.

Hypothesis 9: Cognitive load will mediate the negative interactive performance effects generated by a conscious and incongruent primed subconscious goal.

Task complexity. Task complexity moderates the goal to performance effect. Goal-setting effects are strongest on easy tasks (reaction time, brainstorming) and weakest for more complex tasks (simulations, research productivity) (Wood, Locke, & Mento, 1987). This is because on complex tasks, there is less of a direct link from effort, attention, and persistence to performance; instead, performance is more dependent on strategy development. For example, Frost and Mahoney (1976) found that difficult goals lead to higher performance than easy goals on a simple task, but not on a complex task. This is because as complexity increases, goal effects are dependent on the ability to discover the appropriate strategy, and people vary in their ability to do this (Locke & Latham, 2002). On highly complex tasks, such as an air traffic controller simulation, having a difficult goal can even interfere with acquiring the necessary knowledge to perform the task (Kanfer & Ackerman, 1989).

Hypothesis 10: The effect of a difficult conscious goal on performance will be larger on simple tasks compared with more complex tasks.

For this reason, in examining the interaction of primed subconscious and assigned conscious goals on performance, the relative contribution of the complexity of the task must also be considered (see also Stajkovic & Luthans, 1998). In comparison to less complex tasks, highly complex tasks require different skills for successful execution. These types of tasks place greater demands on (a) knowledge, (b) cognitive ability, (c) memory capacity, (d) behavioral facility, (e) information processing, (f) persistence, and (g) physical effort (Bandura, 1986; Stajkovic & Luthans, 1998). Given the multitude of different task demands, complex patterns of behaviors do not lend themselves to easy allocation resources. Instead, multifaceted tasks require a variety of capabilities for successful execution (Stajkovic & Luthans, 1998). Although complex tasks limit the effectiveness of conscious goals, this may not be the case with subconscious goals (Chen & Latham, 2014; Poincaré, 2000). Social psychology research has found that the subconscious aids performance on complex problems because of its higher degree of cognitive processing capacity (Dijksterhuis, 2004; Dijksterhuis & Nordgren, 2006). On complex tasks, therefore, a congruent subconscious goal may continue to positively influence on performance. This, however, has yet to be empirically examined. Thus, an added contribution of this research is varying the degree of task complexity across the three experiments to investigate complexity as a boundary condition.

Types of cognitive processing. Research in neuroscience has consistently shown that different types of cognitive processes activate different regions of the brain (Arsalidou & Taylor, 2011; Barsalou, 2003; Binder et al., 2009; Gerlach, Spreng, Gilmore, & Shacter, 2011; Hoenig, Sim, Bochev, Hernberger, & Kiefer, 2008; Locke, 1959; van Overwalle, 2009). This is because long term memory is not a single entity; it is composed of several different components mediated by separate brain systems (Cohen & Squire, 1980; Jacoby & Witherspoon, 1982). Relatedly, scholars in social psychology have also conceptualized different types of cognitive processing. Though sometimes labelled "two minds" (e.g., Evans & Frankish, 2009), this research suggests the existence of two distinct types of mental processes underlying human reasoning (Frankish, 2010; Kahneman & Egan, 2011). They can be differentiated by the pursuits they support.

Mental processes that support conscious pursuits are initiated with intent, carried out with effort, and operated within awareness, i.e., a person is aware that s/he is attempting to mentally retrieve stored information (Hayman & Tulving, 1989; Tulving, 1983; Squire, Knowlton, &

Musen, 1993). Mental processes governing subconscious pursuits do not require intention. They can be carried out automatically without conscious awareness. These subconscious processes are relied on for encoding new information, recognizing underlying patterns, and drawing abstractions among informational cues (Squire et al., 1993).

Given these distinctions, it appears plausible that different tasks rely more on one type of processing than the other. For example, creative tasks, such as brainstorming, depend more on recognition of abstract patterns (i.e., perceptual fluency) (Gardiner, 1988; Johnston, Dark, & Jacoby, 1985). Because subconscious mental processes are responsible for linking disparate elements of information, they are more likely to be relied on for creative tasks (Raidl & Lubart, 2001). The distributed, content-associated structure of memory during brainstorming actives many areas in memory (Gabora, 2002). Therefore, researchers have found that "It is not unbridled psychoticism that is most strongly associated with creativity, but psychoticism tempered by high ego strength of ego control" (Feist, 1999, p. 288). This means brainstorming requires both a state of defocused attention where activation of one memory location activates other areas (i.e., conceptual fluidity), and it requires exercise of subconscious control over retrieval of newly connected ideas to avoid overwhelming the conscious with possibilities. Thus, I posit that for creative tasks, mental efficiency will be enhanced by subconscious processes.

Hypothesis 11: Priming a subconscious goal will improve mental efficiency on a creative brainstorming task.

In contrast, logical reasoning tasks necessitate selectively focused attention to uncover concrete patterns among informational cues. This type of thinking requires self-control to systematically process and decode information. These processes are characterized by their sequential nature. Sequential processing is a hallmark quality of conscious processing (Evans, 2008). Assigning a difficult conscious goal for a logic task should narrow focus, increase effort, and sustain persistence. For this reason, mental efficiency for this type of task is likely to improve when guided by a difficult conscious goal instead of a do best goal. This is because when a "do best" conscious goal is assigned greater demands are put on cognitive resources to stay focused. Consider, for example, an accountant tasked with compiling a financial statement from the general ledger. This task is straightforward and relies on a sequential process of adding and subtracting income and expense items for each category. If the accountant is given a difficult conscious goal to create the report with no more than .01 cents of error, she is likely to efficiently process the ledger information. In contrast, if the accountant is told to "do your best," it will take more mental processing capacity to stay on task and to apply the same degree of precision.

Hypothesis 12: Assigning a difficult conscious goal will improve mental efficiency on a straightforward logic task.

When a logical reasoning task becomes more complex, such that a concrete pattern among cues becomes more abstract, cognitive processing necessary for success reverts back to the subconscious. This is because decoding abstract data requires more than sequential thinking; it requires parallel thinking (Gabora, 2002). Consider an air traffic controller who is simultaneously tasked with initiating takeoffs, directing landings, and monitoring movements of aircrafts on the ground and in the air. Parallel thinking with a higher capacity to abstractly process information is critical to success. The air traffic controller will likely be more mentally efficient if s/he can automate some of the necessary behavioral patterns. This will free-up conscious processing for more critical components, such ensuring two planes do not collide.

Hypothesis 13: Priming a subconscious goal will improve mental efficiency on a complex logic task.

Summary of Theoretical Premises

Conscious goals partly derive a standing from the absence of an automated response to the goal pursuit. In this sense, subconscious goals are, arguably, a more basic form of goals because a goal that is overlearned to the point of being automated is vital to a person (Higgins, 1997, 2000). This route of goal automation embodies “Goal seeking for issues that are critically important … that are now automated, deeply embedded in the fabric of the self” (Carver & Scheier, 1998, p. 270). To ignore effects of subconscious goals on conscious goals is to assume they are equally detrimental or inconsequential, or that they override or are irrelevant to them. Such view is lacking theory nuance (Custers et al., 2012; Kanfer & Chen, 2016).

Practically, if conscious goals conflict, an employee can ask their supervisor for clarification. With conflict between conscious and subconscious goals, the employee is only aware of the conscious goal. The key downstream consequence is the employee’s inability to detect the conflict and deliberately remedy it. Yet, some part of their mind is grinding away to allocate cognitive resources to the incongruent goals, putting greater pressure on cognitive processing capacity and depleting self-regulatory resources. Because this goes unnoticed, it leads to compromised behaviors inexplicable to oneself and presents challenges to adaptive self-regulation in the workplace. The conceptual summary of my theory is presented in Figure 1.

[Insert Figure 1 about here]

Chapter 3: Methods Overview

Priming is a technique used to study how internal mental states are influenced by the environment via subconscious processes and how these states influence behavior. Three experimental techniques fall under the general umbrella of priming (Bargh & Chartrand, 2000). *Conceptual priming* involves activating a mental representation in one context to examine its passive, unintended influence in a subsequent unrelated context. *Mindset priming* involves participants' active engagement in goal-directed thought to examine how the activated mindset operates later in an unrelated context (Gollwitzer, 1990). *Sequential priming* tests for activation of numerous constructs to examine their structural connections (Bargh & Chartrand, 2000).

I use conceptual priming to activate a mental representation of a goal. Importantly, participants are unaware of the subconscious goal and its influence on their behavior (Bargh & Chartrand, 2000). To accomplish this, I use a supraliminal priming task and validated post-experimental awareness questionnaire (Bargh et al., 2001; Stajkovic et al., 2006). Awareness assessment is critical in priming research because the prime must activate a subconscious goal, not a conscious one. There are varying degrees to which an individual may be aware (or unaware) of priming stimuli. With supraliminal priming, participants are exposed to a prime as part of a conscious task; the individual is aware of the stimuli but unaware of subconscious goal (Bargh & Chartrand, 2000).

A common technique for supraliminal priming is the "Scrambled Sentence Task." During this task, participants are instructed to make a grammatically correct sentence using four out of five scrambled words. Prime words are embedded, typically within 60% of the sentences (Stajkovic et al., 2006), to activate a goal. Research has also used subliminal priming techniques. This method reduces possibility of awareness as primes are presented below the threshold of visibility (Greenwald, Klinger, & Schuh, 1995). Bargh (2013) recommends that researchers use supraliminal priming for applied behavioral research because of its ecological validity.

Awareness Checks

Priming is interesting because of its underlying premise that people's thoughts and actions can be influenced by factors they fail to recognize. Therefore, participants should be probed for three aspects of awareness: the (a) prime, e.g., "Did you notice any particular pattern or theme to the words…?" (b) measured outcome, e.g., "Did anything you did on one task affect what you did on any other task?" and (c) relation between them, e.g., "Did you think that any of the tasks you did were related in any way?" (e.g., Bargh & Chartrand, 2000, p. 37). Aware participants should be excluded as they can generate reverse priming effects that mask effects in unaware participants (Glaser & Banaji, 1999). Consequently, "over the past 30 years … psychologists have used increasingly refined methods to assess awareness in studies of priming" (Doyen, Klein, Simons, & Cleeremans, 2014, p. 18). Participants are typically given a post-experiment questionnaire consisting of six questions (Bargh & Chartrand, 2000, p. 85).

Task Complexity

Simple task. The simple performance task used in Experiment 1 is "listing uses for a common object (a wire coat hanger), as often used in goal theory research" (Stajkovic et al., 2006). This task, sometimes called the "Alternative Use Task" (e.g., Mullineaux & Dilalla, 2009; Radel, Davranche, Fournier, Dietrich, 2015), is a measure of creative performance. In short, participants are given two minutes to list as many uses as possible for a common object (e.g., brick). According to Wood's (1986) general theoretical model of task complexity, this task would be classified as simple for the following reasons. First, the product, or entity created by the behavior that is measurable (Wood, 1986), is one – uses for the object. Second, the cognitive act required to create the product is also one – brainstorming. Third, information cues, or descriptions of the task properties, are, again, one; participants are simply informed to "list uses for a wire coat hanger." For this reason, I use this task as a simple task in Experiment 1.

Medium complex task. To increase task complexity and examine convergent, instead of divergent thinking, in the next study I use a logic reasoning task adapted from a real Law School Admissions Test (LSAT). The product for this task is twofold. It involves both re-creating a 7-day interview schedule and determining which candidates were offered the job. For this task, there are eight information cues provided that must be sorted and connected for successful performance. The content of the cues, however, is relatively straightforward. The cognitive acts required to connect the information cues requires conscious, goal-directed information processing. This is because the solution emerges with simple addition of the information cues (i.e., A connects to B, which connects to C; A, B, and C are all provided). Therefore, this task requires sequential processing. According to Wood (1986), this task would be more difficult than the brainstorming task, but the sequential nature of it does not warrant high complexity.

Highly complex task. To increase task complexity, Experiment 3 uses the same task as described for Experiment 2, but with modifications to the information cues. Although the number of cues remains the same, the cognitive acts required to connect the cues for successful performance do not rely solely on additive, sequential thinking. Instead, this task requires an orchestrated stream of thought to draw abstract leaps between cues (i.e., A connects to B, which connects to F, and then back to C; only A and F are provided). Therefore, finding a solution requires a higher degree of cognitive processing capacity for successful completion of the task.

To test for successful manipulation of complexity across the three experiments, after completing the task participants were presented with a validated, 9-point anchor scale asking them about perceived task complexity (Paas, 1992; Paas & van Merriënboer, 1994). Experiment 1 was rated on average at 5.76 (*SD* = 1.95), Experiment 2 at 6.48 (*SD* = 2.09), and Experiment 3 at 7.10 (*SD* = 1.97) out of 9. A one-way analysis of variance (ANOVA) confirmed statistically significant differences between experiments, $F(1, 783) = 47.92$ $p < .001$, $\eta_p^2 = .06$. A follow-up multiple orthogonal comparison confirmed that Experiment 1 was perceived significantly less complex than Experiment 2, $F(1, 782) = 41.33$, $p < .001$, and Experiment 2 was perceived significantly less complex than Experiment 3, $F(1, 782) = 35.14$, $p < .001$. Together, these results indicate successful manipulation of task complexity across the three studies.

Cognitive Load

Cognitive load is defined as, "a multidimensional construct representing the load that performing a particular task imposes on the learner's cognitive system" (Paas, Tuovinen, Tabbers, & Van Gerven, 2003, p. 64). It consists of three dimensions: mental load, mental effort, and mental efficiency (Paas, van Merriënboer, & Adam, 1994; Paas et al., 2003; Sweller, van Merriënboer, & Paas, 1998). Mental load represents the expected cognitive demands; it is an *a priori* estimate of cognitive load demanded by a particular task (Paas et al., 2003). Mental effort represents the level of cognitive resources actually used to complete the task. Performance outcomes capture mental efficiency to infer cognitive load. Most commonly, research examining the impact of cognitive load uses interventions to manipulate cognitive load (e.g., high or low) and examines its impact on a dependent variable of interest.

Manipulations. Cognitive load has been manipulated with a variety of techniques. For example, Bargh and Thein (1985) presented a series of photographs on a computer screen. To experimentally increase cognitive load the words flashed and disappeared quickly, giving participants just enough time to read the word before the next word appeared. Results revealed that when cognitive load was artificially increased, priming honesty had no effect on impression formation. Another technique to manipulate load is a dual-task paradigm (Duffy & Smith, 2014; van Boven & Robinson, 2012). This involves assigning a second task for participants to perform while they perform the primary task (e.g., memorize a five-digit number) (Bargh & Tota, 1988; Gilbert & Osborne, 1989). Participants are told to maximize performance on both tasks but to focus on the primary one (DeShon et al., 1996). The core component of cognitive load manipulations is that they increase pressure on cognitive processing capacity, thereby depleting the availability of self-regulatory resources for subsequent behavioral and cognitive tasks.

Measurement. The three most commonly used techniques for measuring cognitive load include subjective ratings, physiological responses, and performance-based outcomes. Subjective measures of cognitive load use a self-report of mental effort. Although some criticize self-reports, a substantial body of work has demonstrated that people are capable of numerically indicating their perceived cognitive load (Gopher & Braune, 1984). Accumulating research indicates reliable estimates of mental effort can be obtained with the *Paas Cognitive Load scale*. This is a one-item, unidimensional scale with a 9-point Likert anchor; it is sensitive to small differences in load, is validated and reliable, and is unobtrusive, which ensures the measurement itself does not artificially inflate cognitive load (Ayres, 2006; Brunken, Plass, & Leutner, 2003; Paas, Ayres, & Pachman, 2008; Paas, van Gog, & Sweller, 2010; Paas et al., 1994, 2003).

Physiological techniques assess changes in cognitive or biological functioning to infer load. Commonly used indicators include heart rate variability (Paaas & van Merriënboer, 1994), brain activity (Callicot et al., 1999), and pupillary dilation or blink rate (Beatty, Lucer-Wagoner, 2000). Task performance techniques use the dual-task paradigm described above, where performance on the secondary task measures cognitive load imposed by the primary task (Fink & Neubauer, 2001). The problem with this technique is that the secondary task can interfere with the primary task, especially when the task is complex. People also tend to compensate for an increase in mental load imposed by the dual-tasks by investing more effort (Paas et al., 2003). Consequently, cognitive load levels cannot be inferred from performance measures alone.

Together, the most accurate measurement of cognitive load has been argued to be the combination of mental effort and mental efficiency (see Paas & van Merriënboer, 1994). Though researchers have tried to develop physiological and secondary task measures of cognitive load, the Paas Cognitive Load scale remains the most validated and reliable method for measuring mental effort (Naismith, Cheung, Ringsted, & Cavalcanti, 2015; Pollock, Chandler, & Sweller, 2002). Thus, I will use the *Paas Cognitive Load* scale to measure mental effort across conditions.

Meaningful interpretation of cognitive load is best provided in the context of its associated mental efficiency, or performance level (Paas and van Merriënboer, 1993). Using both a measure of mental effort and mental efficiency provides a more accurate conception of the role of cognitive load in task performance. To capture this dimension of cognitive load, I use the *Stroop task* to measure mental efficiency. This task uses color words on a screen that are presented in a font color either congruent or incongruent with their meaning (e.g., BLUE is shown in the color PINK). Participants are asked to indicate if the color of the word presented is congruent or incongruent with its meaning. On incongruent trials, the meaning interferes with identifying the color. Thus, efficient use of mental resources is required for accurate performance (Inzlicht & Gutsell, 2007; Job, Dweck, & Walton, 2010). A distinction of this task from other tasks (e.g., mathematics) is that it is independent of cognitive ability and knowledge. For this reason, it is a relatively unbiased measure of mental efficiency.

Chapter 4: Experiment 1

Method

Design. This experiment is a 2 (subconscious goal, control) by 2 (difficult conscious goal, do best conscious goal) design. It is a conceptual replication and extension of Stajkovic et al. (2006). The purpose is to replicate the positive interactive effect of the assigned conscious (henceforth, conscious) and primed subconscious (henceforth subconscious) goals on task performance and test if cognitive load mediates the effects. The study design was like Stajkovic et al. (2006), but with several modifications. First, Stajkovic et al. (2006) manipulated a conscious goal at three levels (easy, do best, and difficult). In this study, conscious goal was manipulated at only two levels (do best, difficult).[3] Second, Stajkovic et al. (2006) conducted their study in a laboratory, requiring participants to write-out responses on paper. This study was conducted online using Qualtrics. Third, Stajkovic et al. (2006) participants were undergraduate and graduate students at a large Midwestern university. Participants in this study, though, were recruited from a general population sample. Fourth, Stajkovic et al. (2006) allotted seven minutes for the sentence unscrambling task. This study imposed no time limit. Instead, after finishing the sentence unscrambling participants could immediately move onto the performance task. Finally, in the Stajkovic et al. (2001) "do your best" goal condition, none of the lines were numbered for the performance task, and in the "difficult" goal condition 12 lines were numbered. In the present experiment, both conscious goal conditions received a response page with 20 numbered lines.

Participants. I conducted an *a priori* power analysis using the effect size of the goal interaction from Stajkovic et al. (2006). Specifically, I used the "*pwr.f2.test*" from the '*pwr*' package in R software version 3.4.0 with the following inputs: d = 0.58 (Stajkovic et al., 2006, p.

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[3] The elimination of the easy conscious goal for this experiment was due to a restricted quantity of participants to recruit. Therefore, to enhance statistical power four cells instead of six were used.

1175), $\alpha = .05$, power = 80%. This indicated that $n = 47$ for each experimental condition would provide 80% power to detect the effect. Following Caruso, Shapira, and Landy (2017), I recruited an additional 20% to account for the following potential exclusions: a) participants were under the age of 18, b) failure to complete the experiment, and c) awareness of the subconscious goal. I provided my desired sample size to my vendor Qualtrics, and they oversaw managing and stopping data collection once the target was reached. Because there was no expectation that gender or other demographic variables would moderate any effects, the only inclusion criterion was that participants be over the age of 18, as approved in the protocol submitted to the UW-Madison Institutional Review Board (IRB). After receiving data from 10 participants to check for accuracy of the experiment, the main data collection proceeded. Once I received data, I reviewed responses relevant to the pre-defined exclusion criteria to flag those that warranted exclusion. Qualtrics extended data collection to replace low-quality responses. All responses provided by Qualtrics were obtained prior to any statistical analyses.

In total, Qualtrics provided data for 294 participants. Of these, there were 42 participants screened out for being under 18 and another 19 participants excluded for failing to complete the survey. This brought the final sample size to 233 participants (73.47% female, $M_{age} = 45.92$, $SD = 15.96$, age range: 18-82 years).

Treatment manipulations. I manipulated two independent variables: a subconscious and a conscious goal.

Subconscious goal. As mentioned in Chapter 3, the sentence unscramble task was used to prime the subconscious goal. Participants were asked to construct a grammatically correct four-word sentence. There were 20 sentences in this task. In the priming condition, per Stajkovic et al. (2006), 12 out of 20 sentences (60%) included words related to achievement, and they were taken from Stajkovic et al. (2006) (see Appendix B). In the no-prime (control) group, all words in the 20 sentences were achievement-neutral (see Appendix C).

Conscious goal. Conscious goals were assigned as either "do your best" or a difficult goal in relation to task performance. Performance involved listing uses for a common object. The same object, a wire coat hanger, used in Stajkovic et al. (2006) was used in this study. Based on the design of Stajkovic et al. (2006), the difficult conscious goal was listing 12 uses (expected success rate of 10%).

Procedure

The experiment was administered online by Qualtrics. Participants were greeted with a welcome message and were asked whether or not they were at least 18 years of age. Those over the age of 18 were randomly assigned to the conditions. Instructions for the priming task appeared next. The text explained the task and the rules and provided an example of the sentences to follow. A forced response and validation rule were set for each sentence to ensure at least 10 characters were typed in the response. This was to avoid participants clicking "next" without unscrambling the sentences and to avoid participants entering only one or a few characters, e.g., "aaaa," instead of actually unscrambling the sentences. Given the key role of cognitive load in this research, following the sentence unscrambling task participants were presented with the *Paas Cognitive Load Scale*: "In the sentence unscrambling task, I invested …" with responses on a 9-point anchor. The purpose of asking this after the priming task was to ensure that the content of the sentences did not induce differences in cognitive load, which was statistically confirmed (p = .422).

The next screen presented the instructions for the performance task. Participants were informed the next task is a creativity task that involves listing uses for a common object. After the text, conscious goal was stated, e.g., "Your goal is to list 12 uses for the object." The conscious goal was presented in larger, bold font, along with the statement that "you will have two minutes." After participants clicked "next," a new screen appeared. It listed the object of a wire coat hanger with instructions to "List as many uses you have seen or can imagine for a Wire Coat Hanger, keeping in mind your goal." Under the instructions, free-form text boxes were presented and numbered from "Use 1" to "Use 20++" (see Appendix D). An automatic two-minute timer required participants to spend exactly two-minutes on the task. Performance was measured with the number of uses listed. Duplicate uses (e.g., "to hang clothes" and "to hang pants") were counted as one use, and incomplete uses (e.g., "shirt") were not counted.

After the two minutes expired, participants were given the *Paas Cognitive Load Scale* to assess mental effort in relation to the brainstorming task. They were also asked about their perception of task complexity on a 9-point scale. After answering these two questions, the next screen provided instructions for the *Stroop task*, which was used to measure mental efficiency. In short, the instructions stated that the next task would present a word of a color that would either be printed in a "CONGRUENT" or "IN-CONGRUENT" color to the meaning of the word. Examples of both possibilities were given, and participants were told their task was to identify as quickly as possible whether the word and color combination are congruent or in-congruent. After reading the instructions and proceeding, words were randomly presented in chunks, i.e., with four words appearing on the same screen. After responding to the chunk of four words and clicking next, a new chunk with four words would appear. There were five word-chunks in total, resulting in 20 word/color combinations. Correct identification of the color/word combination as either "congruent" or "in-congruent" was used as the measure of mental efficiency.

Finally, participants were administered a post experimental awareness questionnaire consisting of six questions (see Appendix E). To reduce subjectivity in assessing awareness, I evaluated further participant responses with the Linguistic Inquiry and Word Count (LIWC)

2015 software (Gottschalk, 1997; Hirsh & Peterson, 2009; Krippendorff & Bock, 2009; Mehl, 2006; Pennebaker, 2011, Tauscik & Pennebaker, 2010). To tailor assessment of responses to awareness for the achievement prime words, I created a LIWC dictionary to probe responses for the following words and variations thereof: *achieve, subconscious, unconscious, priming, goal, strive, and mastery*. None of the responses were flagged as aware by the LWIC software.

Results

Descriptive statistics. Descriptive statistics and correlations are reported in Tables 1 and 2. In examining the performance means across the conditions, the pattern was consistent with theory and with the descriptive statistics of Stajkovic et al. (2006). The subconscious goal paired with a difficult conscious goal had the highest average performance and the do best conscious goal with no subconscious goal had the lowest average performance.

[Insert Table 1 and 2 about here]

Main analysis. I conducted ANOVA using a model comparison approach (Judd, McClelland, & Ryan, 2011) to test between-group main and interactive effects of subconscious and conscious goals on performance. Subconscious goal factor was coded as (-.5) for control group and (.5) for achievement goal group, and conscious goal factor was coded as (-.5) for do best group and (.5) for difficult goal group. Supporting Hypotheses 1, 2, and 3, a difficult conscious goal improved performance by 1.07 more uses compared to a do best conscious goal, $F(1, 229) = 13.06$, $p < .001$, $\eta_p^2 = .05$, a subconscious goal improved performance by 0.87 more uses than no subconscious goal, $F(1, 229) = 8.56$, $p = .004$, $\eta_p^2 = .04$, and the interaction of the two types of goals was positive and significant, $b = 1.21$, $F(1, 229) = 4.14$, $p = .043$, $\eta_p^2 = .02$.[4] The positive interaction between the conscious and subconscious goal is illustrated in Figure 2.

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[4] Using the "*pwr.f2.test*" in R version 3.4.0 (henceforth used for all post hoc power calculations) the power to detect the subconscious goal effect was 83.29%, the power to detect the conscious goal effect was 95.10%, and power to detect the interaction effect was 52.88%. A power sensitivity analysis in

[Insert Figure 2 about here]

Cognitive load. Given the low and not significant correlations of two cognitive load dimensions, mental effort and mental efficiency, I separately tested the effect of conscious and subconscious goal and their interaction on each. For mental effort, where higher mental effort results in greater cognitive load, a difficult conscious goal compared with a do best conscious goal increased mental effort, $b = 0.596$ $F(1, 229) = 4.79$, $p = .029$, $\eta_p^2 = .02$, but neither subconscious goal ($p = .234$, $\eta_p^2 = .006$) nor its interaction with a conscious goal was significant predictor of amount of mental effort.[5] Therefore, relative to a difficult conscious goal, a subconscious goal results in performance benefits, and positive interaction adds incremental variance to it, but without increasing mental effort. This provides initial evidence to suggest that congruent subconscious goals operate "resource free," at least when it comes to level of mental effort and this measure of it, supporting Hypothesis 6.

For mental efficiency, where greater mental efficiency is related to a reduction in cognitive load, Hypothesis 11 was supported, as a subconscious goal significantly improved mental efficiency on this creative brainstorming task, $b = 0.98$, $F(1, 229) = 4.30$ $p = .039$, $\eta_p^2 = .02$. The interaction effect of conscious and subconscious goal on mental efficiency was not significant.[6] Thus, a subconscious goal improves performance without increasing mental effort and reduces cognitive load by increasing mental efficiency. No support, however, was found for mediation by cognitive load of the positive interaction, as the interaction did not significantly

G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) with alpha = .05 and power = 80% (henceforth used for all sensitivity analyses) revealed a minimum effect size of $\eta_p^2 = .03$, suggesting the experiment was sufficiently powered to detect a small effect (Miles, & Shevlin, 2001).

[5] The power to detect the effect of conscious goal on cognitive load was 65.83%.

[6] The power to detect the conscious goal effect was 38.37% and the power to detect the subconscious goal effect was 54.59%. A difficult goal marginally reduced mental efficiency, $b = -0.78$, $F(1, 229) = 2.76$, $p = .099$, $\eta_p^2 = .01$.

explain incremental variance in either mental effort or mental efficiency, failing to support Hypothesis 7.

Discussion

Figure 3 illustrates a summary of the results of Experiment 1. This study makes several contributions. First, it replicated positive interaction effect reported by Stajkovic et al. (2006). When a difficult conscious goal is paired with a congruent subconscious goal, the positive performance effect is beyond the simple sum of their individual main effects. Second, building on Stajkovic et al. (2006), who found that the subconscious goal positively interacted with an assigned difficult goal compared to an easy goal, this study also found a positive interaction between the conscious difficult goal compared to a do best goal with a subconscious goal.[7] Taken together, findings from prior research and the current experiment provide support for the notion that that performance benefits can be garnered by pairing a difficult conscious goal and with a congruent subconscious goal.

[Insert Figure 3 about here]

Second, a difficult conscious goal increased mental effort on the performance task, but a subconscious goal did not. A subconscious goal improved mental efficiency, but a conscious goal did not. These findings have implications for reconciling the paradox of increased cognitive load in the workplace. Empirically, it seems that subconscious goals can augment performance without increasing cognitive load. This results in cognitive "savings" compared with conscious goals, which boost performance but at the cost of increased cognitive load. These findings also indicate that conscious goals operate through different mental processes than subconscious goals.

[7] The pattern of performance means in Stajkovic et al. (2006) was consistent with the same interaction found in the present study (see Stajkovic et al., 2006, pp. 1176-177). Likely, it did not reach significance in that prior study because 96 participants were spread across six conditions. With 233 participants spread across only four conditions in the present study, power was increased and the interaction between the subconscious goal and these two conscious goals was found.

Third, the null finding regarding the interaction of a subconscious goal and conscious goal on cognitive load suggests that another mechanism is responsible for generating the synergistic performance effect. That is, although a subconscious goal reduced cognitive load compared to no subconscious goal, it did not differentially influence cognitive load when it was paired with a difficult conscious goal versus a do best conscious goal. Therefore, more research is needed to better understand what construct(s) underlie the positive interaction of conscious and subconscious goals on performance. Findings from Stajkovic et al. (2018) suggest the answer could be motivation. In their study, priming a subconscious achievement goal increased level of motivation, which fully mediated the subconscious goal effect on task performance. Therefore, future research could include a measure of motivation level to test if increased motivation, as Stajkovic et al. (2006) proposed, not reduced cognitive load mediates the positive interaction effect of two congruent conscious and subconscious goals on task performance.

Chapter 5: Experiment 2

Method

Design. This experiment is a 3 (incongruent subconscious goal, control, congruent subconscious goal) by 2 (difficult conscious goal, do best conscious goal) design, resulting in six experimental cells. The purpose of this study is threefold. First, it attempts to replicate the positive interaction of a congruent conscious and subconscious goal on performance. Second, it examines a negative interaction, where an incongruent subconscious goal can undermine performance guided by a difficult conscious goal. Third, it tests cognitive load as a mechanism underlying these effects. Unlike the creativity task in Experiment 1, this study uses a relatively straightforward logic task. As described in Chapter 3, the performance task is adapted from a real LSAT exam. To manipulate task complexity, I relied on Wood's (1986) definition of complexity. Specifically, this performance task compared to the next experiment places relatively lower demands on: a) cognitive ability, (b) memory capacity, and (c) information processing.

In this experiment, the difficult conscious goal related to accuracy. This allowed the subconscious goal to be manipulated as congruent (i.e., also aimed for accuracy) or incongruent (aimed at speed). Speed and accuracy were chosen as incongruent goals because of their inherent trade-offs and their importance in human affairs (Schouten & Bekker, 1967; Wickelgren, 1977; Woodworth, 1899). Accuracy in completing a task is related logarithmically to the speed with which the task is completed. At high speed, correct responses occur at levels no greater than chance, i.e., they are random. As speed is reduced, accuracy increases (Wickelgren, 1977). The generalizability of this tradeoff was evidenced by Beersma et al. (2003), who concluded that "most complex tasks require some degree of both speed and accuracy, but there are tradeoffs that make meeting both of these task requirements difficult." Research suggests that dealing effectively with this trade-off requires large amounts of cognitive processing capacity to assure that inaccuracy does not exceed the pre-set tolerable industry, company, normative, or legal standards. This creates optimal conditions for the present study to examine the relationship between these goals and their impact on overall cognitive load.

Participants. I used the method for sample size and recruiting participants as described in Experiment 1. I aimed for 50 participants in each of the six experimental cells, plus 20% extra. This resulted in a desired sample of 360 participants. Qualtrics recruited 410 participants. Of these, 32 were screened out for being under the age of 18 and another 28 were excluded for failing to complete the survey (e.g., leaving responses blank, using gibberish, or failing to use prime words in the sentences). The final sample size was 350 participants (73% female, M_{age} = 27.81, *SD* = 14.97, age range: 18 to 62 years).

Treatment manipulations. The independent variables were the same as Experiment 1.

Subconscious goal. Participants were randomly assigned to one of three subconscious goal groups: incongruent (speed), congruent (accuracy), or control group (no prime). The sentence unscrambling task was used to prime the subconscious goals. In the incongruent (speed) subconscious goal group, 12 of the 20 sentences contained a speed-related word (see Appendix F). In the congruent (accuracy) subconscious goal group, these 12 sentences contained an accuracy-related word (see Appendix G). The prime words for speed and accuracy goals were adopted from Stajkovic et al. (2007). In the control group, all 20 sentences were goal-neutral. To ensure the priming task did not induce differences in cognitive load across groups, participants were asked the following question: “In the sentence unscrambling task, I invested…” with a 9-point response anchor. There were no statistical differences between experimental groups (p = .65).

Conscious goal. Conscious goals were assigned in two groups: difficult or do your best, in relation to the performance task. The performance task involved solving 14 questions related to a logic reasoning problem. Based on a pilot study, the difficult goal was set for correctly answering 13 out of 14 questions (expected success rate of 10%).

Procedures

The experiment was administered online using Qualtrics. The greeting, sentence unscrambling task, and follow up cognitive load assessment were identical to Experiment 1. Next, participants were presented with the instructions for the performance task. Participants were informed the next task is a reasoning task that involves a limited set of available facts. Based on the information provided, they were told they need to recreate a job interview schedule and determine who was given an offer. The bottom of the instruction screen assigned the conscious goal, e.g., "Your goal is to answer 13 out of 14 questions correctly." The conscious goal was presented in larger, bold font, along with the statement that "you will have 4 minutes." There was a checkbox below the instructions that required participants to click that they "understand their goal is to [insert goal condition here]." After checking this box, a new screen appeared. It contained the instructions for the performance the task (see Appendix H). In short, this task required participants to read eight information cues to reconstruct a list of job interview applicants. The cues for this experiment compared with the next one require less cognitive capacity to draw connections among facts and impose lower strain on memory capacity. An automatic four-minute timer required participants to spend exactly four-minutes on the task.

The content of the conscious goal was accuracy. Therefore, performance was measured with the percentage of correct responses, i.e., number of correct responses divided by number of attempted questions. After finishing the task, participants completed the mental effort scale and rated their perception of task complexity. Then, they were given instructions for the *Stroop task*, as described in Experiment 1. Following the *Stroop task*, participants completed the six-item awareness questionnaire. Responses were evaluated using the LIWC 2015 software using the dictionary described in Experiment 1. No responses were flagged as aware.

After completing the awareness check and demographic items, one last question was added to this experiment. Because this experiment was longer than Experiment 1, participants were asked to recall the conscious goal they were assigned. Three multiple choice answers were provided: a) To do my best, b) To correctly answer 3 out of 14 questions, or c) To correctly answer 13 out of 14 questions. Failure to correctly answer the recall question is indicative of lack of goal acceptance. Because goal acceptance is a necessary component of goal effectiveness in goal theory (Locke & Latham, 2004), participants who failed to correctly answer the recall question were excluded (supplemental analyses with both sets of participants are reported).

Analytical Procedures

To test Hypotheses 2 and 4, I used linear contrast analysis (LCA). LCA is increasingly used in social psychology and OB research because of its statistical sophistication and power to detect a theory-driven pattern of effects (Anderson, Siegel, Bliss-Moreau, & Barrett, 2011; Savani & King, 2015; Wilkowski & Meier, 2010). LCA has been suggested as a preferred statistical test for analyzing patterns of systematic variation among more than two means, and when a theoretically driven pattern, or trend, of means is hypothesized (Judd, McClelland & Culhane, 1995; Judd et al. 2011; Keppel & Zedeck, 1989). By testing the hypothesized order of means, the significance of the pattern is revealed (Rosnow & Rosenthal, 1991, 1995; Rosnow, Rosenthal, & Rubin, 2000). Thus, LCA goes beyond the pieces of the story and enables the whole story to be tested. My hypothesis predicts the following pattern of performance means: incongruent (speed) subconscious goal < control group < congruent (accuracy) subconscious goal. Thus, “test the predicted pattern of means by assigning to each cell a weight that corresponds to the predicted pattern” (Petty, Fabrigar, Wegener, Priester, 1996, pp. 249-250) of subconscious goals. Because contrast weights must represent the hypothesized trend of means, I assigned contrast weights of (-.5, 0, .5) to the three subconscious goal groups.

In addition to providing the *F* test value and related probability, LCA requires that the *F* test of the residual sum of squares not be significant (Abelson & Prentice, 1997). This indicates that data are described by the *a priori* hypothesis for the pattern of systematic variation, and that deviations from the pattern can be attributed to chance variation. Without a test of the residual variance, the *a priori* contrast cannot be unambiguously said to account for the systematic variance. To determine if Y_i can be predicted as a function of the categorical variable having m groups, is akin to asking if there are differences among the m group means ($\bar{Y}_k$) across levels (with k varying from 1 to m) (Judd et al., 2011). To answer this question, m-1 contrast-coded predictors must be included in the model. The pairs of contrasts across m conditions must be orthogonal to capture residual variance (Judd et al., 2011). Contrasts are orthogonal when the sum (across k) equals zero and the products of λ values from the pairs of contrasts equals zero.

Correspondingly, because I manipulated subconscious goal in three groups (m), I included one orthogonal contrast to preclude the possibility that some other pattern of means accounts for significant variance. Therefore, I created a centered and orthogonal contrast, (-.5, 1, -.5). Two conditions must be met to conclude that the data supports the hypothesized pattern. First, the test with the planned orthogonal contrasts must indicate the hypothesized linear contrast is statistically significant. Second, a comparison between a model containing only the hypothesized contrasts (and theoretical covariates) and the augmented model containing all planned orthogonal contrasts must indicate that the residual between-group variance explained by the orthogonal contrasts is not significant. Testing orthogonal contrasts as a set decreases the type I error rate and minimizes risk that different contrasts lead to different conclusions (see Abelson & Prentice, 1997; Judd et al., 2011; Rosnow et al., 2000, for all related equations).

Results

Descriptive statistics. Descriptive statistics are reported in Table 3 and correlations in Table 4. The pattern of performance means was consistent with theory. The congruent (accuracy) subconscious goal paired with a difficult conscious goal resulted in the highest average performance, and the incongruent (speed) subconscious goal paired with the do best conscious goal had the lowest average performance.

[Insert Table 3 and Table 4 about here]

Linear contrast analysis. I analyzed a model with the contrast representing the predicted pattern of performance means for subconscious goal factor (-.5, 0, .5), the orthogonal contrast (-.5, 1, -.5), conscious goal factor (-.5, .5), and their interaction. The hypothesized subconscious goal contrast was a significant predictor of performance, b = 11.16, F(1, 272) = 7.95, p = .005, η_p^2 = .03, and the orthogonal contrast testing the residual between-group variance was not significant, lending support for Hypothesis 2 and 4. A difficult conscious goal increased performance by 7.58% compared to a do best conscious goal, F(1, 272) = 5.14, p = .024, η_p^2 = .02, supporting Hypothesis 1. The interaction of the subconscious goal contrast and conscious goal was marginally significant, b = 13.93, F(1, 272) = 3.04, p = .082, η_p^2 = .011.[8] Figure 4 shows the predicted performance means for subconscious goal group with corresponding error bars of the point estimates, controlling for conscious goal and Figure 5 illustrates the interaction.

[Insert Figure 4 about here]

[Insert Figure 5 about here]

[8] The power to detect the effect of the hypothesized pattern for subconscious goal contrast was 79.75%, the power to detect the conscious goal effect was 62.08%, and the power to detect their interaction effect was 41.31%. A power sensitivity analysis revealed a minimum effect size of η_p^2 = .028, suggesting the study was adequately powered to detect a small to medium effect.

Multiple planned orthogonal comparisons (MPOC). To clarify the influence of subconscious goals on performance and their interaction with conscious goals, I ran a model with multiple planned orthogonal comparisons (MPOC) (Judd et al., 2010). MPOC are used when there are multiple hypotheses that can be "translated" in multiple orthogonal contrasts. The two *a priori* hypotheses for this study were as follows: that the congruent (accuracy) subconscious goal (.5) would outperform the control group (-.5); and, that the control group (.5) would outperform the incongruent (speed) subconscious goal (-.5). The model simultaneously accounts for these two predictions, as well as included a predictor for conscious goal, and its interaction with each of the two MPOC. This allows a more granular testing of the interaction effects.

Controlling for conscious goal, an incongruent (speed) subconscious goal undermined performance by 9.83% compared to the control group, $F(1, 271) = 4.57$, $p = .034$, $\eta_p^2 = .02$, supporting Hypothesis 4. A congruent (accuracy) subconscious goal improved performance by 12.63% compared to the control group, $b = 12.63$, $F(1, 271) = 7.04$, $p = .008$, $\eta_p^2 = .03$, supporting Hypothesis 2. A difficult conscious goal continued to increase performance by 7.44% compared with a do best conscious goal, $F(1, 271) = 4.93$, $p = .027$, $\eta_p^2 = .02$, supporting Hypothesis 1. The negative interaction between an incongruent (speed) subconscious goal and conscious goal was not significant, failing to support Hypothesis 5. There was, however, a marginally significant positive interaction between conscious goal and congruent (accuracy) subconscious goal, $b = 17.02$, $F(1, 271) = 3.20$, $p = .075$, $\eta_p^2 = .01$, supporting Hypothesis 3.[9] Figure 4 illustrates this positive interaction. Taken together, these findings suggest that performance is improved when a congruent subconscious goal is primed, is undermined when an

[9] The power to detect the effect of primed incongruent (speed) goal compared to control was 56.95%, the power to detect the effect of primed congruent (accuracy) goal compared to control was 75.58%, the power to detect the effect of assigned difficult goal compared to do best goal was 60.27%, and the power to detect the interaction of the congruent primed (accuracy) goal and conscious goal condition was 43.12%.

incongruent subconscious goal is primed, and the synergistic positive interaction from Experiment 1 holds for a logic task of medium complexity. See source table results in Table 5.

[Insert Table 5 about here]

Cognitive load. For mental effort, the hypothesized subconscious goal contrast had a significant, negative relation to mental effort, $b = -0.68$, $F(1, 272) = 6.75$, $p < .001$, $\eta_p^2 = .02$, lending support for Hypothesis 6 and 8. Similar to Experiment 1, a difficult conscious goal compared to a do best conscious goal marginally increased mental effort, $b = 0.41$, $F(1, 272) = 3.48$, $p = .063$, $\eta_p^2 = .01$.[10] The contrast testing the residual between group variance was not significant, nor was the interaction of the subconscious goal linear contrast and conscious goal condition. I conducted a follow-up analysis with the MPOC. The incongruent (speed) subconscious goal increased mental effort compared to the control group, $F(1, 271) = 8.33$, $p = .004$, $\eta_p^2 = .03$, supporting Hypothesis 8. Again, in this model, a goal conscious difficult goal compared with a do best goal marginally increased mental effort, $F(1,271) = 3.14$, $p = .077$, $\eta_p^2 = .01$. Consistent with Experiment 1, there was no effect of the congruent (accuracy) subconscious goal compared to control on mental effort, supporting Hypothesis 6. This suggests that a congruent subconscious goal does not increase mental effort in the same way that a conscious goal does. Yet, the finding that an incongruent subconscious goal increases mental effort indicates that subconscious goals can usurp limited mental resources when they are incongruent with a conscious goal. Together, these results support a dynamic theory of self-regulation, where cognitive resources are divided to meet demands of both active goals. See Figure 6 for mental effort with error bars of the point estimates, controlling for conscious goal.

[Insert Figure 6 about here]

[10] Power to detect the effect of the hypothesized pattern of subconscious goals was 73.78% and the power to detect the effect of conscious goal condition was 46.14%.

For mental efficiency, a difficult conscious goal compared with a do best conscious goal improved mental efficiency on this logic task, $F(1, 272) = 10.24$, $p = .002$, $\eta_p^2 = .04$, supporting Hypothesis 12.[11] Neither the subconscious goal contrast ($p = .229$, $\eta_p^2 = .005$), nor the MPOC of incongruent subconscious goal compared to control ($p = .315$, $\eta_p^2 = .004$) or the congruent subconscious goal compared to control ($p = .292$, $\eta_p^2 = .004$) predicted mental efficiency (see Figure 7). Consistent with Experiment 1, neither interaction term of conscious and subconscious goal were mediated by cognitive load, failing to support Hypothesis 7 and 9.

[Insert Figure 7 about here]

Additional Analyses

Mediation analysis. To determine if main effects were mediated by cognitive load, I assessed if either dimension of cognitive load predicted performance. Mental effort was not related to performance ($p = .498$), but greater mental efficiency led to higher performance, $b = 2.28$, $F(1, 275) = 30.29$, $p < .001$, $\eta_p^2 = .10$.[12] Following Baron and Kenny (1986) mediation procedures, mental efficiency may mediate the conscious goal effect. That is, conscious goal and mental efficiency predicted performance, and a difficult conscious goal enhanced mental efficiency. In the full model, the hypothesized subconscious goal contrast continued to predict performance, $b = 9.73$, $F(1, 271) = 6.44$, $p = .012$, $\eta_p^2 = .02$, conscious goal became not significant, mental efficiency significantly predicted performance, $b = -2.13$, $F(1, 271) = 26.03$, $p < .001$, $\eta_p^2 = .09$, and a significant interaction between the subconscious goal contrast and conscious goal factor emerged, $b = 15.14$, $F(1, 271) = 3.91$, $p = .049$, $\eta_p^2 = .01$, supporting Hypothesis 3. [13] The data is consistent with mediation, where a difficult conscious goal boosts

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[11] Power to detect the conscious goal effect was 88.69%.
[12] The power to detect this effect was 99.98%.
[13] The power to detect the subconscious goal effect was 71.93%, power to detect the mental efficiency effect was 99.91%, and the power to detect the interaction effect was 50.58%.

performance by improving mental efficiency. A reverse mediation model cannot be considered, as conscious goal was manipulated prior to the measure of performance and mental efficiency.

Following Tingley, Yamamoto, Hirose, Imai, and Keele (2014) causal mediation procedures in R, the next step is to test the significance of the indirect effect. As seen in the causal mediation results in Table 6, the average causal mediated effect (ACME) of conscious goal on performance through mental efficiency was significant. The average direct effect of conscious goal to performance became not significant. The total effect and proportion of the effect mediated were significant ($p = .036$). This result is consistent with full mediation. I tested if subconscious goal moderated the mediated effect, but this was not supported. See Figure 8 for the mediated, direct, and interactive effects of conscious and subconscious goals to performance.

[Insert Table 6 about here]

[Insert Figure 8 about here]

Failed recall. To ascertain the importance of goal acceptance, I included 90 participants who failed to correctly recall their conscious goal and re-ran all analyses. The following changes emerged. First, conscious goal no longer significantly predicted performance ($p = .13$).[14] As expected, this suggests that conscious goals are only effective on medium complexity logic tasks if the goal is accepted. Notably, no changes were found in relation to conscious goals and mental effort, as the difficult conscious goal compared to a do best goal still increased mental effort, $b = 0.43$, $F(1, 345) = 5.35$, $p = .021$, $\eta_p^2 = .02$.[15]

[14] The hypothesized subconscious goal pattern remained a significant predictor of performance in this model, $b = 10.13$, $F(1, 345) = 8.48$, $p = .004$, $\eta_p^2 = .024$, and the power to detect this effect was 83.01%. A sensitivity power analysis revealed a minimum effect size for this model of $\eta_p^2 = .022$, suggesting it was sufficiently powered to detect a small effect.

[15] Power to detect the conscious goal effect was 63.78%. The hypothesized subconscious goal contrast continued to affect cognitive load, $b = -0.59$, $F(1, 345) = 6.67$, $p = .010$, $\eta_p^2 = .019$, and power to detect the subconscious goal effect was 73.35%.

This finding, juxtaposed with lack of goal acceptance negating the performance effect, implies that being assigned a difficult goal is sufficient to increase cognitive load, despite it not garnering benefits. This implication was further supported in the re-analysis of mental efficiency, as the difficult conscious goal became only marginally significant, $b = 0.77$, $F(1, 345) = 3.29$, $p = .071$, $\eta_p^2 = .01$. It is worth noting, though, that in the full mediation model, mental efficiency continued to predict performance, $b = 1.79$, $F(1, 344) = 26.60$, $p < .001$, $\eta_p^2 = .07$, as did the hypothesized subconscious goal contrast, $b = 8.87$, $F(1, 344) = 6.96$, $p = .009$, $\eta_p^2 = .02$.[16]

Likelihood of goal recall. An interesting question that can be addressed with these data post hoc is whether a congruent (accuracy) subconscious goal increases likelihood of participants accepting the conscious goal. I tested this post hoc hypothesis in a generalized linear model (GLM) that included the subconscious goal contrast, conscious goal factor, and their interaction. I used the binomial family with the logit link function for GLM. I report the chi square statistics from GLM and the odds ratio to quantify effect size of significant effects. Subconscious goal contrast did not affect likelihood of goal recall, but a difficult conscious goal compared with a do best conscious goal reduced likelihood of goal acceptance, $\chi^2(1) = 62.66$, $p < .001$. Transforming the log-odds into probabilities revealed that the probability of accepting the do best goal was 95.18%, compared with only 60.73% probability of accepting a difficult conscious goal.

Although the subconscious goal contrast did not statistically significantly affect likelihood of accepting the goal, the patterns of predicted probabilities were consistent with expectations: 75% for incongruent (speed) subconscious goal; 80% for control; and 84% for congruent (accuracy) subconscious goal condition. Next, I ran the GLM with a 5 *d.f.* test, which showed significant differences across experimental groups, $\chi^2(1) = 4.49$, $p = .034$. From least

[16] The power to detect the effect of mental efficiency was 99.93% and the power to detect the subconscious goal effect was 75.11%. Neither conscious goal, the orthogonal contrast, nor the interaction of conscious and subconscious goal condition was significant in this model.

likely to most likely, the predicted probabilities of goal acceptance were as follows for conscious and subconscious goal group, respectively: do best/control 85.31%; difficult/control, 83.21%, do best/congruent, 80.89%; difficult/congruent, 78.3%; do best/incongruent, 75.49%; difficult/ incongruent 72.44%. This suggests that priming a subconscious goal, in general, reduces the likelihood a conscious goal will be accepted. However, the content of the subconscious goal also appears to have a small degree of influence, though not significantly so, on goal acceptance.

Discussion

Figure 9 illustrates a summary of the results from Experiment 2. This study replicated Experiment 1 by showing that a congruent subconscious goal and a difficult conscious goal have a positive interaction effect on task performance. The MPOC analyses revealed that an incongruent (speed) subconscious goal has a negative effect on performance. Cognitive load was elevated in the incongruent (speed) subconscious goal group compared with control. This supports theory that self-regulation resources need to be divided and allocated to two incongruent goals, thereby increasing cognitive load. In contrast, when a congruent subconscious goal is primed, cognitive resources are already put in place by conscious processes. Therefore, a congruent subconscious goal does not increase mental effort.

[Insert Figure 9 about here]

A new finding was that despite increasing mental effort, assigning a difficult conscious goal enhanced mental efficiency. As hypothesized, this is because a conscious goal narrows focus and directs effort to uncover the concrete pattern. Consider the following analogy. In bowling, when bumpers are used to cover the gutters the ball moves more easily down the lane toward the pins. When the bumpers are removed, it takes greater self-control on the part of the bowler to keep the ball moving in the right direction. The conscious goal is like the bumpers for this logic task. Without it, demands on cognitive resources are higher and less efficiently used because an individual must determine on which cues to focus and how much energy to expend.

Relatedly, mental efficiency fully mediated the positive effect of a difficult conscious goal on performance. This contributes nuance to goal theory. Goal theory has shown that assigning a goal directs focus, increases effort, and helps sustain persistence. Finding that it enhances mental efficiency on a medium complex logic task adds another layer; it shows that the mechanisms described (e.g., task focus, effort, persistence) may boost performance because each contributes to more efficient use of cognitive resources.

Unlike Experiment 1, I did not find an effect of a congruent subconscious goal on mental efficiency. This lends credence to the notion that mechanisms underlying the effects of conscious and subconscious goals are different. That is, because task complexity and the nature of the task (i.e., creativity vs. reasoning) were different, when conscious processing became critical to improving mental efficiency, the subconscious goal was no longer needed. The theoretical implications of this finding are further discussed in the Chapter 7.

The additional analyses revealed several insights. First, as has been documented, conscious goals require goal acceptance to be effective (Locke & Latham, 2004). However, goal acceptance is irrelevant for conscious goals to affect cognitive load. This highlights a drawback of difficult conscious goals when there is no goal acceptance. For one thing, if the goal is not accepted, performance will not increase, but mental effort will. Relatedly, goal acceptance is more likely when the conscious goal was a do best goal compared to a difficult conscious goal. This finding is logical, as it is easier for people to accept a vague “do best goal” than to accept a difficult one. Interestingly, although a subconscious goal did not affect goal acceptance, the pattern of probabilities was revealing. It seems that simply priming employees with subconscious goals reduces their likelihood to accept an assigned conscious goal, and that this negative effect is exacerbated if the subconscious goal is incongruent with the conscious goal.

Chapter 6: Experiment 3

Method

Design. Design of this experiment was identical to Experiment 2, a 3 (incongruent subconscious goal, control, congruent subconscious goal) by 2 (difficult conscious goal, do best conscious goal). This experiment investigates task complexity as potential boundary condition to the effects observed in Experiment 1 and 2. Therefore, the only change to the design was increasing demands of the performance task on (a) cognitive ability, (b) memory capacity, and (c) information processing. The specific manipulation used to do this is described below.

Participants. I used the same method to determine the sample and to recruit participants. I aimed for 50 participants in each of the six cells, plus 20% extra. This resulted in a desired sample size of 360 participants. Qualtrics recruited 378 participants. Of these, none were screened out for being under the age of 18. However, 47 people were excluded for failing to complete fully the experimental protocol. The final sample size was 331 participants (74.3% female, $M_{age} = 28.44$, $SD = 16.02$, age range: 18 to 64 years).

Treatment manipulations. Treatment manipulations were identical to those described in Experiment 2.

Procedures

The only change in procedures was complexity of the performance task. The language and vagueness of the cues in this experiment compared with Experiment 2 imposed higher strains on memory capacity and required higher levels of information processing to draw abstract connections and perform successfully (see Appendix I). The same scales were used following the performance task. After the *Stroop task*, participants completed the awareness questions. No responses were flagged as aware by the LWIC 2015 software. As described in Experiment 2, participants were then asked to recall their conscious goal.

Results

Descriptive statistics. Descriptive statistics by experimental group are reported in Table 7 and correlations in Table 8. The pattern of performance means deviated from Experiment 2. Specifically, the highest average performance was a difficult conscious goal with no subconscious goal, as compared to a difficult conscious goal and congruent (accuracy) subconscious goal in Experiment 2 (which had the second-best performance in this experiment). Replicating Experiment 2, the incongruent (speed) subconscious goal paired with a do best conscious goal had the lowest average performance.

[Insert Table 7 and Table 8 about here]

Linear contrast analysis. The hypothesized pattern of performance means for the subconscious goal contrast was marginally significant, $b = 6.86$, $F(1,233) = 2.89$, $p = .085$, $\eta_p^2 = .01$, and the orthogonal contrast was not significant, lending some support for Hypothesis 2 and 4. A difficult conscious goal compared to do best conscious goal improved performance by 11.13%, $F(1, 233) = 11.97$, $p = .001$, $\eta_p^2 = .05$, supporting Hypothesis 1. The interaction of subconscious goal contrast and conscious goal was not significant.[17] See Figure 10 for predicted performance means with error bars of the point estimates, controlling for conscious goal.

[Insert Figure 10 about here]

Multiple planned orthogonal comparisons (MPOC). Controlling for conscious goal, the incongruent (speed) subconscious goal reduced performance by 11.21% compared to the control group, $F(1, 232) = 6.39$, $p = .012$, $\eta_p^2 = .03$, supporting Hypothesis 4. The congruent (accuracy) subconscious goal, though, was not significantly different from the control group,

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[17] Power to detect the effect of subconscious goal condition was 40.83% and the power to detect the conscious goal effect was 93.31%. A power sensitivity analysis revealed a minimum effect size of $\eta_p^2 = .033$, suggesting the study was sufficiently powered to detect a small effect.

failing to support Hypothesis 2. This suggests that complexity may be a boundary condition for the positive effect of a congruent subconscious goal, but it does not appear to be a boundary for the negative effect of an incongruent subconscious goal. A difficult conscious goal continued to improve performance by 10.89% compared to a do best conscious goal, $F(1, 232) = 11.71$, $p < .001$, $\eta_p^2 = .05$, supporting Hypothesis 1. Neither type of subconscious goal interacted with a conscious goal, failing to support Hypothesis 3 and 5. Full model results are reported in Table 9.

[Insert Table 9 about here]

Cognitive load. There were no differences in mental effort across conditions. For the congruent subconscious goal, this is consistent with Experiment 1 and 2, supporting Hypothesis 6. In a follow-up MPOC, there was a significant difference in mental efficiency between the congruent (accuracy) subconscious goal compared to the control group, $b = 1.54$, $F(1, 232) = 4.34$, $p = .038$, $\eta_p^2 = .02$, supporting Hypothesis 13.[18] See Figure 11 for mental efficiency by subconscious goal group with corresponding error bars of the point estimates, controlling for conscious goal. Identical to Experiment 1 and 2, cognitive load did not mediate interaction effects of the conscious and subconscious goals, failing to support Hypothesis 7 and 9.

[Insert Figure 11 about here]

Additional Analyses

Mediation analysis. To determine whether mental efficiency mediated main effects, I assessed if it predicted task performance. Consistent with Experiment 2, greater mental efficiency related to higher performance, $b = 1.17$, $F(1, 236) = 7.936$, $p = .005$, $\eta_p^2 = .03$.[19] Unlike Experiment 2, conscious goal did not significantly affect mental efficiency. In the full MPOC model, the incongruent (speed) subconscious goal reduced performance by 10.66%

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[18] The power to detect this effect was 54.90%.
[19] The power to detect this effect was 80.40%.

compared to control, $F(1, 231) = 5.98$, $p = .015$, $\eta_p^2 = .03$, a congruent (accuracy) subconscious goal had no significant effect on performance, a difficult conscious goal improved performance by 10.90% compared with do best goal, $F(1, 231) = 12.15$, $p < .001$, $\eta_p^2 = .05$, every one-unit increase in mental efficiency increased performance by 1.22%, $F(1, 231) = 9.20$, $p = .003$, $\eta_p^2 = .04$, and an incongruent (speed) subconscious goal and difficult conscious goal had a marginally significant negative interaction, $b = -14.14$, $F(1, 231) = 2.74$, $p = .099$, $\eta_p^2 = .01$ (see Figure 10)[20] Thus, Hypothesis 5 was supported in the full model with mental efficiency as a covariate. See Figure 12 for performance by experimental group illustrating the interaction effect.

[Insert Figure 12 about here]

As a congruent subconscious goal was related to mental efficiency, I tested if it affected performance through mental efficiency, despite it not having a direct effect on performance. In a causal mediation analysis, the indirect effect of a congruent subconscious goal through mental efficiency on performance was significant, $b = 1.78$, 95%CI[0.32, 3.79], $p = .01$. There was no evidence of moderated mediation by a conscious goal. Together, this suggests that priming a congruent subconscious goal for highly complex tasks does still yield performance gains. Lastly, despite a significant negative main effect and interaction effect of the incongruent subconscious goal, it had no statistically significant effect on cognitive load, failing to support Hypothesis 7 and 9.

Failed recall. I included 93 participants who failed to correctly recall their conscious goal and re-ran all analyses. No changes in any of the models were observed. This was unlike

[20] Power to detect the effects were as follows: primed incongruent (speed) goal, 68.67%; assigned difficult goal, 93.66%; mental efficiency, 85.85%, interaction effect, 38.07%.

Experiment 2, which showed that goal acceptance was necessary for the main effect of a difficult conscious goal. Therefore, task complexity may be a boundary condition for goal acceptance.[21]

Likelihood of goal recall. Replicating Experiment 2, a do best conscious goal compared with a difficult goal increased likelihood of goal acceptance, $\chi^2(1) = 85.89$, $p < .001$, and the interaction of conscious goal and subconscious goal contrast marginally predicted likelihood of goal acceptance, $\chi^2(1) = 2.74$, p = .098. Transforming the log-odds into probabilities revealed that the probability of accepting a do best conscious goal was 92.98% compared with only 49.38% for a difficult conscious goal. The main effect of subconscious goal on likelihood of goal acceptance did not reach statistical significance.

Discussion

Figure 13 illustrates a summary of the results from Experiment 3. Although task complexity was a boundary condition on the direct positive effect of a congruent subconscious goal, it does not appear to be a boundary condition on the negative effect of an incongruent subconscious goal. Another new insight was that a difficult conscious goal did not increase mental effort in this experiment (as it had in Experiment 1 and 2). This could be a result of restriction of range for the mental effort measure (further discussed in Chapter 7). This is because a complex task is mentally more demanding by nature, restricting the upper end of the 9-point *Paas Cognitive Load Scale* to capture unique variance. Another change in findings was that a difficult conscious goal did not enhance mental efficiency, as it had on the medium complex logic task. Instead, a congruent subconscious goal enhanced mental efficiency on the complex task, consistent with theoretical predictions. The mediation analysis revealed a significant indirect effect of a congruent subconscious goal on performance through enhanced mental

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[21] This finding could be an outlier, as goal acceptance has been repeatedly shown to be necessary for conscious goals to effectively enhance performance (see Latham & Locke, 2018).

efficiency. This further highlights the key role of cognitive load in the subconscious goal to performance relationship, and the importance of "resource-free" subconscious processes.

[Insert Figure 13 about here]

Chapter 7: General Discussion

The full results for each of the 14 hypotheses by experiment is reported in Table 10.

[Insert Table 10 about here]

Implications for theory. Replication is the gold standard in science. The finding by Stajkovic et al. (2006) and Shantz and Latham (2009, 2011) that a congruent subconscious goal and a difficult conscious goal interact to enhance performance was replicated. I extended this research by finding that task complexity is a boundary condition of this interaction effect. Moreover, a congruent subconscious goal not only improved performance, but it also reduced cognitive load relative to a conscious goal. This indicates that subconscious goals can operate "resource free," resulting in performance gains across tasks of varying complexity.

Importantly, I did not find that *all* subconscious goals operate "resource free." Instead, when a subconscious goal was incongruent with a conscious goal it consumed limited mental resources. This implies that cognitive resources need to be divided to support the self-regulatory activities of both goals. To my knowledge, this is the first study to empirically support a dynamic theory of adaptive self-regulation when it comes to subconscious goals. Instead of subconscious goals always operating "resource free" or consuming limited resources, the results of these experiments suggest it can *both* operate without consuming limited resources, but it can also consume resources depending on its congruency with conscious pursuits. Task complexity appears to be a boundary condition for this effect. This may, however, be an artifact of restriction of range in the cognitive load measure, as further described in the limitations section.

Extending research on the interaction of conscious and subconscious goals, when the subconscious goal was incongruent with the conscious goal, performance was derailed. Notably, task complexity was not a boundary condition of this negative effect. It appears the demands to regulate resources to two incongruent goals during a complex task diminishes positive performance effects that would have been achieved by a difficult conscious goal. This is because on the complex task the difficult conscious goal improved performance by 10.89% compared to the do best conscious goal, but an incongruent subconscious goal weakened performance by 11.21% compared to the control group.

Hypothesis 10 was partially supported, as the effect size of a difficult conscious goal on performance was larger on the simple task than the medium complex logic task. However, the effect size of the difficult conscious goal on the highly complex task was equal to the effect size on the simple brainstorming task. This suggests that assigning a difficult conscious goal is not necessarily better suited for only easy tasks. The subconscious goal effect was the largest on the simple brainstorming task, followed by the medium complex task, and was smallest on the highly complex task. This indicates a diminishing return on performance when subconscious goals are primed for increasingly complex tasks.

The data support the notion that goals enhance mental efficiency. Without goals, more self-regulatory resources are needed to enact mental processes needed to accomplish the task. With that said, because types of cognitive processing used by subconscious and conscious goals differ, different effects on mental efficiency were found depending on the nature of the task. By delineating behavioral patterns guided by conscious and subconscious goals among different levels of complexity and types of cognitive processing, this research sheds light on how behavior can be influenced without awareness. Contributing to calls on the interplay of conscious and subconscious goals (Stajkovic & Locke, 2004; Stajkovic et al., 2006, 2007, 2018), this research provided a theory of how subconscious goals can both augment and sabotage task performance.

Implications for practice. Although employees may be consciously motivated to pursue goals that align with company objectives, these attempts may be hindered if cues in the environment prime an incongruent goal. To mitigate goal derailment, organizational members can reflect on goals that may be ingrained in their subconscious. Self-awareness is an important first step to overcoming the controlling influence of the environment. Only after cues that can prime incongruent goals have been identified, can employees begin to adaptively self-regulate.

Management practice can benefit by considering triggers of automatic behavior. During times of accelerated change (Cappelli, 2006, 2012) an increasing number of informational cues that can trigger subconscious goals are present in the workplace (George, 2009; Kay et al., 2004; Schein, 2010). For this reason, raising awareness of the interaction of conscious and subconscious goals is needed, especially in contexts where these goals can produce negative effects. In their article "Bad is stronger than good," Baumeister, Bratslavsky, Finkenauer, and Vohs (2001) claim that one negative experience overwhelms at least four positive ones. Today, employees are faced with 24/7 competitive demands (Cappelli, 2006, 2012) that increase the level of effort and cognitive resources needed to adaptively self-regulate (Bolino, Harvey, & Bachrach, 2012). The need for adaptive work behavior is amplified if employees are unaware of internal motivational conflicts, especially when cognitive pressure is elevated.

Though employees may be hesitant to attribute their behavior to subconscious goals for which they are unaware, this research highlights the need to consider this possibility. How could these goals be primed at work? Consider regulated professions, such as public accounting. In these jobs, repeated interactions between employees and clients can create subconscious associations. This means that when employees work from client sites or have meetings with clients, simply seeing clients could prime client-related goals. Similarly, these goals could be primed by client stationary, pens, or paper. The cause for pause here is that client-related goals, though at times useful, can be incongruent with other assigned conscious goals, such as protecting the public interest. Therefore, although society entrusts these professionals to protect the public, their performance may nonetheless be compromised without their awareness.

What can organizations do to reverse, detect, or prevent primed subconscious goals that can interfere with conscious goals? Decades of goal priming research suggest that attempts at reversing subconsciously held goal-behavior associations is a fool's errand, even for trained professionals (Hassin et al., 2005; Uleman & Bargh, 1989; Wegner & Bargh, 1998). Consequently, company resources are not best spent on attempting to reverse associations.

Instead, deliberate action to detect and prevent negative effects of subconscious goals is possible. For example, training programs could help employees to become conscious of the subconscious. These programs could inform employees about subconscious goals, explain how they form, and describe how they are activated at work. Raising awareness would help people identify potential primes, rendering them ineffective by bringing their influence under conscious control. For instance, discussing money or displaying money-related artwork can prime subconscious goals that lead to automatic selfish and unethical behaviors (Vohs, 2010). By understanding the unintended consequences of primes, leaders can mitigate their harmful effects.

Relatedly, because subconscious goals can cause unethical behavior without awareness, before sanctions are brought down on employees for such behavior, organizational members should consider that the behavior might have been caused by subconscious motives for which the employee was unaware. For example, Welsh and Ordóñez (2014) primed people with ethical and unethical words and found that moral sensitivity was heightened in the priming conditions compared with control. Exposure to concepts of ethics reduced the likelihood of being unethical. These authors also found that when people were *not* monitored, priming reduced cheating. Yet, if priming can promote ethical behavior, can it also exacerbate unethical behavior? Failure to address such possibility could cause subconscious goals to move further into subterranean space. For this reason, it is better to discuss the possibility of subconscious goals impacting work behaviors rather than ignore them; this could help potential bad primes to be removed.

Whereas awareness of subconscious goals can decrease their negative effects, it could also be used to increase their positive performance effects. For example, findings from this research suggest that organizations could harness the power of congruent conscious and subconscious goals. Goal-related primes (e.g., achievement) can be embedded in e-mails (Stajkovic et al., 2018), posters (Vohs et al., 2006), or instructional documents (Shantz & Latham, 2009). Prime photos could be embedded in screensavers, desktop backgrounds, or in artwork throughout the office building (Kay et al., 2004).

Caution should be exercised , though, when intentionally implanting primes to activate subconscious goals, as primed goals are not without some unintended effects. For instance, if an organization requires employees to have red pens on their desks to prime an accuracy goal, employees could pursue automatically accuracy at the expense of efficiency. Additionally, if primes are used to enhance employee performance, accordant reinforcement must be adjusted to ensure performance is equitably rewarded. Said differently, priming people to work harder, while paying them the same or less is not ethical. As a result, ethical considerations should be addressed by leaders before priming is used in organizations.

Limitations and Future Research

Much ink has been spilled in the literature to provide theoretical gruel to the uncertainty expressed by critics regarding what construct is primed, e.g., associative semantics, procedures, goals, traits (see Förster, Liberman, & Friedman, 2009). By defining subconscious goals and explaining how they are primed, this research advanced our understanding of subconscious goals. However, several limitations provide opportunities for future research. First, one alternative explanation to the relation between conscious and subconscious goals and mental efficiency is that the measure of efficiency was confounded with performance. That is, the positive effect on mental efficiency of could have been caused by residual carryover (i.e., perform better by correctly identifying matches) that enabled better performance on the *Stroop task*. If this was the case, however, I would have expected both a difficult conscious goal and a congruent subconscious goal to improve mental efficiency in all three experiments. Instead, only one type of goal influenced mental efficiency in each study, consistent with theory predictions. Future research, though, should conceptually replicate these findings by using different measures of mental efficiency (see Paas et al., 2003).

A second limitation is the restriction of range in the *Paas Cognitive Load Scale.* Though the scale is helpful in identifying differences in cognitive load, the complexity of tasks across studies structurally imposed varying degrees of cognitive load. This makes it difficult to interpret the effects of conscious and subconscious goals on cognitive load across studies. For example, average mental effort systematically increased as the task became more complex. This leaves less variance between average mental effort and the maximum mental effort level of nine. Because increasing task complexity reduces variance available to be explained by the independent variables, lack of findings on mental effort in Experiment 3 may be an artifact of the experiment design. Future research can use different measures of cognitive load to test this.

Third, mental effort was not related to performance in any of the three studies. This could be suggestive of a "true effect" in which mental effort is unrelated to performance. But, it also could be an artifact of the "one-shot" experimental design. This is because cognitive load imposed by a task may not predict performance on that task, but it could have downstream effects by influencing performance on a subsequent task. In other words, if assigning a difficult goal increases cognitive load and if a congruent subconscious goal decreases it, the "real" mediated effect may not be captured by a single measure experiment. Consider the following example. An employee completes a variance analysis in the morning. He reports a high level of mental effort for this task. Despite taxing mental resources, his performance on the task may not have suffered; it could even be better than a colleague who invested less mental effort. But, if his next task is calculating break-even time of a new product, his performance on this task could be affected by the high degree of mental effort he "spent" on the first task. Comparatively, someone who used less mental effort on the first task may perform better on the second task. Future research could investigate this possibility with a longitudinal, repeated-measures design. This would more definitively answer the question of whether the cognitive "savings" generated by a subconscious goal are cumulative, such that cognitive load mediates its overall work-day/week performance effect.

Fourth, a general boundary condition of priming according to Bargh's (1990) auto-motive model, is that only a goal already stored in the subconscious can be primed. Priming does not create subconscious goals. Thus, cues at work can only prime subconscious goals that reside in employees' minds. Though simple, this is critical. For example, in a presentation of related goal priming research, a colleague from another field asked, paraphrasing: "What if someone primes you to kill a colleague, can it be that easy?" The answer is of course not, unless the goal had already been pursued, observed, or ingrained; and its memory trace had been firmly associated with behavioral, social, or situational features in the work environment.

Fifth, two or more subconscious goals may interact with one another. Such interaction is beyond the scope of the present research. I only briefly illustrate how one prime might have the power to subconsciously negate another prime. Steele (2011, p. 6) described an example of an African American student walking the streets of Chicago after evening classes, whereby passersby's subconscious prejudice was primed upon seeing the African American man dressed informally at night, activating their automatic categorization of the youth as violent. This led to subtle, undesired behaviors when they approached him, e.g., couples locked arms or crossed the street. Out of nervousness, the student started whistling Vivaldi's *Four Seasons*, which caused tension of the passersby to drain. The presence of the second prime (classical music) overrode the first. This is because the association between classical music and genteel behavior trumped the association with violence, changing the automatic behavior that unfolded. This logic could be extrapolated to organizations such that strong positive primes are used to mute negative primes.

Finally, another fruitful avenue for research would be to examine what types of work tasks are most affected by the interaction of conscious and subconscious goals. For example, future research could examine person, task, and firm characteristics that moderate the relationship between subconscious goals and performance. It is worth noting that any future research conducted on this topic must take care to ensure the designs are in accord with theory. Importantly, subconscious goals are theorized to operate through subconscious processes. If the subconscious goal crosses into consciousness (i.e., awareness), it can no longer be classified as a subconscious goal. Therefore, testing effects of subconscious goals hinges on demonstrating that it operated without awareness.

Conclusion

Deliberative thought is vital to goal pursuit. The present research highlights further the role of subconscious goals in automatically impacting behavior and emphasizes the need for future research to further disentangle the implications of conscious and subconscious goals. Either approach alone is shortsighted, as opined by Aldous Huxley (Bargh et al., 2001, p. 1014):

> We must give up the insane illusion that a conscious self, however virtuous and however intelligent, can do its work single-handed and without assistance.

References

Aaker, J. L., & Lee, A. Y. (2001). "I" seek pleasures and "we" avoid pains: The role of self-regulatory goals in information processing and persuasion. *Journal of Consumer Research*, *28*, 33-49. doi:10.1086/321946

Aarts, H., Custers, R., & Holland, R. W. (2007). The nonconscious cessation of goal pursuit: When goals and negative affect are coactivated. *Journal of Personality and Social Psychology*, *92*, 165-178. doi: 10.1037/0022-3514.92.2.165

Aarts, H., Custers, R., & Wegner, D. M. (2005). On the inference of personal authorship: Enhancing experienced agency by priming effect information. *Consciousness and Cognition*, *14*, 439-458. doi: 10.1016/j.concog.2004.11.001

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, *78*, 53-63. doi: 10.1037/0022-3514.78.1.53

Aarts, H., & Dijksterhuis, A. (2003). The silence of the library: environment, situational norm, and social behavior. *Journal of Personality and Social Psychology*, *84*, 18-28. doi: 10.1037/0022-3514.84.1.18

Aarts, H., Gollwitzer, P. M., & Hassin, R. R. (2004). Goal contagion: perceiving is for pursuing. *Journal of Personality and Social Psychology*, *87*, 23-37. doi: 10.1037/0022-3514.87.1.23

Aarts, H., Verplanken, B., & Knippenberg, A. (1998). Predicting behavior from actions in the past: Repeated decision making or a matter of habit? *Journal of Applied Social Psychology*, *28*, 1355-1374. doi:10.1111/j.1559-1816.1998.tb01681.x

Abelson, R. P. (1979). Differences between belief and knowledge systems. *Cognitive Science*, *3*, 355-366. doi: 10.1207/s15516709cog0304_4

Abelson, R. P., & Prentice, D. A. (1997). Contrast tests of interaction hypothesis. *Psychological Methods*, *2*, 315-328. doi: 0.1037/1082-989X.2.4.315

Aggarwal, P., & McGill, A. L. (2012). When brands seem human, do humans act like brands? Automatic behavioral priming effects of brand anthropomorphism. *Journal of Consumer Research*, *39*, 307-323.

Albarracín, D., & Handley, I. M. (2011). The time for doing is not the time for change: Effects of general action and inaction goals on attitude retrieval and attitude change. *Journal of Personality and Social Psychology*, *100*, 983-998. doi: 10.1086/662614

Albarracín, D., Handley, I. M., Noguchi, K., McCulloch, K. C., Li, H., Leeper, J., ... & Hart, W. P. (2008). Increasing and decreasing motor and cognitive output: a model of general action and inaction goals. *Journal of Personality and Social Psychology*, *95*, 510-523. doi: 0.1037/a0012833

Albarracín, D., & Hart, W. (2011). Positive mood+ action= negative mood+ inaction: effects of general action and inaction concepts on decisions and performance as a function of affect. *Emotion*, *11*, 951-957. doi: 10.1037/a0024130

Albarracín, D., Wang, W., & Leeper, J. (2009). Immediate increase in food intake following exercise messages. *Obesity*, *17*, 1451-1452. doi: 10.1038/oby.2009.16

Anderson, E., Siegel, E. H., Bliss-Moreau, E., & Barrett, L. F. (2011). The visual impact of gossip. *Science*, *332*, 1446-1448. doi: 10.1126/science.1201574

Ariely, D. (2009). *Predictably irrational*. New York: HarperCollins.

Arsalidou M, Taylor MJ (2011) Is 2+2 =4? Meta-analyses of brain areas needed for numbers and calculations. *NeuroImage, 54,* 2382–2393. doi: 10.1016/j.neuroimage.2010.10.009

Audia, G., Kristof-Brown, A., Brown, K.G., & Locke, E.A. (1996). Relationship of goals and microlevel work processes to performance on a multipath manual task. *Journal of Applied Psychology*, *81,* 483-497. doi: 10.1037/0021-9010.81.5.483

Ayres, P. (2006). Using subjective measures to detect variations of intrinsic cognitive load within problems. *Learning and Instruction*, *16*, 389-400. doi: 10.1016/j.learninstruc.2006.09.001

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, *52*, 1-26. doi: 10.1146/annurev.psych.52.1.1

Bargh, J. A. (1984). Automatic and conscious processing of social information. In Wyer, Jr. R. S., & Srull, T. K. (Eds.), *Handbook of social cognition* (Vol. 3, pp. 1 – 43). Hillsdale, NY: Erlbaum.

Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior,* Vol. 2, (pp. 93-130). New York, NY, US: Guilford Press.

Bargh, J. A. (2012, September 26). Re: A proposal to deal with questions about priming effects. Retrieved from http://www.decisionsciencenews.com/2012/10/05/kahneman-on-the-storm-of-doubts-surrounding-social-priming-research/

Bargh, J.A., (2013). *Social psychology and the unconscious: The automaticity of higher mental processes*. New York, NY: Psychology Press.

Bargh, J. A. (2014). The historical origins of priming as the preparation of behavioral responses: Unconscious carryover and contextual influences of real-world importance. *Social Cognition*, *32*, 209-224. doi: 10.1521/soco.2014.32.supp.209

Bargh, J. A., & Barndollar, K. (1996). Automaticity in action: The unconscious as repository of chronic goals and motives. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 457-481). New York, NY, US: Guilford Press.

Bargh, J. A., & Chartrand, T. L. (2000). The mind in the middle. In Reis, H. T., & Judd, C. M. (Eds). *Handbook of research methods in social and personality psychology*, (pp. 253-285). New York, NY: Cambridge University Press.

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, *71*, 230-244. doi: 10.1037/0022-3514.71.2.230

Bargh, J. A., & Gollwitzer, P. M. (1994). Environmental control of goal-directed action: automatic and strategic contingencies between situations and behavior. In Spaulding, W. D. (Ed), *Nebraska symposium on motivation, Volume 41. Integrative views of motivation, cognition, and emotion* (pp. 71 – 124). Lincoln, NE: University of Nebraska Press.

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology*, *81*, 1014-1027. doi: 10.1037/0022-3514.81.6.1014

Bargh, J. A., Green, M., & Fitzsimons, G. (2008). The selfish goal: Unintended consequences of intended goal pursuits. *Social Cognition*, *26*, 534-554. doi: 10.1521/soco.2008.26.5.534

Bargh, J. A., & Thein, R. D. (1985). Individual construct accessibility, person memory, and the recall-judgment link: The case of information overload. *Journal of Personality and Social Psychology*, *49*, 1129-1146. doi: 10.1037/0022-3514.49.5.1129

Bargh, J. A., & Tota, M. E. (1988). Context-dependent automatic processing in depression: Accessibility of negative constructs with regard to self but not others. *Journal of Personality and Social Psychology*, *54*, 925-939. doi: 10.1037/0022-3514.54.6.925

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182. doi:10.1037/0022-3514.51.6.1173

Barrouillet, P., Bernardin, S., Portrat, S., Vergauwe, E., & Camos, V. (2007). Time and cognitive load in working memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*, 570-585. doi: 10.1037/0278-7393.33.3.570

Barsalou, L.W. (2003). Situated simulation in the human conceptual system. *Language Cognittive Processes, 18,* 513–562. Doi: doi.org/10.1080/01690960344000026

Bartelt, V. L., Dennis, A. R., Yuan, L., & Barlow, J. B. (2013). Individual priming in virtual team decision-making. *Group Decision and Negotiation*, *22*, 873-896. doi: 10.1007/s10726-012-9333-3

Baumeister, R.F., Bratslavsky, E., Finkenauer, C., & Vohs, K.D. (2001). Bad is stronger than good. *Review of General Psychology*, *5,* 323-370. doi:10.1037/1089-2680.5.4.323

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1999). Ego depletion: Is the active self a limitedresource? In R. F. Baumeister (Ed.), *Key readings in social psychology. The self in social psychology* (pp. 317-338). New York, NY: Psychology Press.

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry*, *7*, 1-15. doi: 10.1207/s15327965pli0701_1

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. San Diego, CA: Academic press.

Beatty, J., Lucer-Wagoner, B. (2000). The pupillary system. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (2nd ed., pp. 142–162). Cambride, MA: Cambridge University Press.

Beersma, B., Hollenbeck, J. R., Humphrey, S. E., Moon, H., Conlon, D. E., & Ilgen, D. R. (2003). Cooperation, competition, and team performance: Toward a contingency approach. *Academy of Management Journal*, *46*, 572-590. doi: 10.5465/30040650

Benjamin, D. J., Brown, S. A., & Shapiro, J. M. (2013). Who is 'behavioral'? Cognitive ability and anomalous preferences. *Journal of the European Economic Association*, *11*, 1231-1255. doi: 10.1111/jeea.12055

Bhattacharya, M., Gibson, D. E., & Doty, D. H. (2005). The effects of flexibility in employee skills, employee behaviors, and human resource practices on firm performance. *Journal of Management*, *31*, 622-640. doi: 10.1177/0149206304272347

Bijleveld, E., Custers, R., & Aarts, H. (2009). The unconscious eye opener: Pupil dilation reveals strategic recruitment of resources upon presentation of subliminal reward cues. *Psychological Science*, *20*, 1313-1315. doi: 10.1111/j.1467-9280.2009.02443.x

Boland, W. A., Connell, P. M., & Vallen, B. (2013). Time of day effects on the regulation of food consumption after activation of health goals. *Appetite*, *70*, 47–52. doi: 10.1016/j.appet.2013.06.085

Bolino, M.C., Harvey, J., & Bachrach, D.G. (2012). A self-regulation approach to understanding citizenship behavior in organizations. *Organizational Behavior and Human Decision Processes*, *119,* 126-139. doi: 10.1016/j.obhdp.2012.05.006

Bourgeois, L.J. (1980). Performance and consensus. *Strategic Management Journal*, *1*, 227-248. doi: 10.1002/smj.4250010304

Brcic, J., & Latham, G. (2016). The effect of priming affect on customer service satisfaction. *Academy of Management Discoveries*, *2*, 392-403. doi: 10.5465/amd.2015.0052

Breuer, J. (1895). Unconscious ideas and ideas inadmissible to consciousness – splitting of the mind. In Strachey, J., & Freud, A. (Eds). *Standard Edition of the Complete Psychological Works of Sigmund Freud, Volume II* (pp. 240 – 252). London, Hogarth Press, 1978 print.

Brunken, R., Plass, J. L., & Leutner, D. (2003). Direct measurement of cognitive load in multimedia learning. *Educational Psychologist*, *38*, 53-61. doi: 10.1207/S15326985EP3801_7

Campion, M. A., & Lord, R. G. (1982). A control systems conceptualization of the goal-setting and changing process. *Organizational Behavior and Human Performance*, *30*, 265-287. doi: 10.1016/0030-5073(82)90221-5

Callicott, J. H., Mattay, V. S., Bertolino, A., Finn, K., Coppola, R., Frank, J. A., ... & Weinberger, D. R. (1999). Physiological characteristics of capacity constraints in working memory as revealed by functional MRI. *Cerebral cortex*, *9*, 20-26. doi: 10.1093/cercor/9.1.20

Cappelli, P. (2006). Changes at work and opportunities for theory. In M. Korczinski, R. Hodson, & P. Edwards (Eds.), *Social Theory at Work* (pp. 464-486). Oxford University Press.

Cappelli, P. (2012). *Why good people can't get jobs: The skills gap and what companies can do about it*. Philadelphia: Wharton Digital Press.

Caruso, E. M., Shapira, O., & Landy, J. F. (2017). Show me the money: A systematic exploration of manipulations, moderators, and mechanisms of priming effects. *Psychological science*, *28*, 1148-1159. doi: 10.1177/0956797617706161

Carver, C. S., & Scheier, M. F. (1981). The self-attention-induced feedback loop and social facilitation. *Journal of Experimental Social Psychology*, *17*, 545-568. doi: 10.1016/0022-1031(81)90039-1

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York, NY: Cambridge University Press.

Chartrand, T. L., & Bargh, J. A. (1996). Automatic activation of impression formation and memorization goals: Nonconscious goal priming reproduces effects of explicit task instructions. *Journal of Personality and Social Psychology*, *71*, 464. doi: 10.1037/0022-3514.71.3.464

Chartrand, T. L., & Bargh, J. A. (2002). Nonconscious motivations: Their activation, operation, and consequences. In A. Tesser, D. A. Stapel, & J. V. Wood (Eds.), *Self and motivation: Emerging psychological perspectives* (pp. 13-41). Washington, DC, US: APA

Chartrand, T. L., Dalton, A. N., & Fitzsimons, G. J. (2007). Nonconscious relationship reactance: When significant others prime opposing goals. *Journal of Experimental Social Psychology*, *43*, 719-726. doi: 10.1016/j.jesp.2006.08.003

Chartrand, T. L., Huber, J., Shiv, B., & Tanner, R. J. (2008). Nonconscious goals and consumer choice. *Journal of Consumer Research*, *35*, 189-201. doi: 10.1086/588685

Chen, X., & Latham, G. P. (2014). The effect of priming learning vs. performance goals on a complex task. *Organizational Behavior and Human Decision Processes*, *125*, 88-97. doi: 10.1016/j.obhdp.2014.06.004

Ciani, K. D., & Sheldon, K. M. (2010). A versus F: The effects of implicit letter priming on cognitive performance. *British Journal of Educational Psychology*, *80*, 99-119. doi: 10.1348/000709909X466479

Cocchini, G., Logie, R. H., Della Sala, S., MacPherson, S. E., & Baddeley, A. D. (2002). Concurrent performance of two memory tasks: Evidence for domain-specific working memory systems. *Memory & Cognition*, *30*, 1086-1095. doi: 10.3758/BF03194326

Cohen, N. J., & Squire, L. R. (1980). Preserved learning and retention of pattern-analyzing skill in amnesia: Dissociation of knowing how and knowing that. *Science*, *210*, 207-210. Doi: 10.1126/science.7414331

Connell, P. M., & Mayor, L. F. (2013). Activating health goals reduces (increases) hedonic evaluation of food brands for people who harbor highly positive (negative) affect toward them. *Appetite*, *65*, 159-164. doi: 10.1016/j.appet.2013.02.014

Corkin, S. (2013). *Permanent present tense: The unforgettable life of the amnesic patient*. New York, NY: Basic Books

Custers, R., & Aarts, H. (2005a). Beyond accessibility: The role of affect and goal- discrepancies in implicit processes of motivation and goal-pursuit. *European Review of Social Psychology, 16,* 257-300. doi: 10.1080/10463280500435919

Custers, R., & Aarts, H. (2005b). Positive affect as implicit motivator: On the non- conscious operation of behavioral goals. *Journal of Personality and Social Psychology, 89*, 129-142. doi: 10.1037/0022-3514.89.2.129

Custers, R., & Aarts, H. (2007a). In search of the nonconscious sources of goal pursuit: Accessibility and positive affective valence of the goal state. *Journal of Experimental Social Psychology*, *43*, 312-318. doi: 10.1016/j.jesp.2006.02.005

Custers, R., & Aarts, H. (2007b). Goal-discrepant situations prime goal-directed actions if goals are temporarily or chronically accessible. *Personality and Social Psychology Bulletin*, *33*, 623-633. doi: 10.1177/0146167206297404

Custers, R., & Aarts, H. (2010). The unconscious will: How the pursuit of goals operates outside of conscious awareness. *Science*, *329*(5987), 47-50. doi: 10.1126/science.1188595

Custers, R., Eitam, B., & Bargh, J. A. (2012). Conscious and unconscious processes in goal pursuit. In Aarts, H., & Elliot, A. (Eds.), *Goal-directed behavior,* (pp. 231 – 266). New York, NY: Psychology Press.

Dahlke, J. A., & Sackett, P. R. (2017). The relationship between cognitive-ability saturation and subgroup mean differences across predictors of job performance. *Journal of Applied Psychology*, *102*, 1403-1420. doi: 10.1037/apl0000234

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied psychology*, *86*, 499-512. doi: 10/1037//0021-9010.86.3.499

Dennis, A. R., Bhagwatwar, A., & Minas, R. K. (2013). Play for Performance: Using Computer Games to Improve Motivation and Test-Taking Performance. *Journal of Information Systems Education*, *24*, 223-231. ISSN: 1055-3096

DeShon, R. P., Brown, K. G., & Greenis, J. L. (1996). Does self-regulation require cognitive resources? Evaluation of resource allocation models of goal setting. *Journal of Applied Psychology*, *81*, 595-608. doi: 10.1037/0021-9010.81.5.595

Dijksterhuis, A. (2004). Think different: The merits of unconscious thought in preference development and decision making. *Journal of Personality and Social Psychology, 87*, 586-598. doi: 10.1037/0022-3514.87.5.586

Dijksterhuis, A., Chartrand, T. L., & Aarts, H. (2007). Effects of Priming and Perception on Social Behavior and Goal Pursuit. In Bargh, J. A. (Ed.), *Frontiers of social psychology. Social psychology and the unconscious: The automaticity of higher mental processes* (pp. 51-131). New York, NY: Psychology Press.

Dijksterhuis, A., & Nordgren, L. (2006). A theory of unconscious thought. *Perspectives on Psychological Science, 1*, 95-109. doi: 10.1111/j.1745-6916.2006.00007.x

Dirsmith, M. W., Covaleski, M. A., & Samuel, S. (2014). On being professional in the 21st century: An empirically informed essay. *Auditing: A Journal of Practice & Theory*, *34*, 167-200. doi: 10.2308/ajpt-50698

Docherty, P., Forslin, J., & Shani, A. B, & Kira, M. (2002). Emerging work systems: From intensive to sustainable'. In P. Docherty, Forslin J., Shani B., (Eds) *Creating sustainable work systems: emerging perspectives and practice* (pp. 3 – 14). London, UK: Routledge.

Doyen, S., Klein, O., Pichon, C. L., & Cleeremans, A. (2012). Behavioral priming: it's all in the mind, but whose mind?. *PloS one*, *7*, e29081. doi: 10.1371/journal.pone.0029081

Doyen, S., Klein, O., Simons, D. J., & Cleeremans, A. (2014). On the Other Side of the Mirror: Priming in Cognitive and Social Psychology. *Social Cognition*, 32, 12-32. doi: 10.1521/soco.2014.32.supp.12

Duffy, S., & Smith, J. (2014). Cognitive load in the multi-player prisoner's dilemma game: Are there brains in games? *Journal of Behavioral and Experimental Economics*, *51*, 47-56. doi: 10.1016/j.socec.2014.01.006

Engeser, S. (2009). Nonconscious activation of achievement goals: moderated by word class and the explicit achievement motive? *Swiss Journal of Psychology*, *68*, 193-200. doi: 10.1024/1421-0185.68.4.193

Erez, M., Earley, P. C., Hulin, C. L. (1985). The impact of participation on goal acceptance and performance: A two-step model. *Academy of Management Journal, 28*, 50-66. doi: 10.5465/256061

Erez, M., Gopher, D., & Arazi, N. (1990). Effects of goal difficulty, self-set goals, and monetary rewards on dual task performance. *Organizational Behavior and Human Decision Processes, 47*, 247-269. doi: 10.1016/0749-5978(90)90038-B

Erez, M., & Kanfer, F. H. (1983). The role of goal acceptance in goal setting and task performance. *Academy of management review*, *8*, 454-463. doi: 10.5465/amr.1983.4284597

Erez, M., & Zidon, I. (1984). Effect of goal acceptance on the relationship of goal difficulty to performance. *Journal of Applied Psychology*, *69*, 69-78. doi: 10.1037/0021-9010.69.1.69

Evans, J. S. B. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychol*ogy, *59*, 255-278. doi: 10.1146/annurev.psych.59.103006.093629

Evans, J. S. B., & Frankish, K. E. (2009). *In two minds: Dual processes and beyond*. Oxford University Press.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191. doi: 0.3758/BF03193146

Feist, G. J. (1999). The Influence of Personality on Artistic and Scientific Creativity. In Sternberg, R. J. (Ed). *Handbook of creativity*, (pp. 273-296). New York, NY: Cambridge University Press.

Ferguson, M. J. (2008). On becoming ready to pursue a goal you don't know you have: Effects of nonconscious goals on evaluative readiness. *Journal of Personality and Social Psychology*, *95*, 1268-1294. doi: 10.1037/a0013263

Fink, A., & Neubauer, A. C. (2001). Speed of information processing, psychometric intelligence, and time estimation as an index of cognitive load. *Personality & Individual Differences, 30,* 1009–1021. doi: 10.1016/S0191-8869(00)00089-1

Fishbach, A., Friedman, R. S., & Kruglanski, A. W. (2003). Leading us not into temptation: Momentary allurements elicit overriding goal activation. *Journal of Personality and Social Psychology*, *84*, 296-309. doi: 10.1037/0022-3514.84.2.296

Fitzsimons, G. M., & Bargh, J. A. (2003). Thinking of you: nonconscious pursuit of interpersonal goals associated with relationship partners. *Journal of Personality and Social Psychology*, *84*, 148-164. doi: 10.1037/0022-3514.84.1.148

Fitzsimons, G. M., Chartrand, T. L., & Fitzsimons, G. J. (2008). Automatic effects of brand exposure on motivated behavior: how apple makes you "think different". *Journal of Consumer Research*, *35*, 21-35. doi: 10.1086/527269

Förster, J., Liberman, N., & Friedman, R.S. (2009). What do we prime? On distinguishing between semantic priming, procedural priming, and goal priming. *Oxford handbook of human action* (pp. 173-192). Oxford, UK: Oxford University Press.

Frankish, K. (2010). Dual-process and dual-system theories of reasoning. *Philosophy Compass*, *5*, 914-926. doi: 10.1111/j.1747-9991.2010.00330.x

Freud, S. (1893). Case histories: Fräulein Elisabeth von R. In Strachey, J. & Freud, A. (Eds), *The Standard Edition of the Complete Psychological Works of Sigmund Freud, Volume II* (pp. 135 – 182). London, Hogarth Press, 1978 print.

Friedman, R. S., McCarthy, D. M., Pedersen, S. L., & Hicks, J. A. (2009). Alcohol expectancy priming and drinking behavior: The role of compatibility between prime and expectancy content. *Psychology of Addictive Behaviors*, *23*, 329-333. doi: 0.1037/a0015704

Frost, P. J., & Mahoney, T. A. (1976). Goal setting and the task process: I. An interactive influence on individual performance. *Organizational Behavior & Human Performance, 17*, 328-350. doi: 10.1016/0030-5073(76)90071-4

Gabora, L. (2002, October). Cognitive mechanisms underlying the creative process. In *Proceedings of the 4th conference on Creativity & cognition* (pp. 126-133). Loughborough, UK. doi: 10.1145/581710.581730

Galy, E., Cariou, M., & Mélan, C. (2012). What is the relationship between mental workload factors and cognitive load types? *International Journal of Psychophysiology*, *83*, 269-275. doi: 10.1016/j.ijpsycho.2011.09.023

Ganegoda, D. B., Latham, G. P., & Folger, R. (2016). The effect of a consciously set and a primed goal on fair behavior. *Human Resource Management*, *55*, 789-807. doi: 10.1002/hrm.21743

Ganster, D. C. (2005). Executive job demands: Suggestions from a stress and decision-making perspective. *Academy of Management Review*, *30*, 492-502. doi: 10.5465/amr.2005.17293366

Gardiner, J. M. (1988). Functional aspects of recollective experience. *Memory & Cognition*, *16*, 309-313. doi: 10.3758/BF03197041

George, J. M. (2009). The illusion of will in organizational behavior research: Nonconscious processes and job design. *Journal of Management*, *35*, 1318-1339. doi: 10.1177/0149206309346337

Gerlach K.D., Spreng, N., Gilmore, A. W., & Schacter, D. L. (2011). Solving future problems: default network and executive activity associated with goal-directed mental simulations. *Neuroimage, 55,* 1816–1824.

Getz, S. J. (2013). Cognitive control and intertemporal choice: The role of cognitive control in impulsive decision making. *PhD Dissertation*. Princeton University.

Gilbert, D. T., & Osborne, R. E. (1989). Thinking backward: Some curable and incurable consequences of cognitive busyness. *Journal of Personality and Social Psychology*, *57*, 940-949. doi: 10.1037/0022-3514.57.6.940

Gino, F., Schweitzer, M. E., Mead, N. L., & Ariely, D. (2011). Unable to resist temptation: How self-control depletion promotes unethical behavior. *Organizational Behavior and Human Decision Processes*, *115*, 191-203. doi: 10.1016/j.obhdp.2011.03.001

Gino, F., Shu, L. L., & Bazerman, M. H. (2010). Nameless+ harmless= blameless: When seemingly irrelevant factors influence judgment of (un) ethical behavior. *Organizational Behavior and Human Decision Processes*, *111*, 93-101. doi: 0.1016/j.obhdp.2009.11.001

Glaser, J., & Banaji, M. R. (1999). When fair is foul and foul is fair: Reverse priming in automatic evaluation. *Journal of Personality and Social Psychology*, *77*, 669-687. doi: 10.1037/0022-3514.77.4.669

Gollwitzer, P. M. (1990). Action phases and mind-sets. In E. T. Higgins & R. M. Sorrentino (Eds.), *The handbook of motivation and cognition: Foundations of social behavior*, Vol. 2, (pp. 53-92). New York: Guilford Press.

Gopher, D., & Braune, R. (1984). On the psychophysics of workload: Why bother with subjective measures? *Human Factors*, *26*, 519-532. doi: 10.1177/001872088402600504

Gottschalk, L.A. (1997). The unobtrusive measurement of psychological states and traits. In Roberts, C. W. (Ed), *Text Analysis for the Social Sciences*, (pp. 117-129). Mahwah, NJ: Erlbaum.

Greenlees, I., Figgins, S., & Kearney, P. (2014). Can Achievement Goals be Primed in Competitive Tasks?. *Journal of Human Kinetics*, *40*, 245-250. doi: 10.2478/hukin-2014-0026

Greenwald, A. G., Klinger, M. R., & Schuh, E. S. (1995). Activation by marginally perceptible (" subliminal") stimuli: dissociation of unconscious from conscious cognition. *Journal of Experimental Psychology: General*, *124*, 22-42. doi: 10.1037/0096-3445.124.1.22

Gustafson, J. P. (1995). *The dilemmas of brief psychotherapy.* New York, NY: Plenum Press.

Gustafson, J. P. (2005). *Very brief psychotherapy.* New York, NY: Routledge.

Harris, C. R., Coburn, N., Rohrer, D., & Pashler, H. (2013). Two failures to replicate high-performance-goal priming effects. *PloS one*, *8*(8), e72467. doi: 10.1371/journal.pone.0072467

Hart, W., & Albarracín, D. (2009). The effects of chronic achievement motivation and achievement primes on the activation of achievement and fun goals. *Journal of Personality and Social Psychology*, *97*, 1129-1141. doi: 10.1037/a0017146

Hassin, R. R., Aarts, H., & Ferguson, M. J. (2005). Automatic goal inferences. *Journal of Experimental Social Psychology*, *41*, 129-140. doi: 10.1016/j.jesp.2004.06.008

Hayman, C. G., & Tulving, E. (1989). Is priming in fragment completion based on a" traceless" memory system?. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *15*, 941-956. doi: 10.1.1.533.2651

Helper, J., & Albarracín, D. (2013). Attitudes without objects: Evidence for dispositional attitude, its measurement, and its consequences. *Journal of Personality and Social Psychology, 104*, 1060-1076. doi: 10.1037/a0032282

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, *52*, 1280-1300. doi: 10.1037/0003-066X.52.12.1280

Higgins, E. T. (2000). Making a good decision: value from fit. *American psychologist*, *55*, 1217-1230. doi: 10.1037/0003-066X.55.11.1217

Higgins, E. T. (2005). Value from regulatory fit. *Current Directions in Psychological Science*, *14*, 209-213. doi: 10.1111/j.0963-7214.2005.00366.x

Hirsh, J.B., & Peterson, J.B. (2009). Personality and language use in self-narratives. *Journal of Personality in Research*, 43, 524-527. doi: 10.1016/j.jrp.2009.01.006

Hoenig, K., Sim, E. J., Bochev, V., Herrnberger, B., & Kiefer, M. (2008). Conceptual flexibility in the human brain: dynamic recruitment of semantic maps from visual, motor, and motion-related areas. *Journal of Cognitive Neuroscience*, *20*, 1799-1814. doi: 10.1162/jocn.2008.20123

Holland, R. W., Aarts, H., & Langendam, D. (2006). Breaking and creating habits on the working floor: A field-experiment on the power of implementation intentions. *Journal of Experimental Social Psychology*, *42*, 776-783. doi: 10.1016/j.jesp.2005.11.006

Inzlicht, M., & Gutsell, J. N. (2007). Running on empty: Neural signals for self-control failure. *Psychological Science*, *18*, 933-937.

Ivancevich, J. M. (1974). Changes in performance in a management by objectives program. *Administrative Science Quarterly, 1*, 563-74. doi: 10.1111/j.1467-9280.2007.02004.x

Ivancevich, J. M. (1976). Effects of goal setting on performance and job satisfaction. *Journal of Applied Psychology,* 61, 605-612. doi: 10.1037/0021-9010.61.5.605

Jacoby, L. L., & Witherspoon, D. (1982). Remembering without awareness. *Canadian Journal of Psychology*, *36*, 300-324. Doi: 10.1037/h0080638

James, W. (1890). *The Principles of Psychology.* New York: Henry Hold and Company.

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion—Is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological science*, *21*, 1686-1693. doi: 10.1177/0956797610384745

Johnston, W. A., Dark, V. J., & Jacoby, L. L. (1985). Perceptual fluency and recognition judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *11*, 3-11. 10.1037/0278-7393.11.1.3

Judd, C. M., McClelland, G. H., & Culhane, S. E. (1995). Data analysis: Continuing issues in the everyday analysis of psychological data. *Annual Review of Psychology*, *46*, 433-465. doi: 10.1146/annurev.ps.46.020195.002245

Judd, C. M., McClelland, G. H., & Ryan, C. S. (2011). *Data analysis: A model comparison approach*. New York: Routledge.

Kahneman, D. (1973). *Attention and effort* (Vol. 1063). Englewood Cliffs, NJ: Prentice-Hall.

Kahneman, D., & Egan, P. (2011). *Thinking, fast and slow* (Vol. 1). New York: Farrar, Straus and Giroux.

Kanfer, R., & Ackerman, P. L. (1989). Motivation and cognitive abilities: An integrative/aptitude-treatment interaction approach to skill acquisition. *Journal of Applied Psychology*, *74*, 657-690. doi: 10.1037/0021-9010.74.4.657

Kanfer, R., Ackerman, P. L., Murtha, T. C., Dugdale, B., & Nelson, L. (1994). Goal setting, conditions of practice, and task performance: A resource allocation perspective. *Journal of Applied Psychology*, *79*, 826-835. doi: 10.1037/0021-9010.79.6.826

Kanfer, R., & Chen, G. (2016). Motivation in organizational behavior: History, advances and prospects. *Organizational Behavior and Human Decision Processes*, *136*, 6-19. doi: 10.1016/j.obhdp.2016.06.002

Kanfer, R., & Kanfer, F. H. (1991). Goals self-regulation: Applications or theory to work settings'. In ML Maehr and PR Pintrich (Eds), *Advances in motivation and achievement* (pp. 287-326), Greenwich, CT: JAI Press

Kawada, C., Oettingen, G., Gollwitzer, P. M., & Bargh, J. A. (2004). The projection of implicit and explicit goals. *Journal of Personality and Social Psychology*, *86*, 545-559.

Kay, A. C., Wheeler, S. C., Bargh, J. A., & Ross, L. (2004). Material priming: The influence of mundane physical objects on situational construal and competitive behavioral choice. *Organizational Behavior and Human Decision Processes*, *95*(1), 83-96. doi: 10.1037/0022-3514.86.4.545

Keppel, G., & Zedeck, S. (1989). *Data analysis for research designs*. New York, NY: W. H. Freeman and Company.

Kim, H. J. (2011). The effect of nonconscious goals on conscious goal-based preferences. *PhD Dissertation*. University of Toronto (Canada).

Krajewski, J., Sauerland, M., & Muessigmann, M. (2011). The Effects of Priming-Induced Social Approach and Avoidance Goals on the Exploration of Goal-Relevant Stimuli. *Social Psychology*, *42*, 152-158. doi: 10.1027/1864-9335/a000055

Krippendorff, K., & Bock, M. A. (2009). *The Content Analysis Reader*. Los Angeles, CA: Sage.

Kruglanksi, A. W., Shah, J. Y., Fishbach, A., Friedman, R., Chun, W. Y., & Sleeth-Keppler, D. (2002). A theory of goal systems. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology, Vol. 34* (pp. 331-378). San Diego, CA: Academic Press.

Kukla, A. (1972). Foundations of an attributional theory of performance. *Psychological Review*, *79*, 454-470. doi: 10.1037/h0033494

Laran, J., Janiszewski, C., & Cunha Jr, M. (2008). Context-dependent effects of goal primes. *Journal of Consumer Research*, *35*, 653-667. doi: 10.1086/592127

Latham, G. P., Brcic, J., & Steinhauer, A. (2017). Toward an Integration of Goal Setting Theory and the Automaticity Model. *Applied Psychology*, *66*, 25-48. doi: 10.1111/apps.12087

Latham, G. P., & Locke, E. A. (1991). Self-regulation through goal setting. *Organizational Behavior and Human Decision Processes*, *50*, 212-247. doi: 10.1016/0749-5978(91)90021-K

Latham, G. P., & Locke, E. A. (2018). Goal setting theory: Controversies and resolutions. In Ones D. S., Anderson, N., Sinangil, H. K., & Viswesvaran, C. (Eds). *Handbook of Industrial, Work and Organizational Psychology*. Los Angeles, CA: Sage Reference.

Latham, G. P., & Piccolo, R. F. (2012). The effect of context-specific versus nonspecific subconscious goals on employee performance. *Human Resource Management*, *51*, 511-523. doi: 10.1002/hrm.21486

Latham, G. P., & Seijts, G. H. (2016). Distinguished scholar invited essay: Similarities and differences among performance, behavioral, and learning goals. *Journal of Leadership & Organizational Studies*, *23*, 225-233. doi: 10.1177/1548051816641874

Latham, G. P., Stajkovic, A. D., & Locke, E. A. (2010). The relevance and viability of subconscious goals in the workplace. *Journal of Management*, *36*, 234-255. doi: 10.1177/0149206309350777

Légal, J. B., Chappé, J., Coiffard, V., & Villard-Forest, A. (2012). Don't you know that you want to trust me? Subliminal goal priming and persuasion. *Journal of Experimental Social Psychology*, *48*, 358-360. doi: 10.1016/j.jesp.2011.06.006

Légal, J. B., & Meyer, T. (2009). Goal priming and self-efficacy: independent contributions to motor performance. *Perceptual and motor skills*, *108*, 383-391. doi: 10.2466/pms.108.2.383-391

Locke, E. A. (1982). The relationship of goal level to performance with a short work period and multiple goal levels. *Journal of Applied Psychology*, *67*, 512- 514. doi: 10.1037/0021-9010.67.4.512

Locke, E. A. (2000). Motivation, cognition, and action: An analysis of studies of task goals and knowledge. *Applied Psychology: An International Review*, *49*, 408–429. doi: 10.1111/1464-0597.00023

Locke, E. A. (2015). Theory building, replication, and behavioral priming: Where do we need to go from here? *Perspectives on Psychological Science*, *10*, 408-414. doi: 10.1177/1745691614567231

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting & task performance*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, *57*, 705-717. doi: 10.1037/0003-066X.57.9.705

Locke, E. A., & Latham, G. P. (2004). What should we do about motivation theory? Six recommendations for the twenty-first century. *Academy of management review*, *29*, 388-403. doi: 10.5465/amr.2004.13670974

Locke, E. A., & Latham, G. P. (2009). Has goal setting gone wild, or have its attackers abandoned good scholarship? *The Academy of Management Perspectives*, *23,* 17-23. doi: 10.5465/amp.2009.37008000

Locke, E. A., & Latham, G. P. (2013). *New developments in goal setting and task performance*. New York, NY: Routledge.

Locke, E. A., & Latham, G. P. (2015). Breaking the rules: a historical overview of goal-setting theory. In *Advances in Motivation Science*, Vol. 2 (pp. 99-126). London, UK: Elsevier.

Locke, J. (1959). *An essay concerning human understanding*. Dover. 1690/1959.

Lord, R. G., & Levy, P. E. (1994). Moving from cognition to action: A control theory perspective. *Applied psychology*, *43*, 335-367. doi: 10.1111/j.1464-0597.1994.tb00828.x

Lowery, B. S., Eisenberger, N. I., Hardin, C. D., & Sinclair, S. (2007). Long-term effects of subliminal priming on academic performance. *Basic and Applied Social Psychology*, *29*, 151-157. doi: 10.1080/01973530701331718

Marien, H., Custers, R., Hassin, R. R., & Aarts, H. (2012). Unconscious goal activation and the hijacking of the executive function. *Journal of Personality and Social Psychology,* 103, 399-415. doi: 10.1037/a0028955

Markman, A. B., & Brendl, C. M. (2000). The influence of goals on value and choice. *Psychology of learning and motivation*, *39,* 97-128. doi: doi.org/10.1016/S0079-7421(00)80032-8

Masicampo, E. J., & Baumeister, R. F. (2011). Consider it done! Plan making can eliminate the cognitive effects of unfulfilled goals. *Journal of Personality and Social Psychology*, *101*, 667-683. doi: 10.1037/a0024192

Mehl, M. R. (2006). Quantitative text analysis. In Eid, M., & Diener, E. (Eds). *Handbook of Multimethod Measurement in Psychology*, (pp. 141-156). Washington, DC: American Psychological Association. doi: 10.1037/11383-011

Miles, J., & Shevlin, M. (2001). *Applying regression and correlation: A guide for students and researchers*. London, UK: Sage

Miller, G. A., Galanter, E., & Pribram, K. (1960). *Plans and the structure of behavior*. New York, NY: Holt.

Mills, J. (2004). *Rereading Freud: Psychoanlaysis through philosophy.* New York, NY: Suny Press.

Minas, R. K., Poor, M., Dennis, A. R., & Bartelt, V. L. (2016). A prime a day keeps calories away: The effects of supraliminal priming on food consumption and the moderating role of gender and eating restraint. *Appetite*, *105*, 494-499. doi: 10.1016/j.appet.2016.05.022

Miner, J. B. (2003). The rated importance, scientific validity, and practical usefulness of organizational behavior theories: A quantitative review. *Academy of Management Learning & Education*, *2*, 250-268. doi: 10.5465/amle.2003.10932132

Moskowitz, G. B. (2002). Preconscious effects of temporary goals on attention. *Journal of Experimental Social Psychology, 38,* 397–404. doi: 10.1016/S0022-1031(02)00001-X

Mullineaux, P. Y., & Dilalla, L. F. (2009). Preschool pretend play behaviors and early adolescent creativity. *The Journal of Creative Behavior*, *43*, 41-57. doi: 10.1002/j.2162-6057.2009.tb01305.x

Naismith, L. M., Cheung, J. J., Ringsted, C., & Cavalcanti, R. B. (2015). Limitations of subjective cognitive load measures in simulation-based procedural training. *Medical Education*, *49*, 805-814. doi: 10.1111/medu.12732

Navon, D. (1984). Resources—A theoretical soup stone? *Psychological Review*, *91*(2), 216-234.

Neisser, U. (1967). *Cognitive psychology.* New York: Appleton-Century-Crofts.

Oettingen, G., Grant, H., Smith, P. K., Skinner, M., & Gollwitzer, P. M. (2006). Nonconscious goal pursuit: Acting in an explanatory vacuum. *Journal of Experimental Social Psychology*, *42*, 668-675. doi: 10.1016/j.jesp.2005.10.003

Oikawa, M. (2004). Moderation of automatic achievement goals by conscious monitoring. *Psychological Reports*, *95*, 975-980. doi: 10.2466/pr0.95.3.975-980

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, *124*, 54-74. doi: 10.1037/0033-2909.124.1.54

Paas, F., Ayres, P., & Pachman, M. (2008). Assessment of cognitive load in multimedia learning. In Robinson, D. H., & Schraw, G. (Eds), *Recent Innovations in Educational Technology That Facilitate Student Learning*, (pp. 11-35). Charlotte, NC: Information Age Publishing Inc.,

Paas, F., Tuovinen, J. E., Tabbers, H., & Van Gerven, P. W. (2003). Cognitive load measurement as a means to advance cognitive load theory. *Educational Psychologist*, *38*, 63-71. doi: 10.1207/S15326985EP3801_8

Paas, F., van Gog, T., & Sweller, J. (2010). Cognitive load theory: New conceptualizations, specifications, and integrated research perspectives. *Educational Psychology Review*, *22*, 115-121. doi: 10.1007/s10648-010-9133-8

Paas, F. G., & van Merriënboer, J. J. (1993). The efficiency of instructional conditions: An approach to combine mental effort and performance measures. *Human Factors*, *35*, 737-743. doi: 10.1177/001872089303500412

Paas, F. G., & van Merriënboer, J. J. (1994). Variability of worked examples and transfer of geometrical problem-solving skills: A cognitive-load approach. *Journal of Eeducational Psychology*, *86*, 122-133. doi: 10.1037/0022-0663.86.1.122

Paas, F. G., van Merriënboer, J. J., & Adam, J. J. (1994). Measurement of cognitive load in instructional research. *Perceptual and Motor Skills*, *79*, 419-430. doi: 10.2466/pms.1994.79.1.419

Papies, E. K., Potjes, I., Keesman, M., Schwinghammer, S., & Van Koningsbruggen, G. M. (2014). Using health primes to reduce unhealthy snack purchases among overweight consumers in a grocery store. *International Journal of Obesity*, *38*, 597-602. doi: 10.1038/ijo.2013.136

Pennebaker, J.W. (2011). The Secret Life of Pronouns: What Our Words Say About Us. New York, NY: Bloomsbury.

Pessiglione, M., Schmidt, L., Draganski, B., Kalisch, R., Lau, H., Dolan, R. J., & Frith, C. D. (2007). How the brain translates money into force: a neuroimaging study of subliminal motivation. *Science*, *316*(5826), 904-906. doi: 10.1126/science.1140459

Petty, R. E., Fabrigar, L. R., Wegener, D. T., & Priester, J. R. (1996). Understanding data when interactions are present or hypothesized. *Psychological Science*, *7*, 247-252. doi: 10.1111/j.1467-9280.1996.tb00368.x

Poincaré, H. (2000). Mathematical creation. *Resonance*, *5*(2), 85-94. doi: 10.1007/BF02838832

Pollock, E., Chandler, P., & Sweller, J. (2002). Assimilating complex information. *Learning and Instruction*, *12*, 61-86. doi: 10.1016/S0959-4752(01)00016-0

Postle, B. R. (2015). *Essentials of cognitive neuroscience*. New York, NY: Wiley-Blackwell.

Powers, W. T. (2005). *Behavior: The control of perception* (pp. 34-37). New Canaan: Benchmark Publications.

Pratt, M. G., & Crosina, E. (2016). The nonconscious at work. *Annual Review of Organizational Psychology and Organizational Behavior*, *3*, 321-347. doi: 10.1146/annurev-orgpsych-041015-062517

Radel, R., Davranche, K., Fournier, M., & Dietrich, A. (2015). The role of (dis) inhibition in creativity: Decreased inhibition improves idea generation. *Cognition*, *134*, 110-120. doi: 10.1016/j.cognition.2014.09.001

Raidl, M. H., & Lubart, T. I. (2001). An empirical study of intuition and creativity. *Imagination, Cognition and Personality*, *20*, 217-230. doi: 10.2190/34QQ-EX6N-TF8V-7U3N

Renn, R. W.(1998). Participantion's effect on task performance: Mediating roles of goal acceptance and procedural justice. *Journal of Business Research, 41*, 115-125. doi: 10.1016/S0148-2963(97)00020-9

Riketta, M., & Dauenheimer, D. (2003). Anticipated success at unconscious goal pursuit: Consequences for mood, self-esteem, and the evaluation of a goal-relevant task. *Motivation and Emotion*, *27*, 327-338. doi: 10.1023/A:1026283606173

Rosenthal, R., & Rosnow, R. L. (1991). *Essentials of behavioral research: Methods and data analysis.* Boston, MA: McGraw Hill

Rosnow, R. L., & Rosenthal, R. (1995). "Some things you learn aren't so": Cohen's paradox, Asch's paradigm, and the interpretation of interaction. *Psychological Science*, *6*, 3-9. doi: 10.1111/j.1467-9280.1995.tb00297.x

Rosnow, R. L., Rosenthal, R., & Rubin, D. B. (2000). Contrasts and correlations in effect-size estimation. *Psychological science*, *11*, 446-453. doi: 10.1111/1467-9280.00287

Savani, K., & King, D. (2015). Perceiving outcomes as determined by external forces: The role of event construal in attenuating the outcome bias. *Organizational Behavior and Human Decision Processes*, *130*, 136-146. doi: 10.1016/j.obhdp.2015.05.002

Schein, E.H. (2010). *Organizational culture and leadership* (Vol. 2). San Fransisco, CA: John Wiley & Sons.

Schmidt, K. H., Kleinbeck, U., Brockmann, W. (1984). Motivational control of motor performance by goal setting in a dual-task situation. *Psychological Research*, *46*, 129-41. doi: 10.1007/BF00308598

Scholy, F. (1893). What dreams are made of. In *Current literature: A magazine of record and review* (Vol. XIV, Sept. – Dec., 1893, pp. 409-410).

Schouten, J. F., & Bekker, J. A. M. (1967). Reaction time and accuracy. *Acta psychologica*, *27*, 143-153. doi: 10.1016/0001-6918(67)90054-6

Shah, J. (2003a). Automatic for the people: How representations of significant others implicitly affect goal pursuit. *Journal of Personality and Social Psychology*, *84*, 661-681. doi: 10.1037/0022-3514.84.4.661

Shah, J. (2003b). The motivational looking glass: how significant others implicitly affect goal appraisals. *Journal of Personality and Social Psychology*, *85*, 424-439. doi: 10.1037/0022-3514.85.3.424

Shah, J. Y., Friedman, R., & Kruglanski, A. W. (2002). Forgetting all else: on the antecedents and consequences of goal shielding. *Journal of Personality and Social Psychology*, *83*, 1261-1280. doi: 10.1037/0022-3514.83.6.1261

Shah, J. Y., & Kruglanski, A. W. (2003). When opportunity knocks: Bottom-up priming of goals by means and its effects on self-regulation. *Journal of Personality and Social Psychology*, *84*, 1109-1122. doi: 10.1037/0022-3514.84.6.1109

Shantz, A., & Latham, G. P. (2009). An exploratory field experiment of the effect of subconscious and conscious goals on employee performance. *Organizational Behavior and Human Decision Processes*, *109*, 9-17. doi: 10.1016/j.obhdp.2009.01.001

Shantz, A., & Latham, G. (2011). The effect of primed goals on employee performance: Implications for human resource management. *Human Resource Management*, *50*(2), 289-299

Sheeran, P., Aarts, H., Custers, R., Rivis, A., Webb, T., & Cooke, R. (2005). The goal-dependent automaticity of drinking habits. *British Journal of Social Psychology*, *44*, 47-63. doi: 10.1348/014466604X23446

Simon, H. A. (1967). Motivational and emotional controls of cognition. *Psychological Review*, *74*, 29-39. doi: 10.1037/h0024127

Skinner, F. (1939). *The behavior of organisms*. New York, NY: Century Psychology Series.

Sperber, D. (1990). The epidemiology of beliefs. In Fraser, C., & Gaskell, G. (Eds.), *The Social Psychological Study of Widespread Beliefs* (pp. 25 – 44). Oxford, UK: Clarendon.

Sprenger, A. M., Dougherty, M., Atkins, S. M., Franco-Watkins, A. M., Thomas, R., Lange, N., & Abbs, B. (2011). Implications of cognitive load for hypothesis generation and probability judgment. *Frontiers in Psychology*, *2*, 1-15. doi: 10.3389/fpsyg.2011.00129

Squire, L. R., Knowlton, B., & Musen, G. (1993). The structure and organization of memory. *Annual Review of Psychology*, *44*, 453-495. doi:10.1146/annurev.ps.44.020193.002321

Srull, T. K., & Wyer Jr, R. S. (1986). The role of chronic and temporary goals in social information processing. In Sorrentino, R. M., & Higgins, E. T. (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (pp. 503-549). New York, NY: Guilford Press.

Stajkovic, A. D., Latham, G. P., Sergent, K., & Peterson, S. (*in press*). Prime and performance: Can a CEO motivate employees without their awareness? *Journal of Business and Psychology.*

Stajkovic, A. D., Lee, D., Greenwald, J. M., & Raffiee, J. (2015). The role of trait core confidence higher-order construct in self-regulation of performance and attitudes: Evidence from four studies. *Organizational Behavior and Human Decision Processes*, *128*, 29-48. doi: 10.1016/j.obhdp.2015.02.001

Stajkovic, A.D., & Locke, E. A. (2004). Goal priming: A new approach to goal research. Master tutorial. *Society for Industrial and Organizational Psychology*. Chicago, IL.

Stajkovic, A. D., Locke, E. A., & Blair, E. S. (2006). A first examination of the relationships between primed subconscious goals, assigned conscious goals, and task performance. *Journal of Applied Psychology*, *91*, 1172-1180. doi: 10.1037/0021-9010.91.5.1172

Stajkovic, A.D., Locke, E. A., & Blair, E. S. (2007). What happens to performance when conscious and subconscious goals are in conflict. Presented at the *Academy of Management,* Human Resources, and Managerial and Organizational Cognition divisions, Philadelphia, PA.

Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. *Psychological Bulletin, 124*, 240-261. doi: 10.1037/0033-2909.124.2.240

Stämpfli, A. E., & Brunner, T. A. (2016). The art of dieting: Exposure to thin sculptures effortlessly reduces the intake of unhealthy food in motivated eaters. *Food quality and preference*, *50*, 88-93. doi: 10.1016/j.foodqual.2016.01.012

Steele, C.M., 2011. *Whistling Vivaldi: How stereotypes affect us and what we can do*. New York, NY: W.W. Norton & Company.

Stein, K. D., Goldman, M. S., & Del Boca, F. K. (2000). The influence of alcohol expectancy priming and mood manipulation on subsequent alcohol consumption. *Journal of Abnormal Psychology*, *109*, 106-115. doi: 10.1037/0021-843X.109.1.106

Sweller, J., van Merriënboer, J. J., & Paas, F. G. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, *10*, 251-296. doi: 10.1023/A:1022193728205

Swenson, R. A. (2003). *A minute of margin: Restoring balance to overloaded lives.* Colorado Springs, CO: NavPress.

Tausczik, Y.R., & Pennebaker, J.W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, 29, 24-54. doi: 10.1177/0261927X09351676

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: Improving Decisions About Health, Wealth, and Happiness*. New York: NY: Penguin Books.

Tingley, D., Yamamoto, T., Hirose, K., Keele, L., & Imai, K. (2014). Mediation: R package for causal mediation analysis. *Journal of Statistical Software*, 59(5). doi: 10.18637/jss.v059.i05

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology*, *26*, 1-12. Doi: doi.org/10.1037/h0080017

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, *5*, 207-232. doi: 10.1016/0010-0285(73)90033-9

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124-1131. doi: 10.1126/science.185.4157.1124

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. S*cience*, *211*(4481), 453-458. doi: 10.1126/science.7455683

Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, *59,* S251-S278.

Uleman, J. S., & Bargh, J. A. (Eds.). (1989). *Unintended thought*. New York. NY: Guilford Press.

van Boven, L., & Robinson, M. D. (2012). Boys don't cry: Cognitive load and priming increase stereotypic sex differences in emotion memory. *Journal of Experimental Social Psychology*, *48*, 303-309. doi: 10.1016/j.jesp.2011.09.005

van Iddekinge, C. H., Aguinis, H., Mackey, J. D., & DeOrtentiis, P. S. (2018). A meta-analysis of the interactive, additive, and relative effects of cognitive ability and motivation on performance. *Journal of Management*, *44*, 249-279. doi: 10.1177/0149206317702220

van Merriënboer, J. J., & Sweller, J. (2005). Cognitive load theory and complex learning: Recent developments and future directions. *Educational Psychology Review*, *17*, 147-177.

van Overwalle, F. (2009). Social cognition and the brain: a meta-analysis. *Human Brain Mapping*, *30*, 829-858. doi: 10.1002/hbm.20547

Veltkamp, M., Aarts, H., & Custers, R. (2008). Perception in the service of goal pursuit: Motivation to attain goals enhances the perceived size of goal-instrumental objects. *Social Cognition*, *26*(6), 720-736. doi: 10.1007/s10648-005-3951-0

Vohs, K. D. (2015). Money priming can change people's thoughts, feelings, motivations, and behaviors: An update on 10 years of experiments. *Journal of Experimental Psychology: General*, *144*, e86-e93. doi: 10.1037/xge0000091

Vohs, K.D., Mead, N.L., & Goode, M.R. (2006). The psychological consequences of money. *Science*, *314,* 1154-1156. doi: 10.1126/science.1132491

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review, 20*, 158-177. doi: 10.1037/h0074428

Webb, T. L., & Sheeran, P. (2003). Can implementation intentions help to overcome ego-depletion?. *Journal of Experimental Social Psychology*, *39*, 279-286. doi: 10.1016/S0022-1031(02)00527-9

Weingarten, E., Chen, Q., McAdams, M., Yi, J., Hepler, J., & Albarracín, D. (2016). From primed concepts to action: A meta-analysis of the behavioral effects of incidentally presented words. *Psychological Bulletin*, *142*, 472-497. doi: 10.1037/bul0000030

Wegner, D. M., & Bargh, J. A. (1998). Control and automaticity in social life. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 446-496). New York, NY: McGraw-Hill.

Wellman, J. A., & Geers, A. L. (2009). Rebel without a (conscious) cause: Priming a nonconscious goal for psychological reactance. *Basic and Applied Social Psychology*, *31*, 9-16. doi: 10.1080/01973530802659711

Welsh, D. T., & Ordóñez, D. (2014). Conscience without cognition: The effects of subconscious priming on ethical behavior. *Academy of Management Journal*, *57*, 723-742.

Wickelgren, W. A. (1977). Speed-accuracy tradeoff and information processing dynamics. *Acta psychologica*, *41*(1), 67-85. doi: 10.5465/amj.2011.1009

Wilkowski, B. M., & Meier, B. P. (2010). Bring it on: Angry facial expressions potentiate approach-motivated motor behavior. *Journal of Personality and Social Psychology*, *98*, 201-210. doi: 10.1037/a0017992

Winters, D., & Latham, G. P. (1996). The effect of learning versus outcome goals on a simple versus a complex task. *Group & Organization Management*, *21*, 236-250. doi: 10.1177/1059601196212007

Wood, R. E. (1986). Task complexity: Definition of the construct. *Organizational Behavior and Human Decision Processes*, *37*, 60-82. doi: 10.1016/0749-5978(86)90044-0

Wood, R. E., Bandura, A., & Bailey, T. (1990). Mechanisms governing organizational performance in complex decision-making environments. *Organizational Behavior and Human Decision Processes*, *46*, 181-201. doi: 10.1016/0749-5978(90)90028-8

Wood, R. E., Mento, A. J., & Locke, E. A. (1987). Task complexity as a moderator of goal effects: A meta-analysis. *Journal of Applied Psychology*, *72*, 416-425. doi:10.1037/0021-9010.72.3.416

Woodworth, R. S. (1899). Accuracy of voluntary movement. *The Psychological Review: Monograph Supplements*, *3*(3), i.

Wright, P. M., O'Leary-Kelly, A. M., Cortina, J. M., Klein, H. J., & Hollenbeck, J. R. (1994). On the meaning and measurement of goal commitment. *Journal of Applied Psychology, 79*, 795-803. doi: 10.1037/0021-9010.79.6.795

Zedeck, S. (2010). Adverse impact: History and evolution. In Outtz, J. (Ed.), *Adverse impact: Implications for organizational staffing and high stakes selection* (pp. 3-27). New York, NY: Routledge

Zedelius, C. M., Veling, H., & Aarts, H. (2011). Boosting or choking–How conscious and unconscious reward processing modulate the active maintenance of goal-relevant information. *Consciousness and cognition*, *20*, 355-362. doi: 10.1016/j.concog.2010.05.001

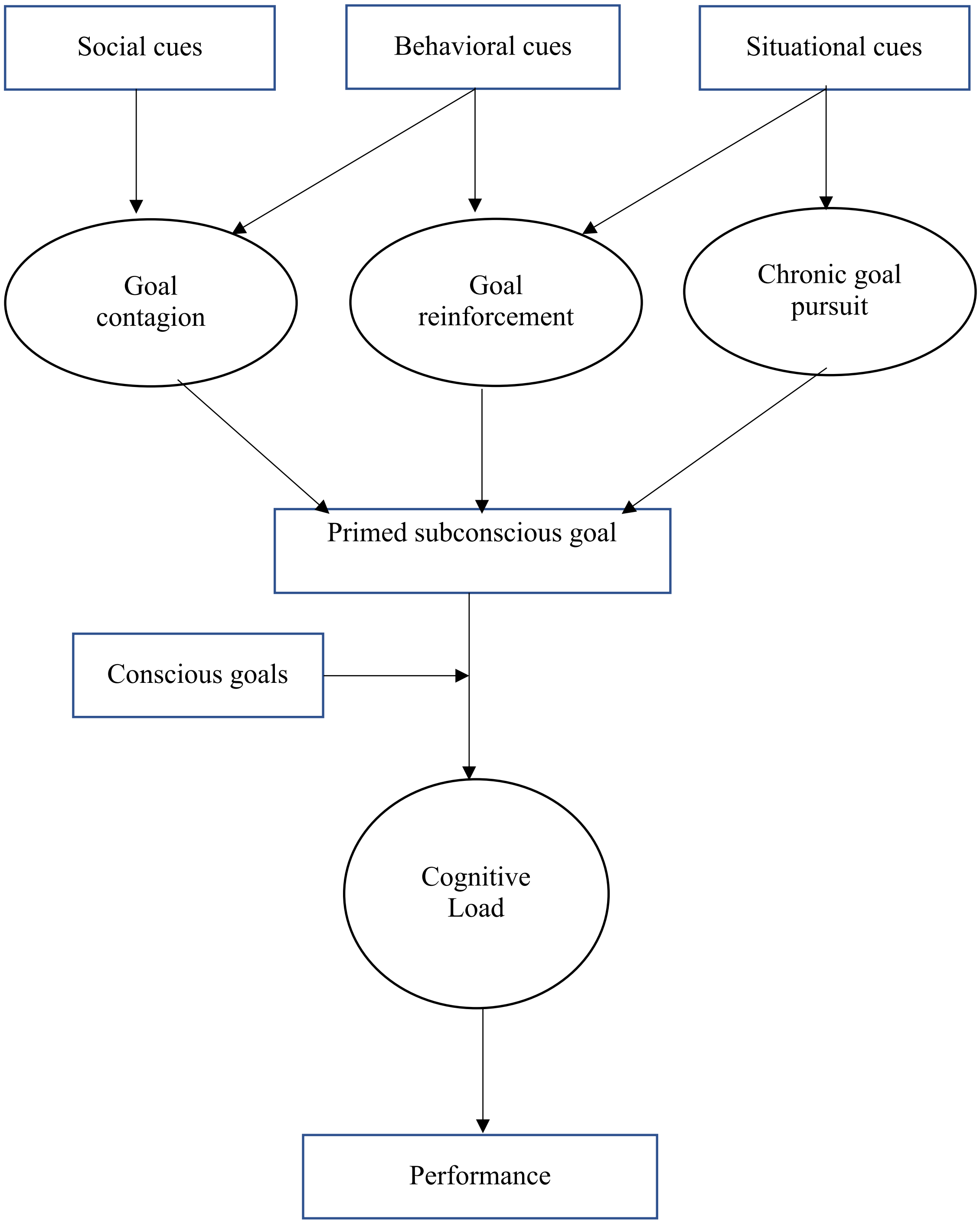


Figure 1. Conceptual illustration of the pathway from prime-to-performance.

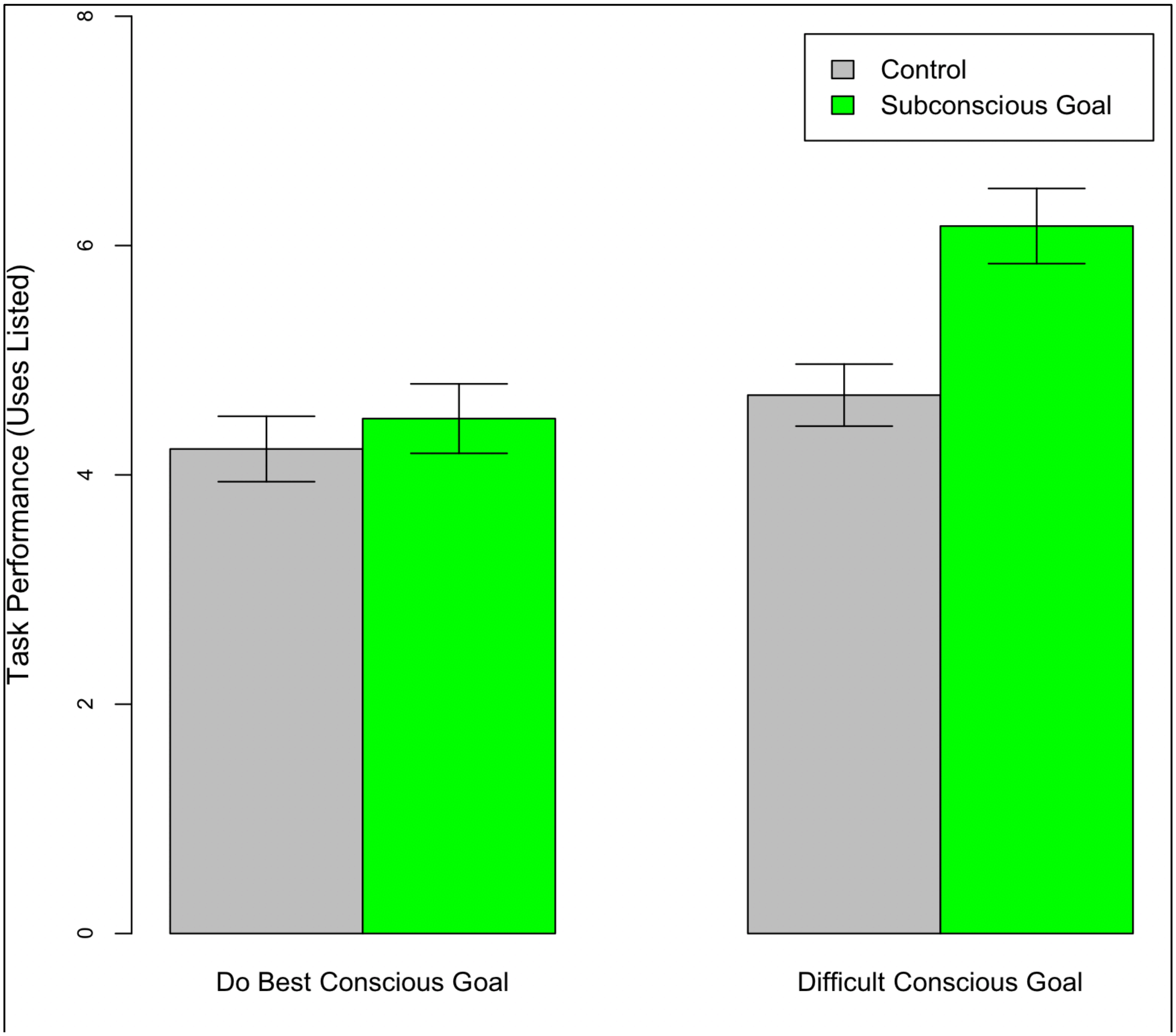


Figure 2: Predicted task performance means for Experiment 1 with corresponding error bars of the point estimates. This figure shows the positive interaction of a difficult conscious goal and subconscious goal on task performance.

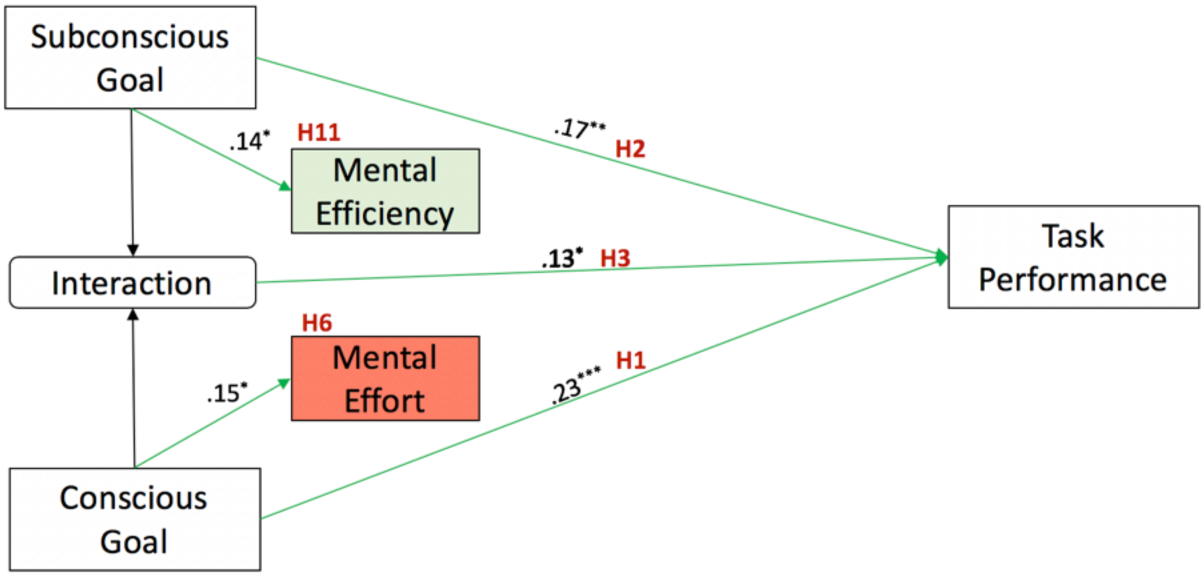


Figure 3: Visual illustration of the combined results of Experiment 1. Edge labels represent standardized regression coefficient and the red "H" labels indicate the hypothesis supported by the effect.

$^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$.

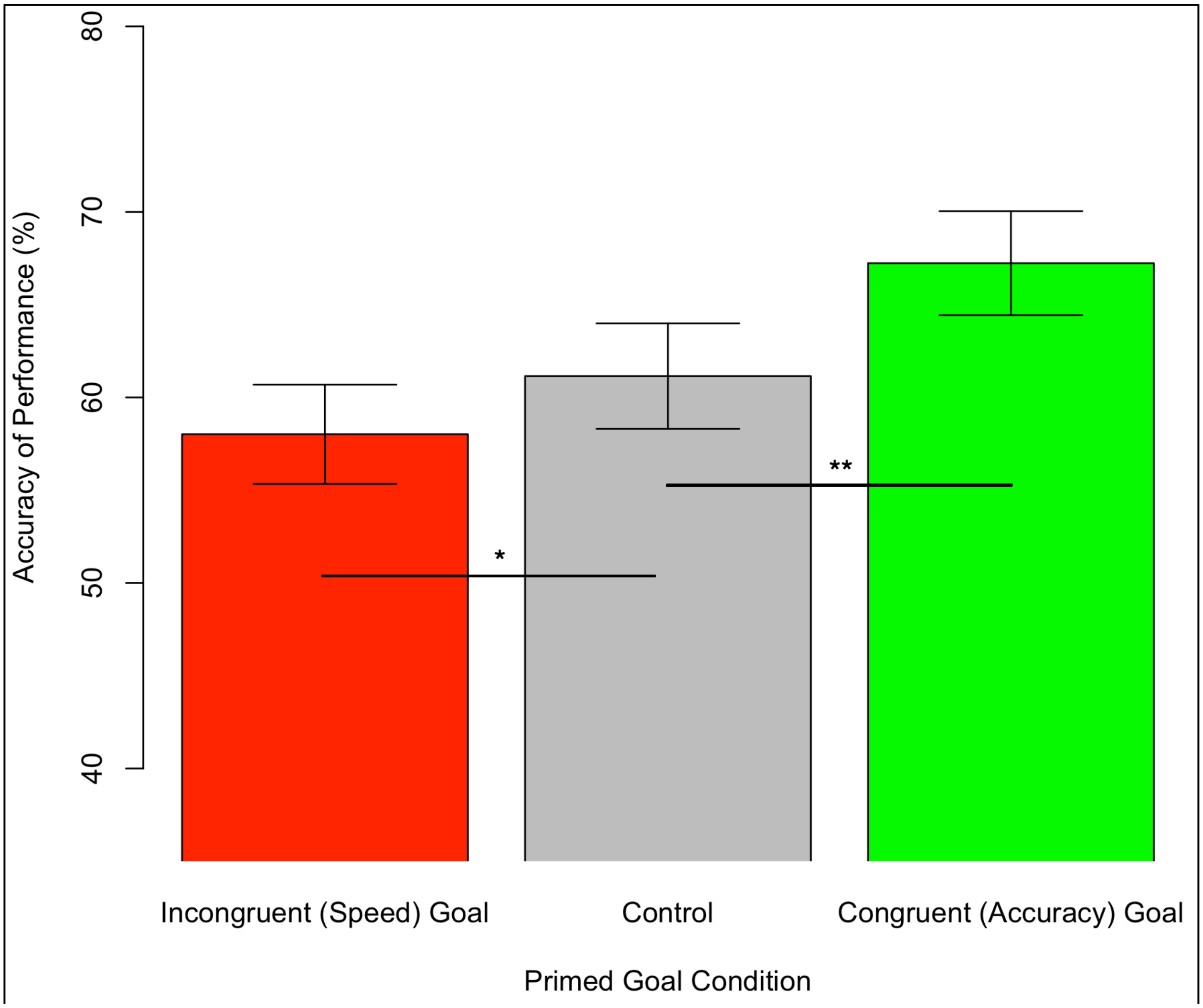


Figure 4: Predicted task performance for Experiment 2 with corresponding error bars of the point estimates, controlling for conscious goal. The black lines show the results of the MPOC to signify significant differences between subconscious goal groups.

$^{*}p < .05$. $^{***}p < .001$.

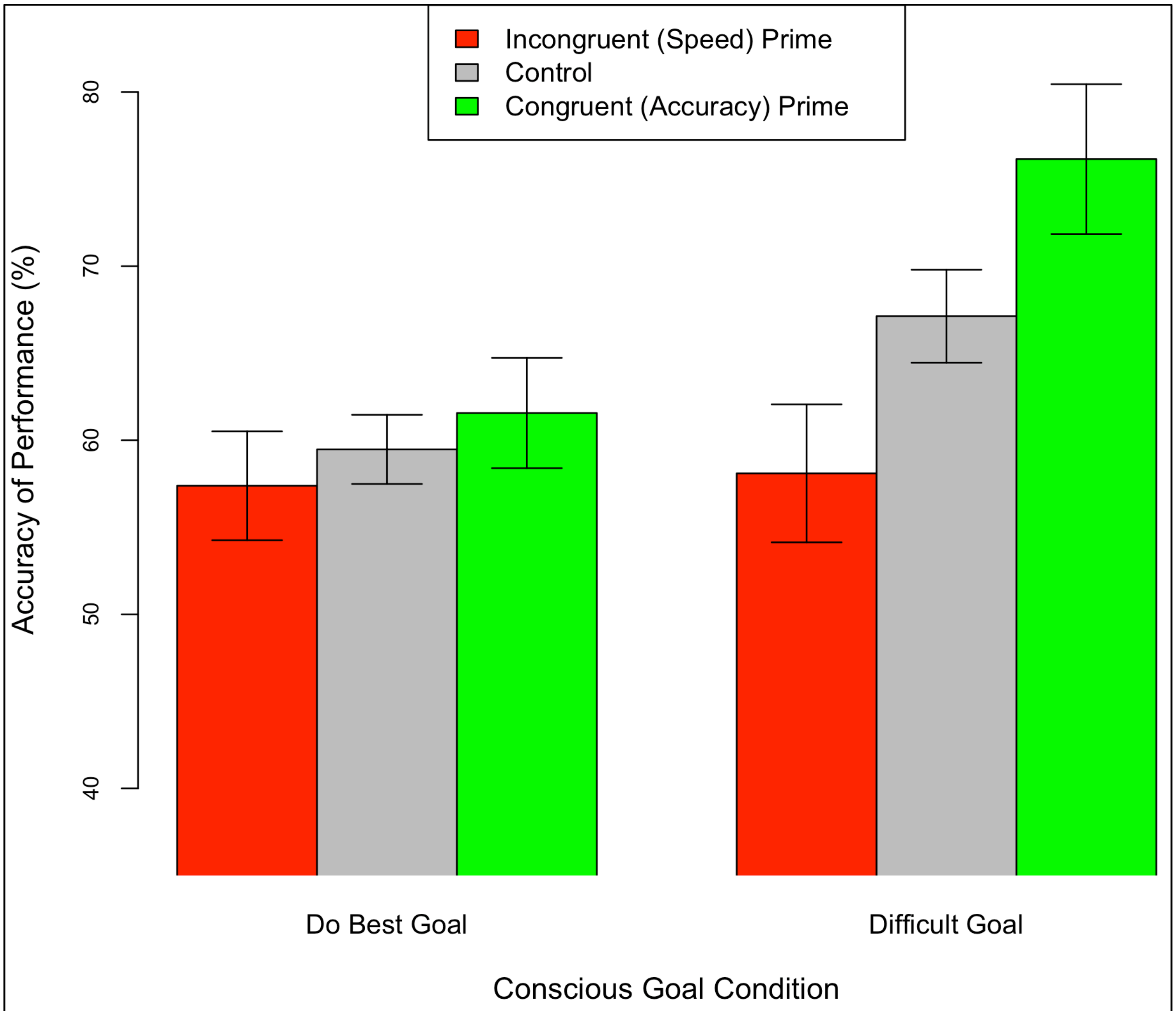


Figure 5: Predicted task performance for Experiment 2 for each of the six experimental groups, with corresponding error bars of the point estimates. This figure shows the positive interaction of the difficult conscious goal and congruent subconscious goal on performance.

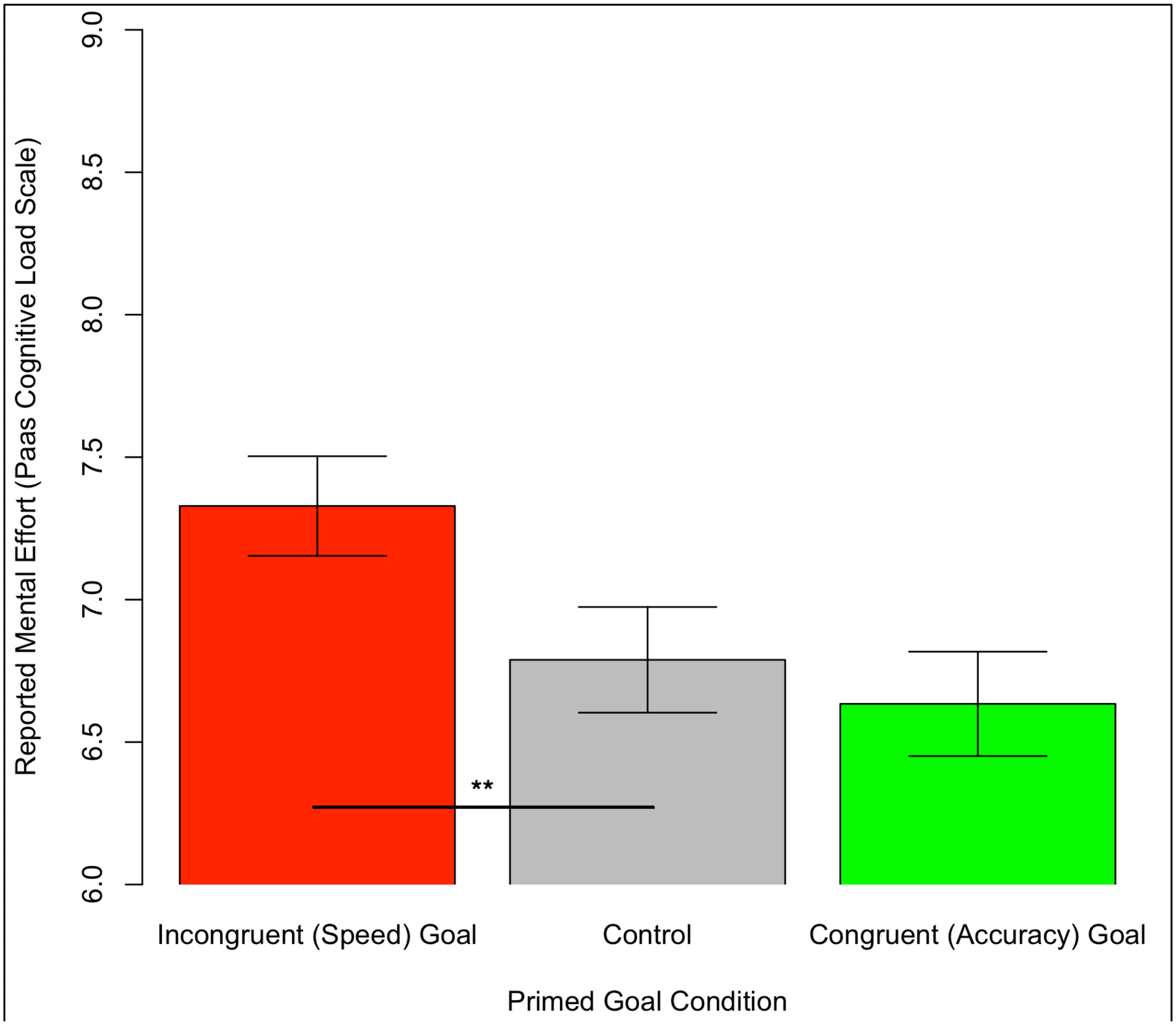


Figure 6: Predicted mental effort in Experiment 2,with corresponding error bars of the point estimates, controlling for conscious goal. The black line shows the results of the MPOC to signify significant differences between subconscious goal groups.

$^{**}p < .01$.

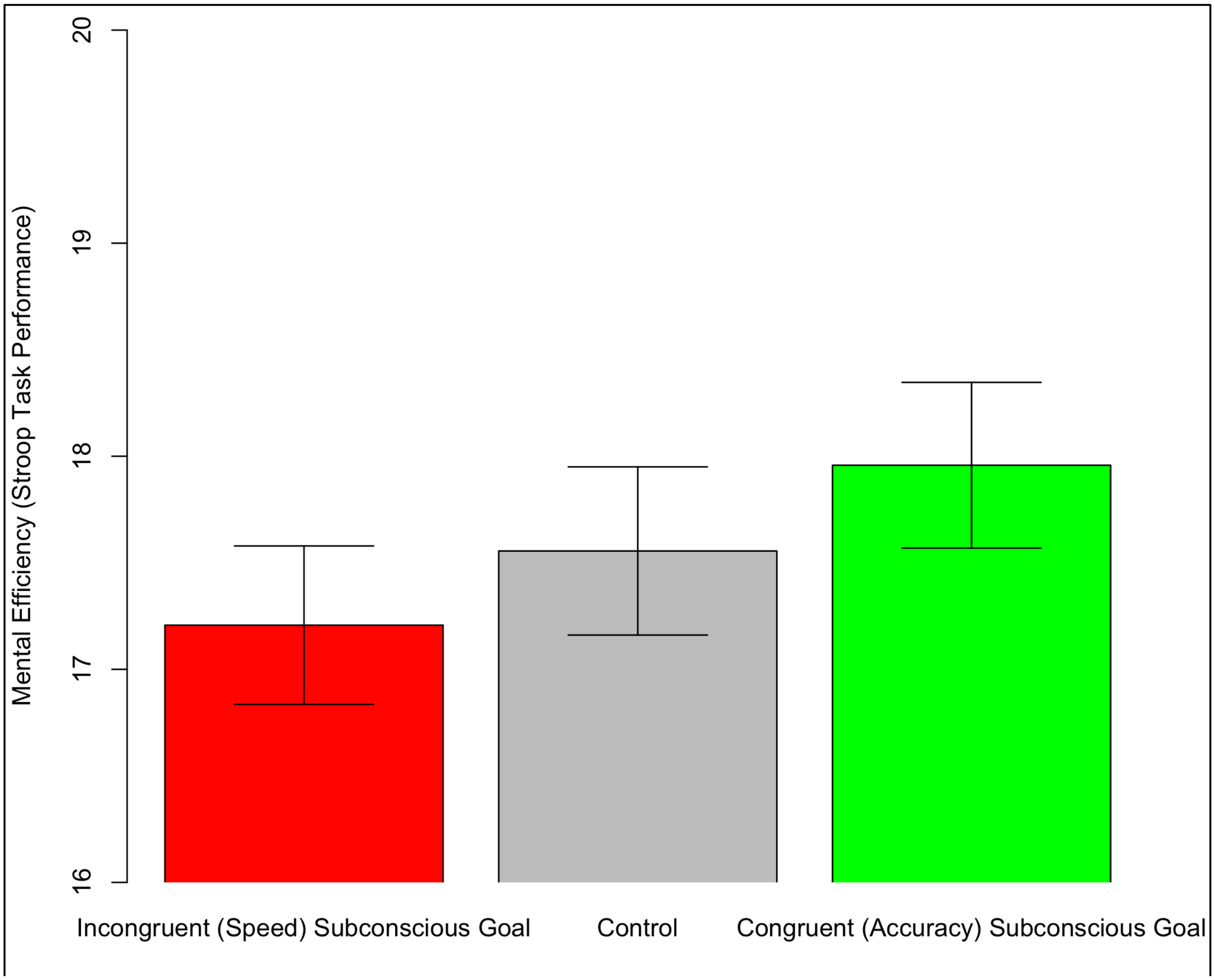
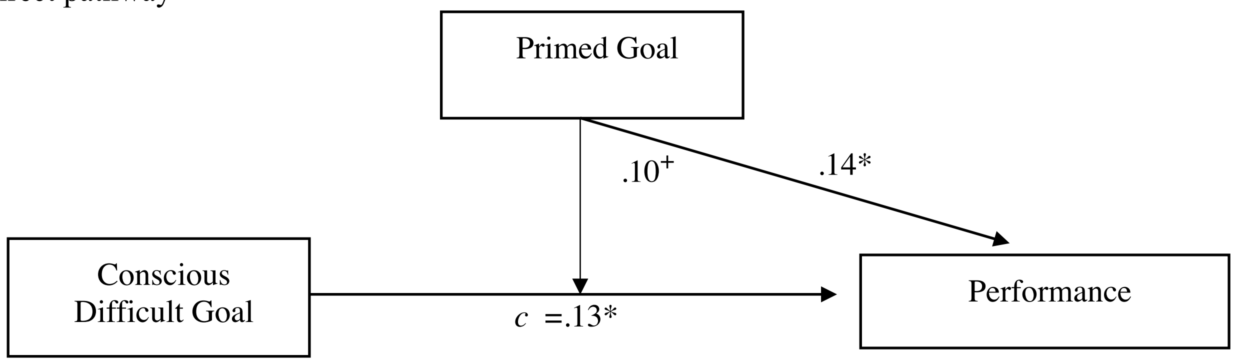


Figure 7. Predicted mental efficiency in Experiment 2,with corresponding error bars of the point estimates, controlling for conscious goal. No significant differences in the MPOC were found.

a) Direct pathway



b) Indirect pathway

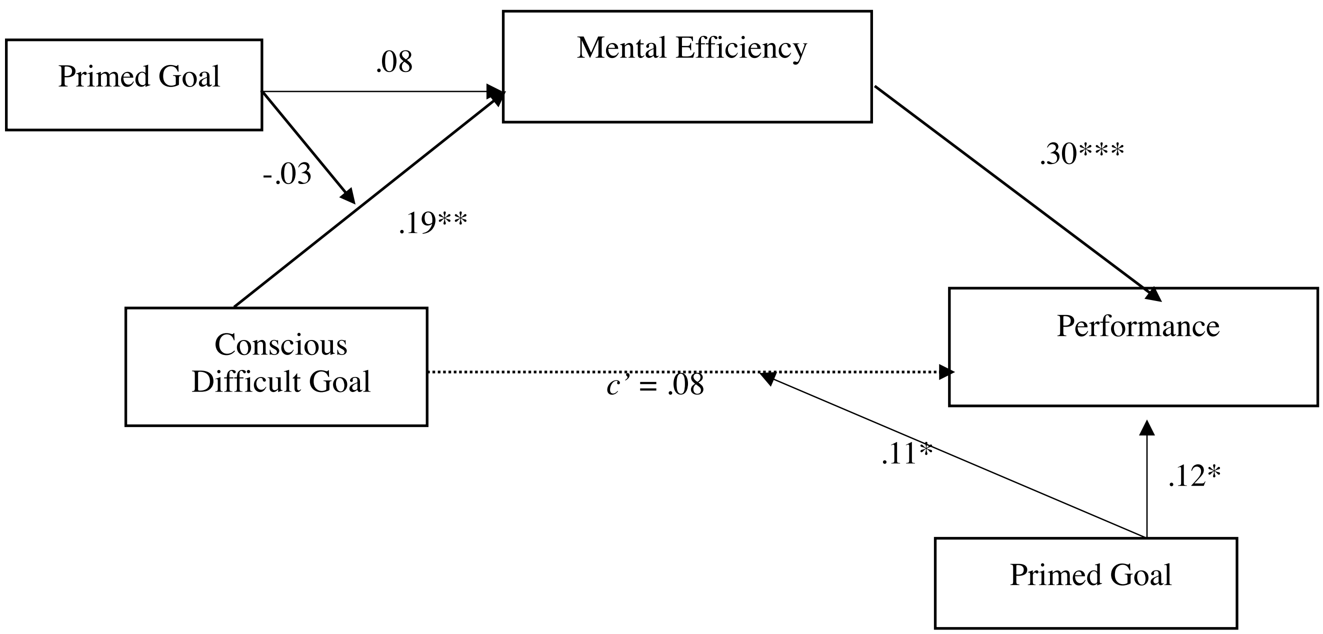


Figure 8: This figure reports the mediation results from Experiment 2. The edge labels represent the standardized regression coefficients from the Baron and Kenney (1986) mediation analysis.

$^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$. $^{+}p < .10$

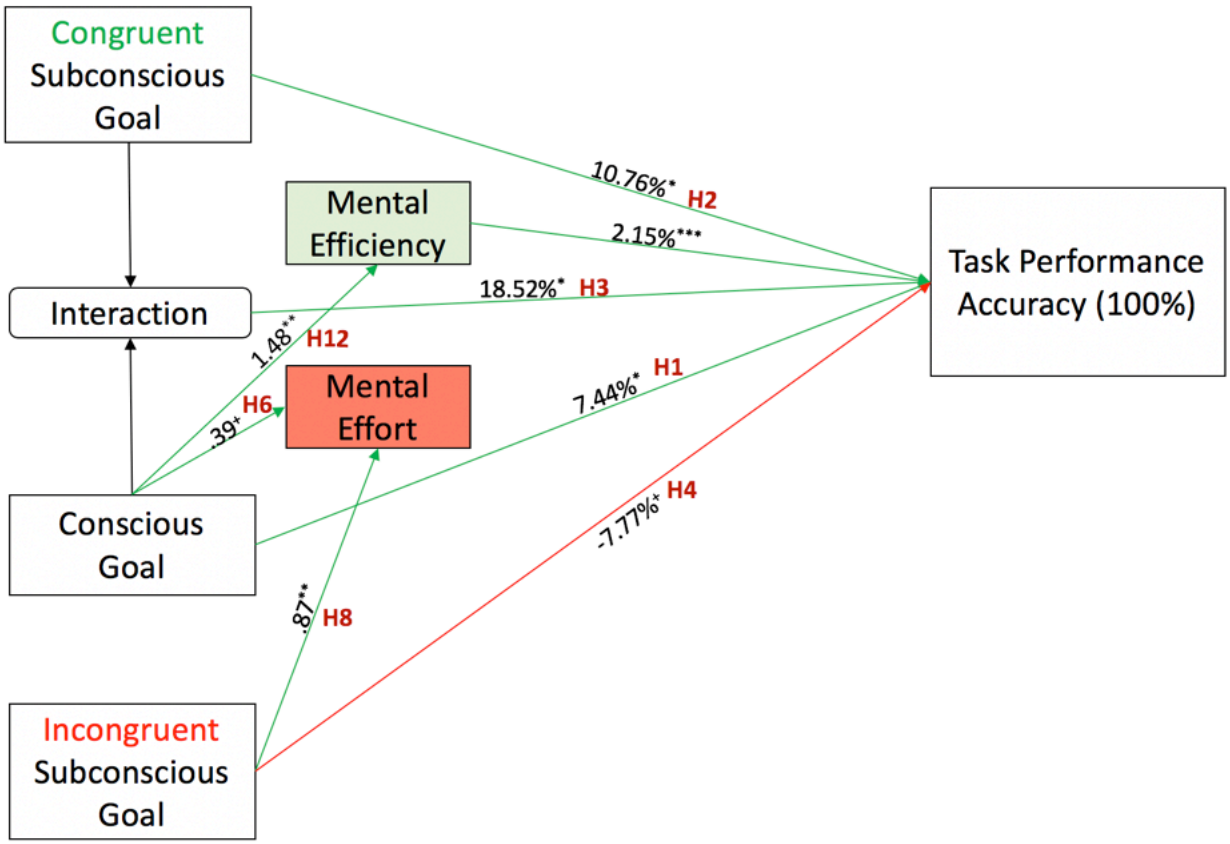


Figure 9: Visual illustration of the combined results of Experiment 2. Edge labels represent unstandardized regression coefficient and the red "H" labels indicate the hypothesis supported by the effect.

$^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$. $^{+}p < .10$

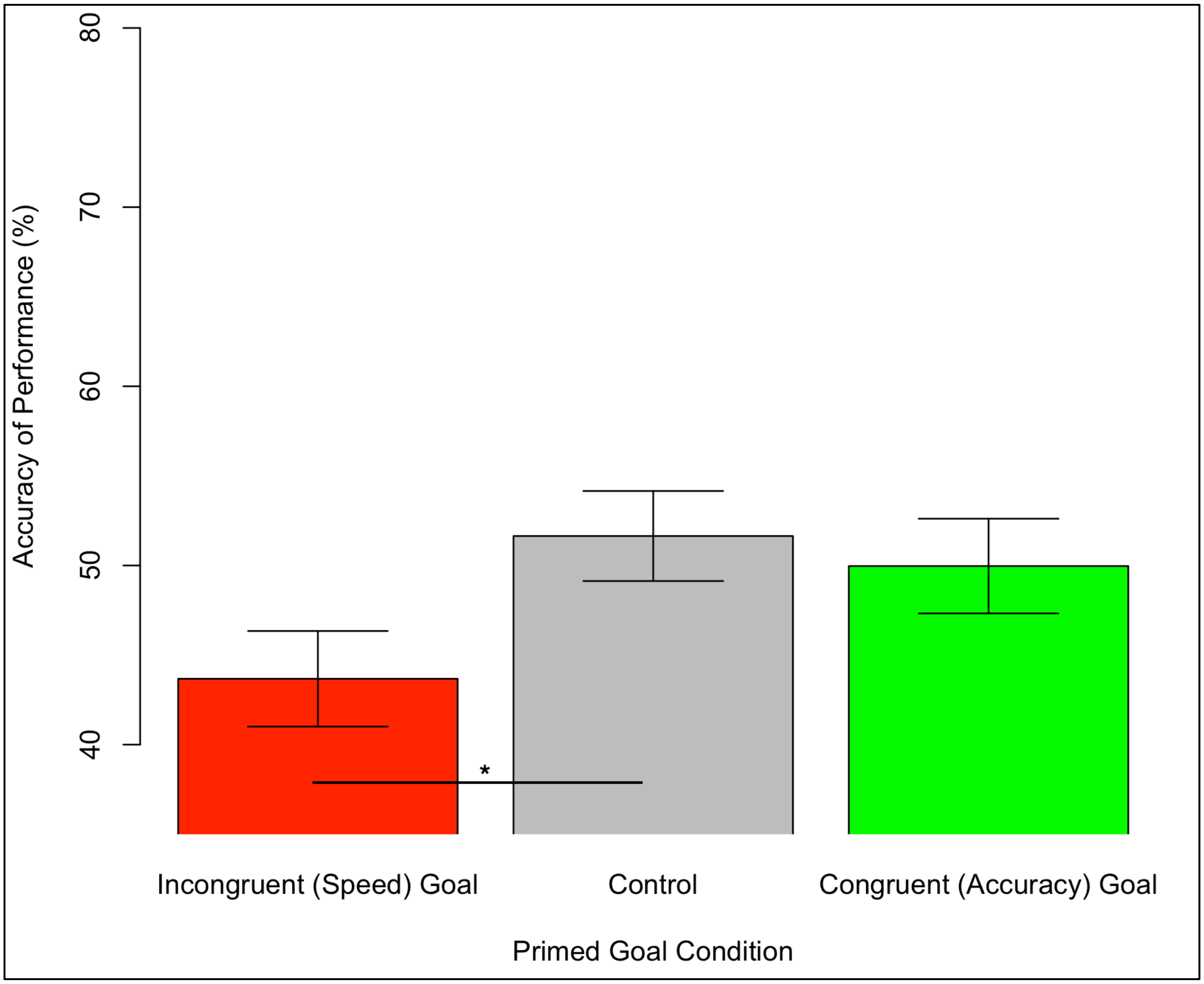


Figure 10: Predicted performance means for Experiment 3 with corresponding error bars of the point estimates, controlling for conscious goal. The black line shows the results of the MPOC to signify significant differences between subconscious goal groups.

$^{*}p < .05$.

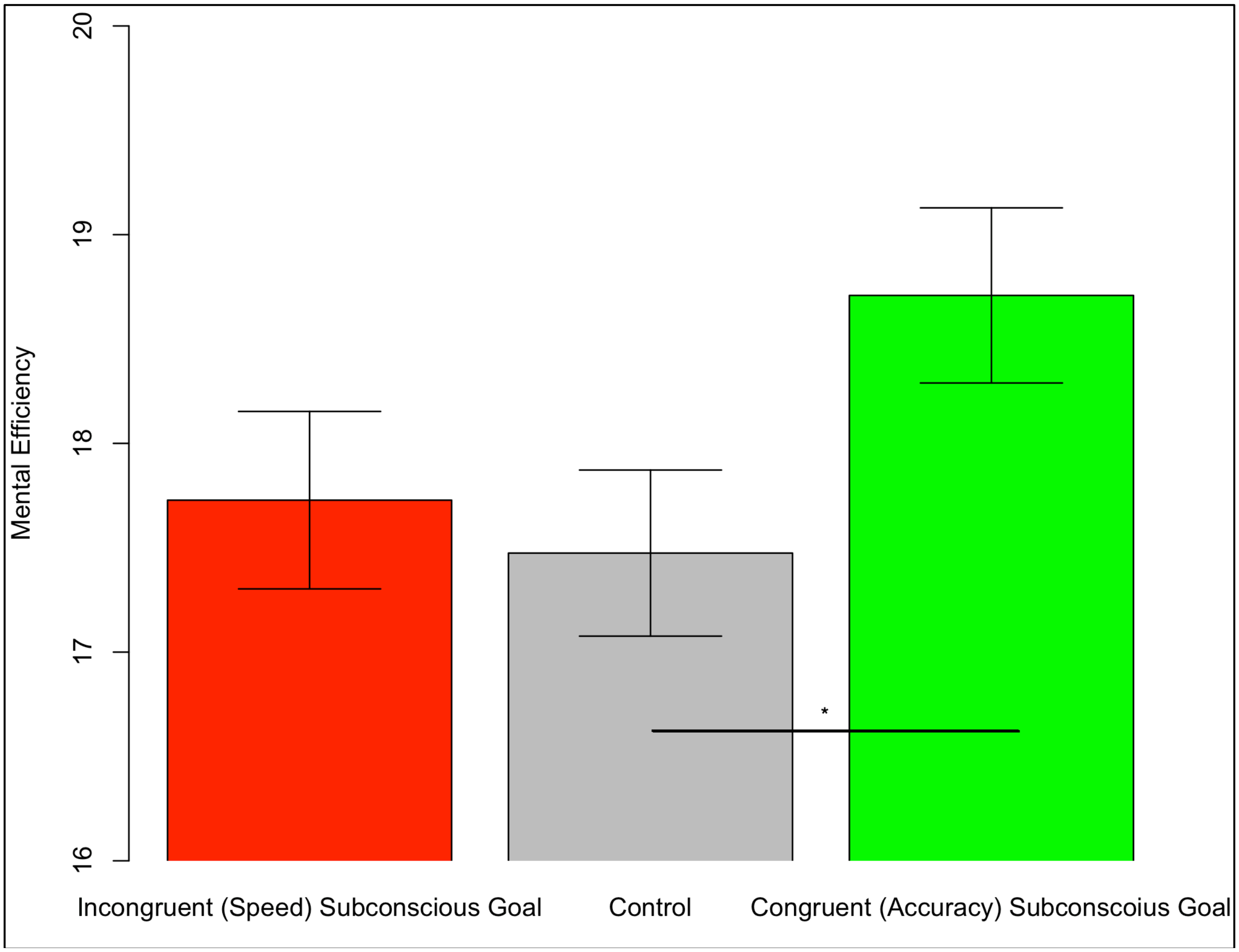


Figure 11. Predicted mental efficiency in Experiment 3 with corresponding error bars of the point estimates, controlling for conscious goal. The black line shows the results of the MPOC to signify significant differences between subconscious goal groups.

$^{*}p < .05$.

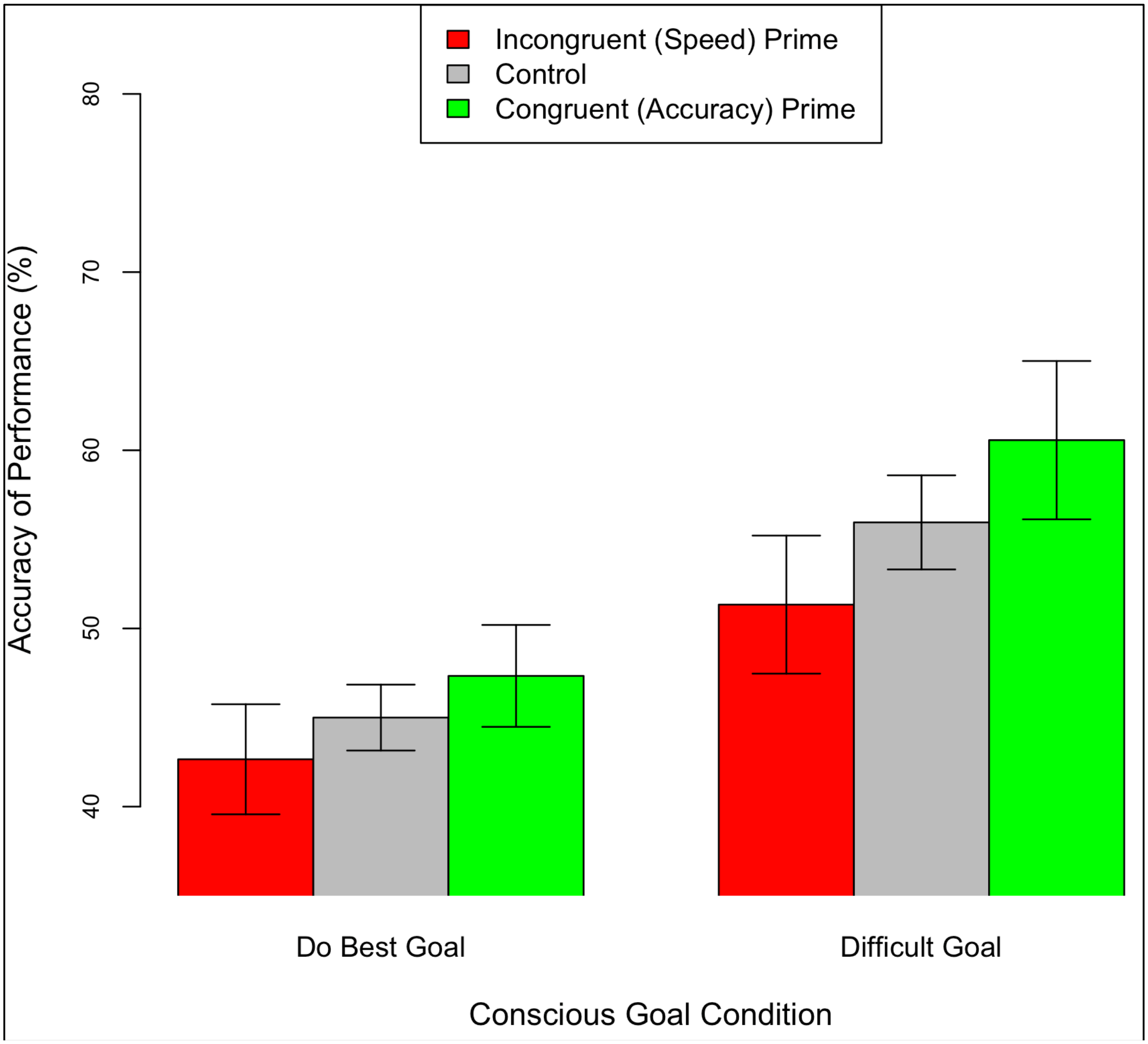


Figure 12: Predicted task performance for Experiment 3 for each of the six experimental groups, with corresponding error bars of the point estimates. This figure shows the negative interaction of the difficult conscious goal and congruent subconscious goal on performance.

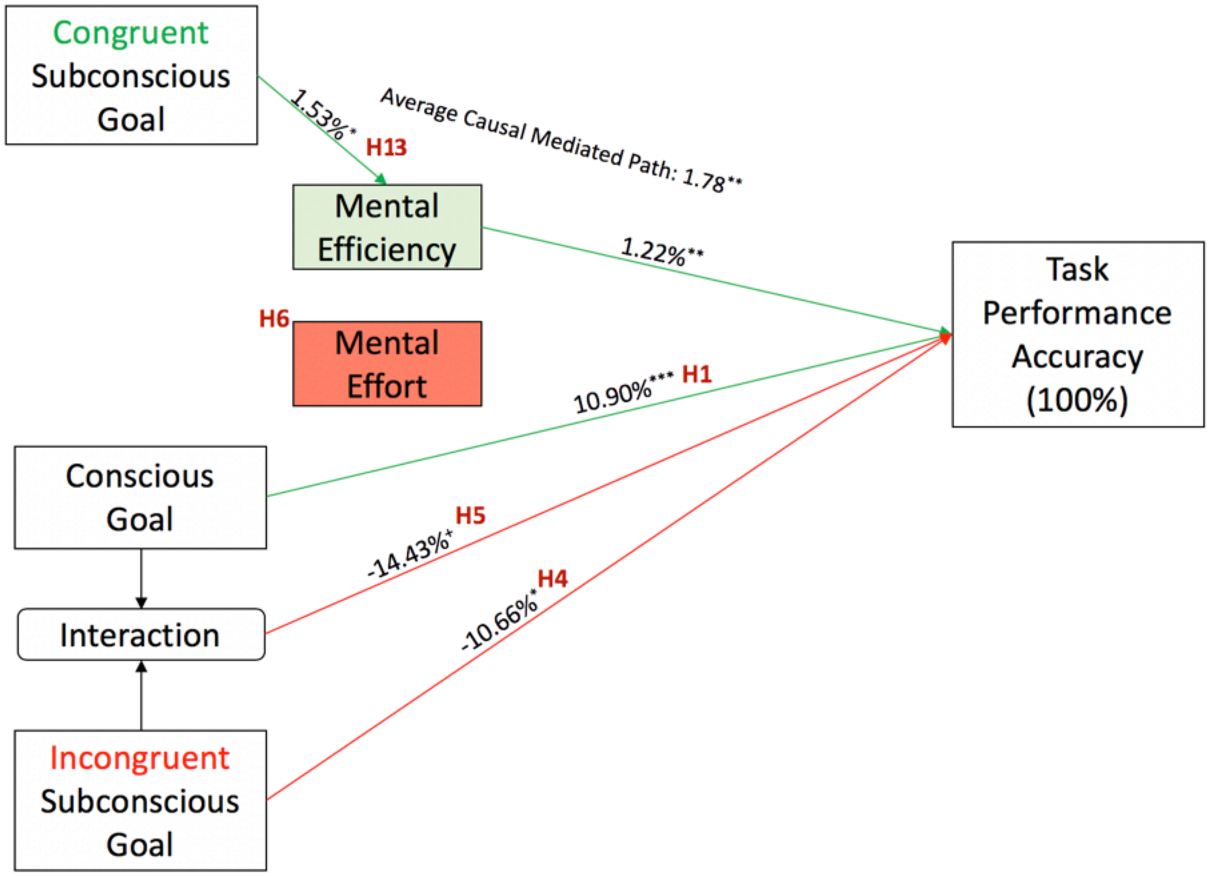


Figure 13: Visual illustration of the combined results of Experiment 3. Edge labels represent unstandardized regression coefficient and the red "H" labels indicate the hypothesis supported by the effect.

$^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$.

Table 1

Descriptive Statistics by Experimental Cell (Experiment 1)

	Control – Difficult Conscious Goal					Subconscious Goal – Difficult Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	69	4.7	2.1	1	10	47	6.17	2.58	2	14
Mental Effort	69	6.29	1.84	1	9	47	6.11	1.67	2	9
Mental Efficiency	69	16.99	4.29	7	20	47	17.94	3.8	7	20
Task Difficulty	69	6.2	1.81	1	9	47	5.87	1.88	2	9
	Control – Do Best Conscious Goal					Subconscious Goal – Do Best Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	62	4.23	2.21	0	9	55	4.49	2.17	0	9
Mental Effort	62	5.89	2.01	1	9	55	5.38	2.12	1	9
Mental Efficiency	62	17.43	3.43	8	20	55	18.75	2.23	11	20
Task Difficulty	62	5.19	2.30	1	9	55	5.76	1.62	2	9

Table 2

Correlation Table by Priming Treatment (Experiment 1)

Variable	1	2	3	4
1. Task Performance		.02	.09	.11
2. Mental Effort	.02		.12	.53***
3. Mental Efficiency	-.02	-.07		.09
4. Task Difficulty	-.25*	.58***	-.09	

Note: Correlations for the control group are presented above the diagonal, and correlations for the subconscious goal group are presented below the diagonal.

* $p < .05$, *** $p < .001$

Table 3

Descriptive Statistics by Experimental Cell (Experiment 2)

	Incongruent (Speed) Subconscious – Difficult Conscious Goal					Incongruent (Speed) Subconscious – Do Best Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	39	59.19	33.29	0	100	60	57.36	24.45	0	100
Mental Effort	39	7.67	1.49	5	9	60	7.13	1.62	4	9
Mental Efficiency	39	18.36	3.17	10	20	60	16.57	4.29	8	20
Task Difficulty	39	6.92	2.11	1	9	60	6.67	1.9	1	9

	Congruent (Accuracy) Subconscious – Difficult Conscious Goal					Congruent (Accuracy) Subconscious – Do Best Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	32	77.49	21.61	0	100	58	61.54	25.95	0	100
Mental Effort	32	7.06	1.29	4	9	58	6.4	2.07	2	9
Mental Efficiency	32	18.75	2.53	9	20	58	17.52	3.75	9	20
Task Difficulty	32	6.81	1.51	3	9	58	6.26	2.12	1	9

	Control – Difficult Conscious Goal					Control – Do Best Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	28	64.07	26.13	14.29	100	60	59.53	26.93	0	100
Mental Effort	28	6.75	2.1	2	9	60	6.78	1.67	2	9
Mental Efficiency	28	18.46	3.34	8	20	60	17.05	3.95	7	20
Task Difficulty	28	6	2.51	1	9	60	6.55	2.07	1	9

Table 4

Panel A: Correlation Table by Priming Treatment (Experiment 2)

Variable	1	2	3	4
1. Task Performance		.04	$.31^{***}$	.01
2. Mental Effort	-.14		.02	36^{***}
3. Mental Efficiency	$.34^{***}$	.05		.11
4. Task Difficulty	$-.24^{**}$	$.63^{***}$	$.17^{+}$	

Panel B: Correlation Table for Control Group (Experiment 2)

Variable	1	2	3	4
1. Task Performance				
2. Mental Effort	.04			
3. Mental Efficiency	$.28^{*}$	.12		
4. Task Difficulty	.04	$.53^{***}$	$.21^{*}$	

Note: Correlations for the incongruent subconscious goal group are presented above the diagonal in Panel A, and correlations for the congruent subconscious goal group are presented below it.

$^{*}p < .05$, $^{***}p < .001$, $^{+}p < .10$

Table 5

Source Table Results for the Multiple Planned Orthogonal Comparison (Experiment 2)

Parameter Description	b_j	SE	*F*	*p*
b_0: Average performance, *intercept*	63.195	1.676	1421.24	$<2e\text{-}16^{***}$
b_1: Change in performance for incongruent (speed) subconscious goal compared to control, holding other variables constant, *main effect*	-9.838	4.605	4.565	$.003^{*}$
b_2: Change in performance of congruent (accuracy) subconscious goal compared to control, holding other variables constant, *main effect*	12.633	4.770	7.043	$.008^{**}$
b_3: Change in performance of a difficult conscious goal compared to ado best conscious goal, holding all other variables constant, *main effect*	7.442	4.353	4.928	$.027^{*}$
b_4: Change in the effect of a difficult conscious goal on performance when an incongruent (speed) subconscious is primed compared with no primed goal, *interaction effect*	-11.209	9.209	1.481	.225
b_5: Change in the effect of a difficult conscious goal on performance when a congruent (accuracy) subconscious goal is primed compared to no prime goal, *interaction effect*	17.017	9.520	3.195	$.075^{+}$

$^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$, $^{+}p < .10$

Table 6

Causal Mediation Results (Experiment 2)

Mediator	*Effect*	*b*	*Lower CI*[a]	*Upper CI*[a]	*p*
Mental Efficiency	ACME	3.15	1.36	5.08	<2e-16**
	ADE	4.24	-1.75	10.41	.190
	Total effect	7.39	0.91	13.64	.022*
	Proportion mediated	0.43	0.15	1.84	.022*

Note: This table reports the results of the causal mediation analysis. ACME (average causal mediation effect) represents the effect of conscious goal through mental efficiency on performance. ADE (average direct effect) represents the effect of conscious goal on performance, holding mental efficiency constant. The total effect represents the total influence of conscious goal on performance, both indirectly and directly. The proportion mediated represents the proportion of the total effect that is mediated by mental efficiency.

[a]CI = Confidence Interval.

** $p < .01$, * $p < .05$

Table 7

Descriptive Statistics by Experimental Cell (Experiment 3)

	Incongruent (Speed) Subconscious – Difficult Conscious Goal					Incongruent (Speed) Subconscious – Do Best Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	31	46.78	28.88	0	100	45	42.95	17.48	7.14	100
Mental Effort	31	7.03	2.27	1	9	45	7.36	1.57	2	9
Mental Efficiency	31	17.81	3.69	9	20	45	17.69	3.88	4	20
Task Difficulty	31	7.61	1.65	1	9	45	7.33	1.95	1	9
	Congruent (Accuracy) Subconscious – Difficult Conscious Goal					Congruent (Accuracy) Subconscious – Do Best Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	22	54.15	27.51	21.43	100	55	47.48	21.65	0	100
Mental Effort	22	7.32	1.43	4	9	55	7.11	1.8	1	9
Mental Efficiency	22	18.82	2.91	10	20	55	18.65	3.09	8	20
Task Difficulty	22	7.41	1.5	4	9	55	7.25	1.66	2	9
	Control – Difficult Conscious Goal					Control – Do Best Conscious Goal				
Variable	*n*	*M*	*SD*	*Min*	*Max*	*n*	*M*	*SD*	*Min*	*Max*
Performance	26	66.81	26.95	21.43	100	59	44.54	20.35	0	100
Mental Effort	26	7.08	1.74	3	9	59	7	1.89	1	9
Mental Efficiency	26	17.27	4.05	7	20	59	17.58	4.03	8	20
Task Difficulty	26	7.38	1.63	2	9	59	7.03	2.22	1	9

Table 8

Panel A: Correlation Table by Priming Treatment (Experiment 3)

Variable	1	2	3	4
1. Task Performance		.30*	.22*	.15
2. Mental Effort	.06		.12	.53***
3. Mental Efficiency	.13	.10		.21^{+}
4. Task Difficulty	.06	.58***	.24*	

Panel B: Correlation Table for Control Group (Experiment 3)

Variable	1	2	3	4
1. Task Performance				
2. Mental Effort	.16			
3. Mental Efficiency	.19^{+}	-.04		
4. Task Difficulty	.17	.40***	.34***	

Note: Correlations for the incongruent subconscious goal condition are presented above the diagonal in Panel A, and correlations for the congruent subconscious goal group are presented below it.

$^{*}p < .05$, $^{***}p < .001$, $^{+}p < .10$

Table 9

Source Table Results for the Multiple Planned Orthogonal Comparisons (Experiment 3)

Parameter Description	b_j	SE	*F*	*p*
b_0: Average performance, *intercept*	50.471	1.591	1006.21	<2e-16***
b_1: Change in performance for incongruent (speed) subconscious goal compared to control, holding other variables constant, *main effect*	-11.205	4.434	6.385	.012*
b_2: Change in performance of congruent (accuracy) subconscious goal compared to control, holding other variables constant, *main effect*	0.789	4.612	0.029	.864
b_3: Change in performance of a difficult conscious goal compared to a do best conscious goal, holding all other variables constant, *main effect*	10.889	3.182	11.711	.001***
b_4: Change in the effect of a difficult conscious goal on performance when an incongruent (speed) subconscious is primed compared with no primed goal, *interaction effect*	-14.121	8.869	2.535	0.113
b_5: Change in the effect of a difficult conscious goal on performance when a congruent (accuracy) subconscious goal is primed compared to no prime goal, *interaction effect*	-8.637	9.223	0.877	.349

$^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$, $^{+}p < .10$

Table 10

Summary of Hypotheses and Empirical Findings

		Hypothesis Supported (Yes or No)		
	Hypothesis	Brainstorming, Experiment 1	Logic, Experiment 2	Complex Logic, Experiment 3
1	Assigning a difficult conscious goal will improve performance.	Yes	Yes	Yes
2	Priming a subconscious goal that is congruent with a conscious goal will have a direct positive effect on performance.	Yes	Yes	No
3	A congruent subconscious goal and difficult conscious goal will have a positive interaction effect on performance.	Yes	Yes	No
4	Priming a subconscious goal that is incongruent with a conscious goal will have a direct negative effect on performance.	-	Yes	Yes
5	An incongruent subconscious goal and do best conscious goal will have a negative interaction effect on performance.	-	No	Yes
6	When a conscious and subconscious goal are congruent, the subconscious goal will operate “resource-free” by not consuming mental resources.	Yes	Yes	Yes
7	Cognitive load will mediate the positive interactive performance effects generated by a congruent conscious goal and primed subconscious goal.	No	No	No
8	When a conscious and subconscious goal are incongruent, the subconscious goal will consume limited mental resources.	-	Yes	No
9	Cognitive load will mediate the negative interactive performance effects generated by a conscious and incongruent primed subconscious goal.	-	No	No

10	The effect of a difficult conscious goal will be larger on simple tasks compared with more complex tasks.	Yes	Yes	No
11	Priming a subconscious goal will improve mental efficiency on a creative brainstorming task.	Yes	-	-
12	Assigning a difficult conscious goal will improve mental efficiency on a straightforward logic task.	-	Yes	-
13	Priming a subconscious goal will improve mental efficiency on a complex logic task.	-	-	Yes

Appendix A

Review of Findings on Non-Work Related Subconscious Goals

Behavioral Goals

This research examines the effect of priming goals on behavioral outcomes, including impression formation (Chartrand & Bargh, 1996; Laran, Janiszewski, Cunha, 2008), habitual responses (Aarts & Dijksterhuis, 2000), normative behaviors (Aarts & Dijksterhuis, 2003; Oettingen, Grant, Smith, Skinner, & Gollwitzer, 2006), self-agency (Aarts, Custers, & Wegner, 2005), prosocial behavior (Holland, Aarts, & Langendam, 2006), socializing (Aarts, Custers, & Holland, 2007; Custers & Aarts, 2007a), personal hygiene (Custers & Aarts, 2007b), readiness to respond (Ferguson, 2008; Wellman & Geers, 2009), unethical behavior (Welsch & Ordonez, 2009), and physical motor acts (Bargh, Chen, & Burrows, 1996; Doyen, Klein, Pichon, & Cleermans, 2012). A recent meta-analysis of behavioral goal priming found an average effect of $d = 0.33$. It was robust across methodological procedures and only minimally biased by publication of positive vs. negative results (Weingarten et al., 2016).

Cooperation and Competition Goals

Priming a cooperation goal increases sharing behaviors (Bargh et al., 2001; Légal, Chappé, Coiffard, & Villard-Forest, 2012), and priming a goal to "pay attention to others" enhances decision-making of virtual teams (Bartelt, Dennis, Yuan, & Barlow, 2013). In contrast, business-related objects (e.g., briefcase) and apparel (e.g., suits) can prime competition goals (Kay, Wheeler, Bargh & Ross, 2004), which have been shown to increase competitive goal striving behavior (Kawada, Oettingen, Gollwitzer, & Bargh, 2004).

Consumer Goals

Priming retail brands activates purchasing goals (Chartrand, Huber, Shiv, & Tanner, 2008). Examination of specific brands has revealed that Apple logos prime increased creativity

Appendix A (*continued)*

compared with IBM logos (Fitzsimons, Chartrand, & Fitzsimons, 2008), Disney primes increased honesty compared with E!- (Fitzsimons et al., 2008), and Kellogg's primes an increased willingness to take the stairs (Aggarwal & McGill, 2012). Brcic and Latham (2016) also found that priming affect with a happy face sticker increases consumer satisfaction.

Health Goals

Priming health goals shifts preferences towards healthier options (Kim, 2011), decreases snack food eating (Boland, Connell, & Vallen, 2013; Walsh, 2014), reduces pleasure from eating junk food (Connell & Mayor, 2013), lessens junk food purchases (Papies, Potjes, Keesman, Schwinghammer, & van Koningsbruggen, 2014), and lowers calorie consumption (Minas, Poor, Dennis, & Bartelt, 2016). Primes used include images of healthy bodies as well as the presence of thin sculptures (Stämpfli & Brunner, 2016). Priming exercise also reduces food consumption (Albarracin, Wang, & Leeper, 2009). Conversely, priming drinking and socializing goals increases alcohol consumption (Friedman, McCarthy, Pedersen, & Hicks, 2009; Sheeran et al., 2005; Stein, Goldman, & Del Boca, 2000; Veltkamp, Aarts, & Custers, 2008).

Relationship Goals

Exposure to significant others primes goals associated with the person (Shah, 2003a). These primes influence goal value appraisal, persistence, performance, and reactions to success/failure (Shah, 2003b). Context of the relationship matters; priming a friend versus a coworker increases helping, whereas priming one's mother increases academic achievement (Fitzsimons & Bargh, 2003). The more goals associated with a significant other, the less likely priming that person is to activate any one goal (Shah, 2003a); one exception is if the other person is perceived as controlling. In this case, priming can activate a goal that is directly opposed to the wishes of the significant other (Chartrand, Dalton, & Fitzsimons, 2007).

Appendix A *(continued)*

Approach and Avoidance Goals

Individuals with independent self-views are more persuaded by promotion-focused primes compared to interdependent individuals who are more persuaded by prevention focused primes (Aaker & Lee, 2001). Priming avoidance goals causes people to behave less socially compared to priming them with approach goals (Krajewski, Sauerland, & Muessigmann, 2011).

Action and Inaction goals

Priming action and inaction goals can influence physical and cognitive output irrespective of the behavior required by the task (Albarracín et al., 2008). For example, compared with inaction primes, action primes produce less attitude change and less argument scrutiny (Albarracín & Handley, 2011). They also increase performance when people are in good moods, but inaction primes boost performance in bad moods (Albarracín & Hart, 2011) and influence self-control mechanisms without intention (Helper & Albarracín, 2013).

Appendix B

Sentence Unscrambling Task to Prime an Achievement Goal (Experiment 1)

For the next task, you will be provided with several word sets. Each word set contains five words. Your task is to make a grammatically correct sentence using **FOUR** of the five words in each set. In doing so:

a) You cannot change the tense of the verbs (e.g., "flew" to "fly"), and

b) The sentence must make sense without any punctuation except an end period.

An example:

flew eagle the water around (set of five words)

The eagle flew around. (correct **four**-word sentence)

1. was Bob visits yesterday married

____

2. prevail mirror team will the

____

3. accomplished he green the task

____

4. melts water when butter heated

____

5. get to compete mountain promoted

____

6. pet soccer the gently dog

____

7. obstacles car strive against tough

____

Appendix B (*continued)*

8. by	highlighter	work	thrive	they
9. wood	eating	pie	she	likes
10. despite	notebook	triumphed	she	obstacles
11. on	sleeping	turn	the	lamp
12. to	study	hard	achieve	Daisy
13. mastered	Joe	the	piano	sunshine
14. an	aspirin	Suzie	clock	took
15. wins	he	race	superficial	the
16. a	trees	fly	kite	go
17. her	enjoys	swear	success	she
18. by	sunny	money	effort	gain
19. sang	sweetly	robin	the	scratching

Appendix B (*continued)*

20.	attain	import	perfection	to	try

Appendix C

Sentence Unscrambling Task for No Prime Goal (Control Group)

For the next task, you will be provided with several word sets. Each word set contains five words. Your task is to make a grammatically correct sentence using **FOUR** of the five words in each set. In doing so:

a) You cannot change the tense of the verbs (e.g., "flew" to "fly"), and

b) The sentence must make sense without any punctuation except an end period.

An example:

flew eagle the water around (set of five words)

The eagle flew around. (correct **four**-word sentence)

1. was	Bob	visits	yesterday	married
2. spicy	wind	likes	he	food
3. the	push	wash	well	clothes
4. melts	water	when	butter	heated
5. somewhat	type	prepared	was	I
6. pet	soccer	the	gently	dog
7. maintain	river	to	composure	try

Appendix C (*continued)*

8. a	what	worse	smile	great
9. wood	eating	pie	she	likes
10. good	likes	I	deals	he
11. on	sleeping	turn	the	lamp
12. studies	she	history	we	ancient
13. sunshine	Joe	the	guitar	plays
14. an	aspirin	Suzie	clock	took
15. always	she	race	worried	was
16. a	trees	fly	kite	go
17. her	drives	swear	car	she
18. shoes	easy	replace	old	the
19. sang	sweetly	robin	the	scratching

Appendix C (*continued)*

20.	are	try	courteous	often	we

Appendix D

Brainstorming Task Used in Experiment 1

For the next task you will be asked to perform a creativity task. This task involves listing uses for a common object.

Do not give responses that are:

a. non-uses (e.g., "burn it")

b. repetitive (e.g., "to eat at a table" and "to eat at it frequently")

c. Duplicate responses (e.g., "to cut bread," "to cut paper," etc.)

You can use parts of the object. The object for this task will be listed on the next page.

Your goal is to [list 12 uses for the object, do your best].

You will have 2 minutes.

O I understand my goal is to list 12 uses for the object

Object: WIRE COAT HANGER

Use 1 ____

Use 2 ____

Use 3 ____

Use 4 ____

Use 5 ____

Use 6 ____

Use 7 ____

Use 8 ____

Use 9 ____

Use 10 ____

Use 11____

Appendix D (*continued)*

Use 12 ____

Use 13 ____

Use 14 ____

Use 15 ____

Use 16 ____

Use 17 ____

Use 18 ____

Use 19 ____

Use 20++ ____

Appendix E

Awareness Questionnaire Used in All Three Experiments

Please answer the following questions in the space provided.

"Not sure" or "Don't know" are acceptable answers.

1. What do you think the purpose of this experiment was?

____

2. What do you think this experiment was trying to study?

____

3. Did you think that any of the tasks you did were related in any way? If yes, in what way were they related?

____

4. Did anything you did on one task affect what you did on any other task? If yes, how exactly did it affect you?

____

5. When you were completing the scrambled sentence test, did you notice anything unusual about the words?

____

6. Did you notice any particular pattern or theme to the words that were included in the scrambled sentence test? If yes, what was it?

____

Appendix F

Sentence Unscrambling Task to Prime an Incongruent (Speed) Subconscious Goal

For the next task, you will be provided with several word sets. Each word set contains five words. Your task is to make a grammatically correct sentence using **FOUR** of the five words in each set. In doing so:

a) You cannot change the tense of the verbs (e.g., "flew" to "fly"), and

b) The sentence must make sense without any punctuation except an end period.

An example:

flew eagle the water around (set of five words)

The eagle flew around. (correct **four**-word sentence)

1.	was	Bob	visits	yesterday	married
2.	swim	mirror	can	fast	I
3.	bunnies	speedy	carpet	get	away
4.	melts	water	when	butter	heated
5.	quick	make	a	butterfly	turn
6.	pet	soccer	the	gently	dog
7.	were	Tom	numerous	stars	visible

Appendix F (*continued*)

8. prefer	ski	our	quantity	customers
9. wood	eating	pie	she	likes
10. spread	notebook	the	fire	rapidly
11. on s	leeping	turn	the	lamp
12. hurry	you	to	have	spicy
13. the	swift	gotten	was	cowboy
14. an	aspirin	Suzie	clock	took
15. Carmen	began	hastily	tower	dressing
16. a	trees	fly	kite	go
17. brisk	a	swear	jog	take
18. answered	she	shoelace	always	promptly
19. sang	sweetly	robin	the	scratching

Appendix F *(continued)*

20.	horse	like	racing	run	I

Appendix G

Sentence Unscrambling Task to Prime a Congruent (Accuracy) Subconscious Goal

For the next task, you will be provided with several word sets. Each word set contains five words. Your task is to make a grammatically correct sentence using **FOUR** of the five words in each set. In doing so:

a) You cannot change the tense of the verbs (e.g., "flew" to "fly"), and

b) The sentence must make sense without any punctuation except an end period.

An example:

flew eagle the water around (set of five words)

The eagle flew around. (correct **four**-word sentence)

1. was Bob visits yesterday married

___

2. was mirror always right she

___

3. around quality the improved we

___

4. melts water when butter heated

___

5. precise required are butter measurements

___

6. pet soccer the gently dog

___

7. must car we be careful

___

Appendix G (*continued*)

8. involved	I	planning	meticulous	it
9. wood	eating	pie	she	likes
10. correct	crown	be	you	may
11. on	sleeping	turn	the	lamp
12. he	thorough	is	try	very
13. draw	circle	perfect	a	sunshine
14. an	aspirin	Suzie	clock	took
15. me	the	details	give	spicy
16. a	trees	fly	kite	go
17. is	exam	we	error-free	this
18. the	bubbly	exact	thing	same
19. sang	sweetly	robin	the	scratching

Appendix G *(continued)*

20.	clock	boiling	my	accurate	is

Appendix H

Job Interview Task (Medium Complexity – Experiment 2)

Your supervisor recently interviewed seven job applicants for an open position on your team - Sara, Tom, Victoria, Will, Xenia, Yuri, and Zara - each on a different one of seven consecutive days. Each applicant was interviewed exactly once. Any applicant that was hired was given the job offer during the interview.

Due to a reshuffling of office personnel, the schedule of interviews and job offers has gone missing, and your supervisor has asked you to re-create it. After speaking with several colleagues, you have deduced the following facts:

- Sara was interviewed on the last day and was not given an offer
- Will was interviewed one day before Sara
- Zara was interviewed immediately after Yuri
- Zara was the second applicant to be offered a job
- Xenia and Victoria were interviewed two and three days after Zara, respectively.
- Out of Xenia and Victoria, only one received an offer and it was Victoria
- Tom was interviewed on Day 3 and was given an offer
- Exactly two applicants were given offers after Tom was interviewed

Using this information, please answer the following questions.

1. Who was interviewed on Day 1?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

Appendix H (*continued)*

f) Yuri

g) Zara

2. Who was interviewed on Day 2?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

3. Who was interviewed on Day 3?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

4. Who was interviewed on Day 4?

a) Sara

b) Tom

c) Victoria

d) Will

Appendix H (*continued)*

e) Xenia

f) Yuri

g) Zara

5. Who was interviewed on Day 5?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

6. Who was interviewed on Day 6?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

7. Who was interviewed on Day 7?

a) Sara

b) Tom

c) Victoria

Appendix H (*continued)*

d) Will

e) Xenia

f) Yuri

g) Zara

8. Did the candidate interviewed on Day 1 receive a job offer?

a) Yes

b) No

9. Did the candidate interviewed on Day 2 receive a job offer?

a) Yes

b) No

10. Did the candidate interviewed on Day 3 receive a job offer?

a) Yes

b) No

11. Did the candidate interviewed on Day 4 receive a job offer?

a) Yes

b) No

12. Did the candidate interviewed on Day 5 receive a job offer?

a) Yes

b) No

13. Did the candidate interviewed on Day 6 receive a job offer?

a) Yes

b) No

14. Did the candidate interviewed on Day 7 receive a job offer?

Appendix H (*continued)*

a) Yes

b) No

Appendix I

Job Interview Task (High Complexity – Experiment 3)

Your supervisor recently interviewed seven job applicants for an open position on your team - Sara, Tom, Victoria, Will, Xenia, Yuri, and Zara - each on a different one of seven consecutive days. Each applicant was interviewed exactly once. Any applicant that was hired was given the job offer during the interview.

Due to a reshuffling of office personnel, the schedule of interviews and job offers has gone missing, and your supervisor has asked you to recreate it. After speaking with several colleagues, you have deduced the following facts:

- Tom was interviewed on day three
- The person interviewed on day four was not offered a job
- Sara was interviewed after Will was interviewed
- Both Xenia and Victoria were interviewed after Zara was interviewed
- No applicants were given offers after Will was interviewed
- Exactly two applicants were given offers after Tom was interviewed
- Zara was the second applicant to be offered a job
- Xenia was not offered a job, but Tom was offered a job

Using this information, please answer the following questions.

1. Who was interviewed on Day 1?

    a) Sara

    b) Tom

    c) Victoria

    d) Will

    e) Xenia

Appendix I (*continued)*

f) Yuri

g) Zara

2. Who was interviewed on Day 2?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

3. Who was interviewed on Day 3?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

4. Who was interviewed on Day 4?

a) Sara

b) Tom

c) Victoria

d) Will

Appendix I (*continued)*

e) Xenia

f) Yuri

g) Zara

5. Who was interviewed on Day 5?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

6. Who was interviewed on Day 6?

a) Sara

b) Tom

c) Victoria

d) Will

e) Xenia

f) Yuri

g) Zara

7. Who was interviewed on Day 7?

a) Sara

b) Tom

c) Victoria

Appendix I (*continued)*

d) Will

e) Xenia

f) Yuri

g) Zara

8. Did the candidate interviewed on Day 1 receive a job offer?

a) Yes

b) No

9. Did the candidate interviewed on Day 2 receive a job offer?

a) Yes

b) No

10. Did the candidate interviewed on Day 3 receive a job offer?

a) Yes

b) No

11. Did the candidate interviewed on Day 4 receive a job offer?

a) Yes

b) No

12. Did the candidate interviewed on Day 5 receive a job offer?

a) Yes

b) No

13. Did the candidate interviewed on Day 6 receive a job offer?

a) Yes

b) No

14. Did the candidate interviewed on Day 7 receive a job offer?

Appendix I (*continued)*

a) Yes

b) No