Primed Interference: The Cognitive and Behavioral Costs of an Incongruity Between Chronic and Primed Motivational Orientations

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Research has shown that temporarily primed motivational orientations have essentially the same effects on how people pursue their goals as their chronic orientations. This article shows that, despite the interchangeability of temporary and chronic motivations, primed motivational orientations that are incongruent with chronic orientations create interference, requiring the deployment of cognitive resources and thus undermining performance on subsequent tasks that rely on these resources. Across 6 studies, we primed motivational orientations that were either congruent or incongruent with participants' chronic orientations and then assessed their performance on subsequent tasks that required cognitive resources. Consistent with the primed interference hypothesis, we found that incongruity between temporary and chronic motivational orientations undermined participants' (a) inhibition of incorrect but highly accessible responses, (b) mental arithmetic, (c) analytical reasoning, and (d) resistance to temptation. These results—which were observed following the activation of motivations for promotion or prevention (Studies 1–2 and 5–6), high or low need for belonging (Study 3), and high or low power orientations (Study 4)—illustrate the broad implications of holding incongruent chronic and primed orientations.

Keywords: priming, goal pursuit, accessibility, depletion

Variations in the basic motivational orientations that guide people's behaviors have traditionally been viewed as stable dispositions that affect people's chronic approaches to goal pursuit (Emmons, 1989; Murray, 1938; see also Winter, John, Stewart, Klohnen, & Duncan, 1998). That is, some individuals may habitually possess stronger concerns with power, whereas others may possess stronger concerns with belonging and affiliation; and although some may chronically have stronger needs for growth, others may have stronger needs for security. More recent research has demonstrated that people's motivational orientations can also be temporarily activated by cues in the environment or by the social context (Bargh, 1990; Bargh & Gollwitzer, 1994; Kruglanski, 1996). In line with these findings, contemporary theories often conceptualize motivational orientations as coordinated knowledge structures in memory that can vary in their level of activation and serve as a flexible source of goal-directed behaviors (Bargh, 1990; Carver & Scheier, 1998; Higgins, 1997; for a review, see Fishbach & Ferguson, 2007).

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One assumption that has implicitly (and at times explicitly) emerged from the conceptualization of motivational orientations as knowledge structures is that once activated, a particular motivational orientation operates in the same way regardless of how this activation occurred (Higgins, 1990). That is, whether people's concerns with security or power or some other orientations are chronically accessible or temporarily activated, the consequences of these motivational orientations are the same. Indeed, many studies have demonstrated that the temporary activations of a variety of different motivational orientations have equivalent effects on people's cognitions, emotions, and behaviors as chronic individual differences in these orientations (e.g., Anderson & Berdahl, 2002; Anderson & Galinsky, 2006; Förster, Higgins, & Bianco, 2003; Gardner, Gabriel, & Lee, 1999; Higgins, Shah, & Friedman, 1997; Lee, Aaker, & Gardner, 2000; van Baaren, Maddux, Chartrand, de Bouter, & van Knippenberg, 2003).

Although chronic and temporary activations of motivational orientations often have the same influence on the goals that people adopt and the manner in which they pursue these goals, we propose that these sources of activation may not be entirely interchangeable. Frequent activations of chronic motivational orientations should create habitual mental representations and behavioral repertoires that come to function as spontaneous, default reactions across different circumstances. Therefore, the temporary activations of orientations that are incongruent with an individual's chronic orientations may create interference. That is, analogous to performing everyday tasks with one's nondominant hand, the activations of motivational orientations that are incongruent with

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one's chronic motivations may require more executive functioning and effortful monitoring, and in turn tax one's cognitive resources. Thus, although past research has repeatedly demonstrated the equivalence of chronic and temporarily activated motivational orientations in terms of their effects on the goals people pursue and the types of behaviors they enact, the effects of temporarily activating a motivational orientation for continuing goal pursuit may depend on whether this activated orientation is congruent or incongruent with people's chronic orientations. This, in turn, has important implications for the study of temporarily primed motivational orientations as well as for designing interventions to strengthen people's desirable behaviors.

The primary objective of the present research is to investigate how the incongruity between people's chronic and temporarily activated motivational orientations may affect their cognitive resources. In the next sections, we first discuss the current conceptualization of motivational orientations as knowledge structures in memory that may be chronically or temporarily accessible, and we review previous research that has compared the effects of chronic and temporary sources of accessibility. We then elaborate on the potential consequences of our primed interference hypothesis for cognitive disruption and outline specific predictions based on this hypothesis. Finally, we present the result of six studies that provide evidence in support of this hypothesis and discuss the implications of our findings.

Motivational Orientations as Knowledge Structures in Memory

Contemporary conceptualizations of people's motivational orientations typically characterize these orientations as organized constellations of knowledge in memory (Bargh, 1990; Carver & Scheier, 1998; Kruglanski et al., 2002). These knowledge structures may include the primary outcomes that are desired; the strategies for achieving these outcomes; and the expectancies, thoughts, and feelings that typically accompany the implementation of these strategies. For example, the knowledge structure that represents the motivational orientation for academic achievement may include the desired standards that define success and failure, the different study strategies one could implement, and the expectations of—as well as the anticipated pleasure or pain from—different possible outcomes (see Fishbach & Ferguson, 2007).

One of the foundations of a knowledge-structure conceptualization of motivational orientations is that these knowledge structures can fluctuate in their potential for activation in memory (i.e., their *accessibility*; see Higgins, 1996). Motivational orientations that are highly accessible are more likely to be activated and, thus, more likely to guide people's thoughts and behaviors. As with any knowledge structure in memory, the accessibility of these motivational orientations is a function of both the frequency as well as the recency of activation (Higgins, Bargh, & Lombardi, 1985; Wyer & Srull, 1986). Frequent activations of the knowledge structure associated with a specific motivational orientation across many instances or over an extended period of time can result in an increase in the chronic accessibility of that orientation, making that particular motivation more readily activated. At the same time, recent exposures to information or incentives relevant to the knowledge structure associated with an alternative motivational orientation could temporarily increase the accessibility of (i.e., *prime*) this nonchronic orientation and make it more likely to be activated instead (e.g., Bargh & Gollwitzer, 1994; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Shah & Kruglanski, 2003).

To illustrate, in one study demonstrating the influence of temporarily primed motivations on behavior, Bargh et al. (2001) first asked a group of participants to work on word-search puzzles that contained words conceptually related to an achievement orientation, such as "achieve," "master," and "succeed" and then had them complete a new series of word-search puzzles. Participants who were subtly exposed to achievement-related words, which presumably primed a broader achievement orientation, outperformed participants who were not exposed to achievement-related words on the second series of puzzles. In another study, Lakin and Chartrand (2003) subliminally exposed participants to words related to affiliation such as "affiliate," "friend," and "partner" and then presented them with a video portraying a person performing mundane clerical tasks. Participants who had been subliminally exposed to affiliation-related words spent more time mimicking the person in the video than those who had not been subliminally exposed to such words. Similar priming effects were observed in other studies that made accessible a power or achievement orientation by exposing participants to material objects (e.g., Chen, Lee-Chai, & Bargh, 2001) or names of significant others (e.g., Fitzsimons & Bargh, 2003; Shah, 2003; for a review, see Shah, 2005).

The conceptualization of motivational orientations as knowledge structures implies that, once activated, these motivational orientations operate in the same manner regardless of the nature of their activation (conscious or nonconscious) and the source of their accessibility (chronic or temporary; cf. Bargh & Gollwitzer, 1994; for a review, see Bargh, Gollwitzer, & Oettingen, 2010). Supporting this perspective, Chartrand and Bargh (1996) showed that priming impression-formation goals outside of people's awareness has the same effects on information processing as asking people to consciously form the same types of impressions (see also Mc Culloch, Ferguson, Kawada, & Bargh, 2008). Other studies examining the effects of temporary sources of accessibility have shown that temporarily activated cooperation goals (e.g., Bargh et al., 2001) have the same consequences for behavior as cooperation goals that are chronically accessible (e.g., Kramer, McClintock, & Messick, 1986).

Importantly, the equivalence of chronic and temporary sources of accessibility applies not only to specific, concrete goals, such as forming an impression or cooperating at a task, but also to broader motivational orientations, such as a general concern with security or with power. In particular, multiple studies by Higgins and colleagues have shown that temporarily primed growth-focused or security-focused motivational orientations have the same effects on people's sensitivities, strategies, and emotions during goal pursuit as individuals' general priorities for growth or security that are chronically accessible (e.g., Förster et al., 2003; Higgins et al., 1997; also see Molden, Lee, & Higgins, 2008). Similarly, Anderson, Galinsky, and colleagues have found that temporarily primed power orientations have similar effects on how individuals perceive the world, what they pay attention to, and how they behave as do chronic individual differences in power orientations (e.g., Anderson & Berdahl, 2002; Anderson & Galinsky, 2006; Galinsky, Magee, Inesi, & Gruenfeld, 2006). Taken together, all these

studies provide support for the proposition that the source of activation for a particular motivational orientation—whether it is conscious or nonconscious, and whether it is chronically accessible or temporarily primed—does not alter the primary effects of this orientation.

The Primed Interference Hypothesis

Although a wealth of research suggests that chronic and temporarily activated motivational orientations have equivalent effects on people's goal-directed behaviors, we believe that these two different sources of activation may not be completely equivalent in the effort and attention that they demand during the actual executions of these behaviors. More specifically, we propose that temporarily activating a motivational orientation that is incongruent with people's chronically accessible orientation interferes with their habitual tendencies and results in a substantial deployment of cognitive resources, rendering these limited resources less available for other important activities, such as engaging in analytical reasoning or exerting self-control.

There are several reasons why temporarily priming a motivational orientation that is incongruent with one's chronic orientation might lead to interference and consume more cognitive resources than priming a congruent orientation. First, the frequent pursuits of the goals and strategies associated with a particular chronic motivational orientation may over time increase the automaticity of this pursuit (Bargh, 1990). Indeed, the goal-priming literature suggests that automatic associations can develop between a goal and the actions that are frequently activated and executed in pursuit of the goal (e.g., Aarts & Dijksterhuis, 2000) and that these automatic associations in turn facilitate goal pursuit (Fishbach, Friedman, & Kruglanski, 2003; Shah & Kruglanski, 2003). Chronically accessible motivational orientations are by definition orientations that are frequently activated and enacted (cf. Bargh, 1982; Bargh & Thein, 1985; Higgins, 1996). Thus, priming a motivational orientation that is congruent with what is already chronically accessible would result in an automatic and effortless execution of the relevant goal, whereas priming an incongruent orientation would engage less automatized processes of goal execution and thus should require more resources.

Another reason why temporarily priming a motivational orientation that is incongruent with one's chronic orientation might create interference and consume more cognitive resources is that such priming initiates a shift from one's habitual mindset to an alternate mindset. Research on cognitive sets suggests that the process of reconfiguring one's cognitive set is effortful (Jersild, 1927; Rogers & Monsell, 1995), presumably because the act of taking on a different cognitive set involves attentional processes. Further, adopting a different cognitive set may require inhibiting the originally active cognitive set (Brown & McConnell, 2009), rendering the shift even more depleting (e.g., Wegner, Schneider, Carter, & White, 1987). Indeed, recent studies that directly investigate the consequences of shifting between cognitive sets confirm that such shifts deplete self-regulatory resources (Hamilton, Vohs, Sellier, & Meyvis, 2011). Thus, to the extent that a chronically accessible motivational orientation is associated with a habitual, default cognitive set for goal pursuit, priming an incongruent motivational orientation would involve paying attention to and adopting a different cognitive set while inhibiting the habitual cognitive set and, hence, should consume more cognitive resources compared to priming a congruent orientation.

Finally, temporarily priming a motivational orientation that is incongruent with one's chronic orientation could lead to psychological tension between the recently activated and the chronically accessible orientations. Because such tension is uncomfortable, people may deploy cognitive resources to reduce such tension or the associated discomfort. Consistent with this proposition, research examining the interplay between people's implicit and explicit motives (for a review, see McClelland, Koestner, & Weinberger, 1989) shows that a discrepancy between these motives taxes cognitive resources that are necessary for the pursuit of important life-goals (Kehr, 2004) and is associated with negative well-being (Baumann, Kaschel, & Kuhl, 2005). Further, work by Rydell, McConnell, and Mackie (2008) shows that a discrepancy between implicit and explicit attitudes elicits psychological tension or dissonance, which in turn prompts individuals to engage in greater elaboration of discrepancy-related information (see also Briñol, Petty, & Wheeler, 2006). These results suggest that when people experience a discrepancy, attention and efforts are deployed to reduce the discrepancy. Thus, it seems plausible that priming an orientation that is incongruent with one's chronically accessible orientation may create a state of psychological tension that consumes cognitive resources.

Regardless of which of these mechanisms might be at work, much research shows that the amount of cognitive resources required to execute a behavior has important implications for people's subsequent behaviors (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Beilock, Rydell, & McConnell, 2007; Muraven, Tice, & Baumeister, 1998). In fact, consistent with the proposition that people have a limited pool of cognitive resources, many studies have shown that when people engage in an initial task that requires substantial cognitive or self-regulatory resources such as interacting with members of stigmatized outgroups (Richeson & Shelton, 2003), presenting oneself in novel and unfamiliar ways (Vohs, Baumeister, & Ciarroco, 2005), or altering one's emotional responses (Muraven et al., 1998), they perform less well on subsequent tasks that demand similar resources (Hagger, Wood, Stiff, & Chatzisarantis, 2010). Based on these findings, we propose that priming a motivational orientation that is incongruent with one's chronic orientation will deplete cognitive resources and in turn interfere with performance on subsequent tasks that rely on these resources.

Suggestive evidence consistent with this primed interference hypothesis has been documented in the status literature (Josephs, Sellers, Newman, & Mehta, 2006; see also Josephs, Newman, Brown, & Beer, 2003, Study 1). In particular, people's performance on cognitively demanding tasks has been shown to be affected by both their temporarily activated dominant status and their baseline level of testosterone, which has been found to correlate with chronic measures of dominance (V. J. Grant & France, 2001; Udry & Talbert, 1988). Consistent with our hypothesis, an incongruity between testosterone level and temporarily primed status (i.e., high testosterone and submissive status, or low testosterone and dominant status) was found to undermine performance compared to a congruity in testosterone level and status prime (i.e., high testosterone and dominant status, or low testosterone and submissive status). Although Josephs et al. (2003, 2006) have suggested that this effect may be unique to the dynam-

ics of people's status concerns, our research explores whether such interference arising from the incongruity between chronic and temporarily primed status orientations may reflect a broader principle that extends to other motivational orientations, with implications on a variety of phenomena including analytical reasoning and self-control.

At first glance, the primed interference hypothesis may appear related to research on *regulatory fit* (Higgins, 2000; see also Cesario, Higgins, & Scholer, 2008), we propose that there are important distinctions between the two. Research on regulatory fit has shown that when people pursue goals using means that "fit" with (vs. do not fit with) their current motivational orientations, they place greater value on these goals and are more engaged while pursuing them (Cesario et al., 2008; Higgins, 2000, 2006). Moreover, several studies have shown that experiences of regulatory fit enhance cognitive performance and self-control, whereas experiences of regulatory nonfit undermine performance and self-control (Hong & Lee, 2008; see also Shah, Higgins, & Friedman, 1998).

Although it may seem that the primed interference effect described above may invoke a similar experience as regulatory nonfit, they are conceptually and empirically distinguishable constructs. Higgins and colleagues specifically distinguish regulatory fit or nonfit from other types of motivational matches or mismatches (Avnet & Higgins, 2006; Cesario et al., 2008; Higgins, 2002). In particular, regulatory fit theory (Higgins, 2000) posits that regulatory fit or nonfit occurs when there is a match or mismatch between one's current motivational orientation and one's particular *strategies* or *means* of goal pursuit. More specifically, whereas a match between one's motivational orientation and strategies sustains this orientation and leads to the experience of regulatory fit, a mismatch between one's motivational orientation and strategies disrupts the orientation and produces the experience of regulatory nonfit. In contrast, we propose that primed interference occurs when there is a mismatch between two accessible motivational orientations, one of which is chronically active and the other is temporarily primed, and that this mismatch necessitates the deployment of additional cognitive resources for the adoption and execution of the primed motivational orientation. Further, the regulatory fit literature suggests that whereas regulatory fit enhances performance and self-control, regulatory nonfit undermines them. However, our prediction is that whereas activating orientations that are incongruent with people's chronic orientations will undermine performance and self-control, activating orientations that are congruent with chronic orientations should not improve performance and self-control. Although activating a chronically accessible orientation is easier and less effortful than activating a less accessible orientation, there are no a priori reasons to expect that this ease of activating a chronic orientation may lead to enhanced performance or better self-control.

The present research investigates the primed interference hypothesis in six studies. Across all six studies, we first measured participants' chronic motivational orientation, and then we primed them with a motivational orientation that was either congruent or incongruent with their chronic orientation. Finally, we administered a task that required cognitive resources and measured participants' task performance. Across the studies, we examined the effects of primed interference by measuring and manipulating three different types of motivational orientations—regulatory focus (Higgins, 1997), belonging (Baumeister & Leary, 1995), and power (Magee & Galinsky, 2008)—and observing their effects on a variety of tasks that required cognitive resources. In particular, we used the Stroop (1935) task (Studies 1 and 4) and a lexical decision task (Study 2) that required the inhibition of incorrect but highly accessible responses; a mental arithmetic task (Study 3) that required focused attention; a problem-solving task from the Graduate Record Exam (GRE; Study 5) that required analytical reasoning; and a choice between a tempting, but unhealthy, snack versus a healthier alternative that required self-control (Study 6). According to the primed interference hypothesis, we predicted that when participants were temporarily primed with a motivational orientation that was incongruent with their chronically accessible orientation, they would demonstrate impairment in their cognitive and executive functioning and hence be less able to (a) inhibit highly accessible competing responses, (b) engage in mental arithmetic, (c) perform analytical reasoning, and (d) resist temptation.

Study 1

In Study 1, we conducted an initial test of our primed interference hypothesis by observing the effect of the incongruity between participants' chronic and primed regulatory focus. Regulatory focus theory (Higgins, 1997) distinguishes between motivational orientations that involve a focus on growth and advancement (i.e., promotion) versus a focus on safety and security (i.e., prevention). Much research has demonstrated that although individuals may differ in their chronic predominant focus on promotion or prevention, either focus can also be temporarily primed (e.g., Förster et al., 2003; Higgins, Roney, Crowe, & Hymes, 1994; Higgins et al., 1997; Lee, Keller, & Sternthal, 2010; Molden & Higgins, 2008). Research has also shown that people with a promotion focus—whether arising from chronic or temporary sources of activation—represent, experience, and pursue their goals in a different manner than those with a prevention focus (for a review, see Molden et al., 2008). Promotion-focused individuals strive toward attaining their ideals, hopes, and aspirations and prefer eager goal pursuit strategies that seek opportunities for advancement, even at the risk of committing mistakes. In contrast, prevention-focused individuals strive toward fulfilling their responsibilities, duties, and obligations and prefer vigilant strategies that guard against making mistakes, even at the risk of missing opportunities. Thus, for someone who is chronically promotion-focused, temporarily adopting a prevention focus would involve identifying and pursuing goals that are generally incompatible with their habitual practices, and the same would be true for someone who is chronically prevention-focused but adopts a promotion focus. For the reasons discussed above, we predicted that this incongruity should lead to interference, depleting cognitive resources.[1]

[1] It is important to note that growth and security are distinct and independent motivations and that people can, at an absolute level, be chronically high or low in both motivations (see Higgins, 1997). However, most individuals do have a *predominant* promotion or prevention focus that determines their tendency to adopt either eager or vigilant goal pursuit strategies. Because these strategies are fundamentally incompatible with each other (i.e., one cannot simultaneously pursue all possible opportunities and attempt to avoid all possible mistakes), priming a focus that is incompatible with people's predominant focus still creates an incongruity regardless of their absolute levels of growth and security concerns.

In the present study, we began by measuring participants' chronic prevention and promotion orientations using the well-validated Regulatory Focus Questionnaire (RFQ; Higgins et al., 2001; see also Cesario, Grant, & Higgins, 2004; Cesario & Higgins, 2008; H. Grant & Higgins, 2003). After completing the RFQ, participants were randomly assigned to work on an essay-writing exercise designed to temporarily prime either a promotion or a prevention orientation. Finally, they were administered the Stroop task, which is commonly used to gauge inhibitory processes related to executive function. In this task, participants had to indicate the color in which a series of color words were written. On some trials, the color and semantic meaning of the word were matched (e.g., the word "blue" presented in blue), and on other trials the color and semantic meaning were mismatched (e.g., the word "blue" presented in yellow). On mismatched trials, participants must inhibit their natural impulse to read the word and focus their attention on naming the color, which requires executive control (Inzlicht, McKay, & Aronson, 2006; Richeson & Shelton, 2003; Vohs et al., 2005). The less able people are to inhibit their natural impulse, the slower their response times (RTs) will be to mismatched (vs. matched) trials, and the stronger the Stroop effect is (Kane & Engle, 2003). Based on our primed interference hypothesis, we predicted that participants primed with a motivational orientation incongruent with their chronic orientation would use up more cognitive resources than those primed with a chronically congruent motivational orientation and hence have fewer cognitive resources available to inhibit their impulsive responses, leading to a greater Stroop effect.

Method

Participants. Forty-one undergraduate students (21 men, median age = 21 years, range = 19–22) received course credit for participating in the study. Participants were run in small groups of four to eight individuals.

Procedure. Upon arrival in the lab, participants were individually seated in front of a computer and told they would participate in a series of unrelated studies conducted by different researchers. First, they were asked to complete a battery of individual difference measures, which included the RFQ (Higgins et al., 2001), an 11-item questionnaire that contained a promotion subscale (e.g., "I feel like I have made progress toward being successful in my life") and a prevention subscale (e.g., "Not being careful enough has gotten me into trouble at times"; reverse scored). Participants rated how often each of the items was true of them on a 7-point scale ranging from 1 (*never or seldom*) to 7 (*very often*).

After completing the individual difference measures, participants completed a series of unrelated filler tasks for approximately 45 min. Then, they were asked to work on an essay-writing study, supposedly designed to learn more about college students, which contained the regulatory focus manipulation. Participants randomly assigned to the promotion prime condition were asked to consider their hopes and aspirations and to compose a short essay about what they would ideally like to achieve in their life, whereas those randomly assigned to the prevention prime condition were asked to consider their duties and obligations and to write about what responsibilities they ought to fulfill in their life. Identical manipulations have been used to successfully prime motivations for promotion or prevention in past research (e.g., Higgins et al., 1994; Hong & Lee, 2008; Liberman, Molden, Idson, & Higgins, 2001; Molden & Higgins, 2008).

Finally, ostensibly as a different study, participants were administered a version of the Stroop task. They were told that as part of a study of visual perception they would see a series of words in different font colors appearing in the center of the screen one at a time. They were also told that their task was to identify the font color of the word as quickly and accurately as possible and to ignore the semantic meaning of the word. On mismatched trials, a color word appeared in the center of the screen in a font color that mismatched its semantic meaning (e.g., "green" presented in yellow font color). At the bottom of the screen, participants were presented with two response labels representing the conflicting alternatives: the font color of the word ("yellow"; the correct answer) and the semantic meaning of the word ("green"; the incorrect answer). On matched trials, the color word that appeared in the center of the screen was in a font color that matched its semantic meaning, (e.g., "yellow" presented in yellow font color), and the two response labels presented below were the font color of the word ("yellow"; the correct answer), which was also the color described by the word, and a different color randomly selected from the set of colors used in this task (e.g., "blue"; the incorrect answer).

Participants responded by pressing the correct button displayed on the screen with a mouse. The position of the correct response was randomized across trials. The color word remained on the screen until participants clicked on one of the two responses. Participants were randomly presented with nine different color words (blue, brown, green, gray, orange, pink, purple, red, and yellow) printed in one of the nine colors over 100 trials, and RT to indicate the color of the words was recorded. After eight practice trials, of which half were mismatched and the remaining half were matched, participants were presented with 92 experimental trials, of which 88 were mismatched and four were matched trials.[2]

Results and Discussion

Following procedures established in previous research for the coding of participants' chronic motivational orientation (see Cesario et al., 2004; Cesario & Higgins, 2008; Molden & Higgins, 2008), we first reverse-scored the appropriate items and then computed an index of predominant chronic motivational orientation ($M = 0.73$, $SD = 1.13$) by subtracting participants' average ratings on the prevention subscale ($M = 4.77$, $SD = 1.07$, $\alpha = .74$) from their average ratings on the promotion subscale ($M = 5.50$, $SD = 0.75$, $\alpha = .72$). Thus, positive scores on this index indicate a predominant chronic promotion orientation, whereas negative scores indicate a predominant chronic prevention orientation.

To reduce skew in the data, RTs on the Stroop task greater than 3 *SD*s from the mean (1.51% of trials) and those for incorrect

[2] According to Kane and Engle (2003), a Stroop task with a high proportion of incongruent trials taps into the processes involved in resolving response competition, whereas a task with a high proportion of congruent trials taps into the processes involved in maintaining the task goal of ignoring the meaning of the word active in memory. Studies have shown that participants assigned to a Stroop task with a high proportion of incongruent trials exhibit weaker Stroop effects than those assigned to a task with a low proportion of incongruent trials. Thus, by using a Stroop task with a high proportion of incongruent trials, we examined how primed interference affected the processes involved in resolving response competition rather than goal maintenance. Further, by using a cognitively less demanding version of the Stroop task, we provided a more conservative test for the hypothesized primed interference effect.

responses (1.41%) were eliminated; the remaining RTs were log-transformed (Ratcliff, 1993). For each participant, a Stroop-effect score was computed by subtracting each participant's average RT for matched trials from the average RT for mismatched trials (see Richeson & Shelton, 2003), with higher Stroop-effect scores indicating greater impairment of cognitive resources.

To test the primed interference hypothesis, Stroop-effect scores were entered into a hierarchical regression in which the main effects of prime (coded as 1 = promotion prime; 0 = prevention prime) and the continuous chronic motivational orientation index were simultaneously entered in a first step, followed by the Prime × Chronic Orientation interaction in a second step. As shown in Figure 1, results revealed the predicted Prime × Chronic Motivational Orientation interaction, $\beta = -.68$, $t(37) = -3.11$, $p < .01$. No other effect was significant ($-.10 < \beta s < .10$; $-1 < ts < 1$; $ps > .50$). Simple slope analyses (Aiken & West, 1991) showed that in the promotion prime condition, participants with relatively greater chronic prevention orientations exhibited larger Stroop effects, $\beta = -.57$, $t(37) = -2.5$, $p = .02$. In contrast, in the prevention prime condition, participants with relatively greater chronic promotion orientation displayed marginally larger Stroop effects, $\beta = .35$, $t(37) = 1.86$, $p = .07$.[3]

To gain further insight into whether these observed differences in cognitive impairment were due more to the hypothesized interference effects of incongruity between chronic and primed motivational orientations, or to a potential facilitating effects of congruity between chronic and primed motivational orientations, we computed within each prime condition a partial correlation between the promotion subscale and Stroop performance, controlling for the effect of the prevention subscale, and a partial correlation between the prevention subscale and Stroop performance, controlling for the effect of the promotion subscale. The results were consistent with our primed interference hypothesis such that in the prevention prime condition, participants' Stroop-effect scores were positively correlated with their chronic promotion scores ($r = .47$, $p = .04$) but not with their chronic prevention scores ($r = -.25$, $p = .30$). In the promotion prime condition, participants' Stroop-effect scores showed a positive correlation with their chronic prevention scores ($r = .44$, $p = .05$) and a marginal negative correlation with their chronic promotion scores ($r = -.42$, $p = .07$). These results clearly supported the primed interference hypothesis concerning the cognitive disruption people experience when their chronic and temporarily primed motivational orientations mismatch. There was also some indication of cognitive facilitation by a congruity between chronic and temporary motivational orientations, although this facilitation effect was not observed in subsequent studies.

The findings of Study 1 provide initial support for our hypothesis that priming a motivational orientation that is incongruent (vs. congruent) with one's chronically accessible orientation depletes cognitive resources and thus impairs performance on a subsequent task that requires inhibition of prepotent responses. These findings suggest that the equivalence of the effects of primed and chronic motivational orientations may depend on whether congruity or incongruity is experienced. Although our results showed the predicted depletion effect of an incongruent prime, an important question is whether the prime had the intended effect of shifting participants' regulatory focus. One might argue that primes that are depleting will fail to activate the intended motivational orientation. We propose that the difference between priming a chronically congruent versus incongruent orientation lies not in whether the primed orientation is activated but in the cognitive consequences of such activation. That is, people's attitudes and behaviors should reflect the activation of the primed motivational orientation independent of its congruity with the chronic orientation, but individuals primed with the incongruent orientation should be more depleted than those primed with the congruent orientation. We more explicitly tested both of these predictions in the next study.

Study 2

The objective of Study 2 was two-fold: first, to provide convergent support for the primed interference hypothesis by using a different task that measures inhibitory processing; and second, to assess the effectiveness of motivational primes that are incongruent with people's chronic orientations. We therefore had participants complete a lexical decision task in which they were asked to identify as quickly and accurately as possible whether a series of letter-strings represented English words.

To assess the effectiveness of the motivational primes in activating the intended motivational orientation, the lexical decision task included promotion-related words (e.g., *advance*) as well as prevention-related words (e.g., *guard*). Prior research has demonstrated that people are faster at responding to stimuli relevant to orientations or goals that are more accessible (Fishbach et al., 2003; Kruglanski et al., 2002; Shah & Kruglanski, 2003). Thus, we expected that participants primed with a promotion orientation would be faster at responding to promotion-related (vs. prevention-related) words, whereas the reverse would be true for participants primed with a prevention orientation. Furthermore, we expected these effects would hold regardless of participants' chronic motivational orientations.

To assess the extent to which motivational primes incongruent with participants' chronic orientations deplete cognitive resources, the lexical decision task also included a series of nonwords that differed from English words by only one letter. Previous research has demonstrated that when there is a partial overlap between the features of a stimulus (e.g., *scangal*) and those of a concept in memory (e.g., s*candal*), people spontaneously apply the knowledge of the concept in memory to perceive the stimulus (O'Connor & Forster, 1981; Taft & Forster, 1976). To quickly and correctly identify the letter-strings as nonwords, participants must therefore expend cognitive resources to inhibit the activated concepts that overlap with these letter-strings. We predicted that participants primed with a motivational orientation incongruent with their chronic orientation would have fewer resources available to perform such inhibition and thus be slower to identify the letter-strings as nonwords than those primed with a congruent motivational orientation.

Method

Participants. Sixty-five undergraduate students (36 men, median age = 21 years, range = 19–22) who were native English

[3] A similar regression analysis with error rate as a dependent variable did not reveal any significant effect ($-1 < t < 1$).

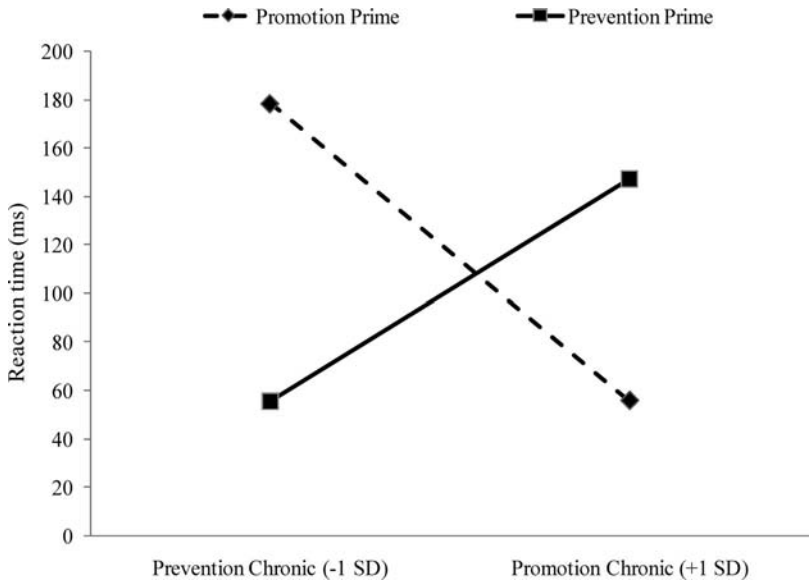

Figure 1. The Stroop effect as a function of participants' predominant chronic and temporarily primed orientations toward promotion or prevention (Study 1). Predicted values were calculated at 1 *SD* above and below the zero point of the predominant chronic motivational orientation index.

speakers participated in the study in exchange for course credit. They were run in small groups of four to eight individuals.

Procedure. Participants were seated in front of a computer and told they would be participating in a series of unrelated studies conducted by different researchers. Using similar procedures as in Study 1, participants began by completing the RFQ (Higgins et al., 2001) and were then randomly assigned to write one of the two essays intended to temporarily prime either a promotion or a prevention orientation.

Participants were then told that they would next take part in a study designed to measure perceptual sensitivity. They were informed that they would see a series of letter-strings, some of which were English words, and the rest were nonwords that resembled English words; their task was to press as quickly and accurately as possible the "Y" key on the keyboard if the letter-string was a word and the "N" key if it was a nonword. At the beginning of each trial, a "+" sign appeared at the center of the screen as a fixation point for 500 ms. Then a letter-string appeared and remained on the screen until participants pressed one of the two keys. RT was recorded for each trial. Participants first completed 10 practice trials; half of the trials contained neutral words unrelated to promotion or prevention orientations, and the remaining half contained nonwords. They were then randomly presented with 80 experimental trials consisting of 40 word trials and 40 nonword trials that were matched for length. Of the 40 word-trials, 10 were promotion-relevant, 10 were prevention-relevant, and the remaining 20 were motivationally neutral (e.g., *guitar*). None of the words used in the lexical decision task appeared in the instructions for the priming task.

Results and Discussion

As in Study 1, an index of predominant chronic motivational orientation ($M = 1.03$, $SD = 1.45$) was computed by subtracting participants' average ratings on the prevention subscale ($M = 4.25$, $SD = 1.35$, $\alpha = .82$) from their average ratings on the promotion subscale ($M = 5.28$, $SD = 0.77$, $\alpha = .72$). RTs on the lexical decision task greater than 3 *SD*s from the mean (1.36% of trials) and those for incorrect responses (3.66%) were eliminated, and the remaining RTs were log-transformed (Ratcliff, 1993).

To examine the effect of the priming manipulation on the accessibility of the primed orientations, separate hierarchical regression analyses were performed on participants' RT for the promotion- and prevention-relevant words. To assess participants' performance on the promotion-relevant words, we simultaneously entered the main effects of prime (coded as 1 = promotion prime; 0 = prevention prime), the chronic motivational orientation index, and RT for the prevention-relevant words (to control for baseline differences in RT to motivationally relevant words)[4] in a first step, followed by the Prime × Chronic Orientation interaction in a second step. Results revealed a main effect of prime, $\beta = -.17$, $t(60) = -2.00$, $p = .05$, such that promotion primed participants were faster than prevention primed participants to identify promotion-relevant words. Neither the main effect of chronic orientation nor the Prime × Chronic Orientation interaction was significant ($-.2 < \beta s < .2$; $-1.5 < ts < 1.5$; $ps > .1$). Parallel analyses for the prevention-relevant words revealed a similar main effect of prime, $\beta = .19$, $t(60) = 2.17$, $p = .03$, such that prevention primed participants were faster than promotion primed participants to identify prevention-relevant words. Again, no other effect was significant ($-.2 < \beta s < .2$; $-1.5 < ts < 1.5$; $ps > .1$). Parallel analyses for the motivationally neutral words showed no significant effect ($-.3 < \beta s < .3$; $-1 < ts < 1$; $ps > .3$). These results

[4] We controlled for baseline differences in RT to other motivationally relevant words to eliminate any possible confounds caused by the motivational content of the promotion- or prevention-relevant words compared to the nonmotivationally relevant neutral and nonwords.

confirmed that the priming manipulation was effective at selectively activating a promotion or prevention orientation independent of participants' predominant chronic orientation (cf. Higgins et al., 1985).

To examine how this temporary activation of motivational orientations influenced participants' cognitive resources as a function of their chronic orientation, a hierarchical regression analysis was performed on participants' RTs on the nonwords, the correct identification of which required the inhibition of some highly accessible albeit incorrect responses. Main effects of prime (coded as 1 = promotion prime; 0 = prevention prime), the chronic orientation index, and RTs for motivationally neutral words (to control for baseline difference in RT)[5] were simultaneously entered in a first step, followed by the Prime × Chronic Orientation interaction in a second step. As shown in Figure 2, the results revealed a main effect of prime, $\beta = .20$, $t(60) = 2.31$, $p = .02$, and a significant Prime × Chronic Orientation interaction, $\beta = -.32$, $t(60) = -2.37$, $p = .02$. Simple slope analyses (see Aiken & West, 1991) showed that in the promotion prime condition, participants with relatively greater chronic prevention orientations exhibited greater cognitive impairment and were slower to correctly identify nonwords, $\beta = -.21$, $t(60) = -2.34$, $p = .02$. In contrast, in the prevention prime condition, those with relatively greater chronic promotion orientations showed greater cognitive impairment and took longer to correctly identify nonwords, although this effect was not statistically significant, $\beta = .15$, $t(60) = 1.23$, $p = .22$.[6] As in Study 1, to examine whether the observed differences were due to the hypothesized interference from motivational incongruity or to facilitation from motivational congruity, we computed within each prime condition a partial correlation between participants' promotion subscale ratings and RTs on the nonwords, controlling for their prevention ratings, and a partial correlation between participants' prevention subscale ratings and RTs on the nonwords, controlling for their promotion ratings. Replicating our Study 1 findings and consistent with the primed interference hypothesis, we found that prevention primed participants' RTs for nonwords were positively correlated with their chronic promotion scores ($r = .34$, $p = .05$) but were not correlated with their chronic prevention scores ($r = -.13$, $p = .46$). Further, promotion primed participants' RTs for nonwords were marginally positively correlated with their chronic prevention scores ($r = .34$, $p = .08$) but were not significantly correlated with their chronic promotion scores ($r = -.27$, $p = .17$). Thus, these results provided convergent evidence in support of our hypothesis that incongruity between chronic and temporary motivational orientations depletes cognitive resources. Unlike Study 1, there was no evidence that congruity between chronic and temporary motivational orientations enhances inhibitory processing.

In summary, consistent with existing work on priming (Bargh, Lombardi, & Higgins, 1988; see also Higgins et al., 1985), our results showed that the motivational orientation that was made accessible through priming influenced participants' responses to motivationally relevant words, independent of their chronically accessible motivational orientation. However, despite this general facilitative effect, when the primed orientation was incongruent with participants' chronic motivation, people were less able to inhibit highly accessible responses and hence were slower in correctly identifying the nonwords.

Across two studies, we found convergent support for our primed interference hypothesis that although priming a motivational orientation that is incongruent with one's chronic orientation may temporarily shift one's current orientation, it has cognitive costs for the individual. However, all of the evidence thus far has come from the incongruity between participants' chronic and temporarily primed regulatory focus. Thus, an important question remains concerning whether the primed interference effects demonstrated in these two studies extend to other motivational orientations besides regulatory focus. Study 3 was designed to address this concern.

Study 3

Study 3 was designed to further test the primed interference hypothesis by measuring and manipulating people's desires for belonging and social connection. People engage in social interactions on a daily basis, and although everyone is motivated to form and maintain relationships with close others and social groups to which they feel connected (Baumeister & Leary, 1995; Brewer, 1991), important variations in people's desires for belonging have also been documented (Leary, Kelly, Cottrell, & Schreindorfer, 2001). Individuals with high desires for belonging tend to have a stronger "appetite" for lasting, positive, and significant interpersonal relationships, whereas individuals with low desires for belonging have a weaker appetite for such relationships. Furthermore, research has shown that beyond their chronic social appetite, people's desires for belonging may change in response to different social circumstances (e.g., Lakin & Chartrand, 2003). Thus, similar to motivations for promotion or prevention, current circumstances may activate a relatively high or low desire to belong that is congruent or incongruent with people's chronic desires to belong.

To further examine the robustness of the primed interference effect, we used a mental arithmetic task to measure cognitive resource depletion (DeStefano & LeFevre, 2004; Vohs et al., 2008). This task was also chosen to provide a more convincing separation between the hypothesized primed interference effects and regulatory nonfit effects. One might argue that participants in Studies 1 and 2 had adopted promotion- or prevention-focused strategies following the prime when performing the Stroop task or the lexical decision task and hence experienced regulatory fit or nonfit depending on their chronic orientation. However, any strategies used to pursue high or low needs for belonging would not be relevant for a mental arithmetic task, and hence any effects observed could not be attributable to a regulatory fit or nonfit.

Finally, to garner more confidence that the results obtained in the earlier studies were due to an incongruity-based interference effect and not to a congruity-based facilitative effect, we added a no-prime control condition in Study 3.

Method

Participants. One hundred seventy-five native English speakers (36 men, median age = 41 years, range = 18–69) from

[5] We controlled for baseline differences in RT to motivationally neutral words because nonwords were designed to resemble motivationally neutral words. We obtain the same pattern of results regardless of whether we use the mean RT of all words or the mean RT of only motivationally neutral words as a covariate.

[6] An analysis of error rates instead of RTs did not reveal any significant effects ($-.40 < \beta s < 0$; $-1.3 < t < 1$; $ps > .20$).

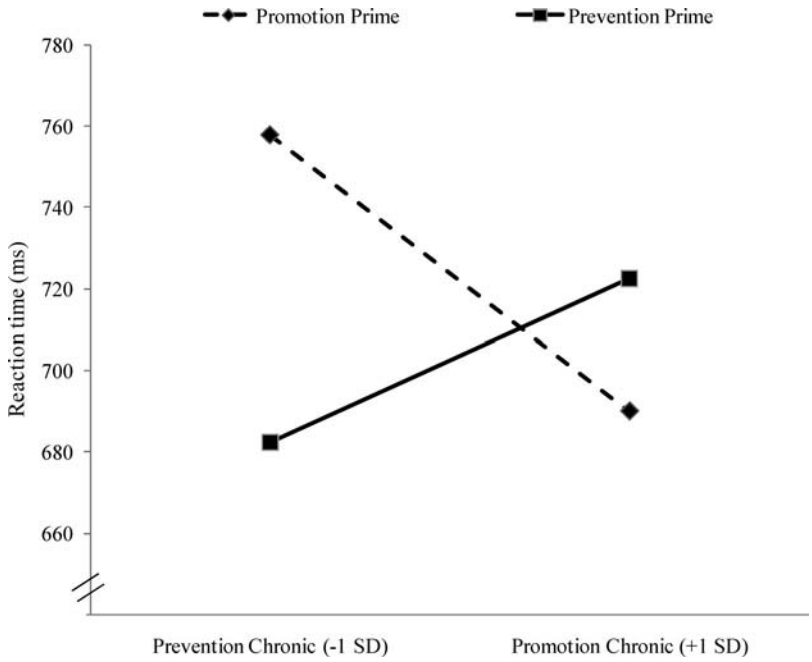

Figure 2. Reaction times for identifying nonwords as a function of participants' predominant chronic and temporarily primed orientations toward promotion or prevention (Study 2). Predicted values were calculated at 1 *SD* above and below the zero point of the predominant chronic motivational orientation index.

a nationwide online subject pool participated in an Internet survey for a 1/50 chance of winning a $25 gift card at a major online retailer.

Procedure. Participants were informed at the outset that they would participate in a series of studies on separate topics. Then, to measure their chronic desires to belong, they completed the 10-item Need to Belong Scale created by Leary et al. (2001), in which they rated their agreement with statements such as "I need to feel that there are people I can turn to in times of need" on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Following a filler task, participants were informed that in the next study they would be asked to describe a past event and were randomly assigned to one of the three priming conditions (i.e., high-belonging prime, low-belonging prime, no-prime control). Participants in the high-belonging prime condition were asked to recall a situation in which their social orientation was salient: "Think about a time in which you felt closely connected with another person or with a group of people and you felt good and comfortable about the relationship." Participants in the low-belonging prime condition were asked to recall a situation in which their social orientation was dormant: "Think about a time in which you did not feel connected with another person or with a group of people and you wanted to distance yourself from the relationship." Participants assigned to the no-prime control condition were simply asked to describe what they had done the previous day (Galinsky, Gruenfeld, & Magee, 2003).

To ensure that our manipulation would activate temporarily high or low desires for belonging as intended, we conducted a pretest in which we administered either the high- or low-belonging prime to a separate group of participants ($n = 39$, 12 men, median age = 33 years, range = 18–78) from the same population. After completing the essay, participants reported how they were feeling at that point in time on 9-point scales anchored by *sad–happy*, *bad mood–good mood*, *irritable–pleased*, and *depressed–cheerful*. These responses were averaged to form a mood index ($\alpha = .94$). Participants then reported the extent to which they desired or wanted to (a) belong to the relationship described in the essay, (b) be close to that person or group of people, (c) be accepted by that person or group of people, (d) distance themselves from that person or group of people (reverse coded), (e) spend time on their own (reverse coded), and (f) be by themselves and do their own things (reverse coded) on 9-point scales ranging from 1 (*not at all*) to 9 (*very much*). The average score of these six items were averaged into a desires for belonging index ($\alpha = .95$). Results showed that the belonging manipulation had no effect on mood ($F < 1$), but it did have a significant effect on the belonging index, $F(1, 37) = 34.57$, $p < .001$, such that participants primed with high belonging reported higher desires for belonging ($M = 7.23$, $SD = 1.28$) than participants primed with low belonging ($M = 3.67$, $SD = 2.32$), suggesting that this induction is effective at manipulating desires for belonging.[7]

[7] The low-belonging prime induction was designed to elicit an instance of low desires for social connection and was not a manipulation of belonging threats or experiences of social exclusion (cf. Molden, Lucas, Gardner, Dean, & Knowles, 2009; Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007). Previous research has shown that feelings of exclusion deplete executive resources (Baumeister, DeWall, Ciarocco, & Twenge, 2005). As reported in the main study, neither belonging prime had an effect on participants' performance, which further indicates the nonequivalence of our low desires for belonging manipulation with a social exclusion manipulation.

After the belonging priming task, participants were presented with a mental arithmetic task that involved summing a series of three two-digit numbers in their head without the use of a calculator. This task thus required the use of cognitive resources to access and to maintain information in working memory while performing the computations. Participants were presented with 40 problems and were asked to solve as many problems as they could in 3 min. Previous research has shown that people's performance on this task suffers when their cognitive resources have been depleted (DeStefano & LeFevre, 2004; Vohs et al., 2008).

Results and Discussion

Six participants solved five or fewer of the 40 problems, which suggested that they were either unable to perform arithmetic problems or unwilling to work on the task, and they were eliminated from all analyses.[8] A chronic desires to belong index ($M = 4.04$, $SD = 1.05$, $\alpha = .87$) was computed by first reverse-scoring the appropriate items from the Need to Belong Scale (Leary et al., 2001) and then averaging all the items, such that higher scores indicated higher chronic desires to belong.

We first computed an omnibus analysis to examine the effects of participants' chronic desires to belong and the belonging primes on their math performance. Specifically, we conducted an F test to examine whether including the interactive effects of the chronic and primed orientations in the regression model may explain significantly more variance than the model with just the main effects of chronic and primed orientations. This analysis revealed a significant interaction, $F(2, 163) = 5.04$, $p < .01$.

To better understand the nature of this interaction, we conducted several regression analyses. Because the regression model involved a continuous variable (participants' chronic desires to belong index) and a categorical variable with three levels (i.e., high-belonging prime, low-belonging prime, and the no-prime control), we created two separate dummy-coded interaction terms. Furthermore, to examine all of the specific paired contrasts involving the associations between chronic desires to belong and math performance across the three priming conditions, we conducted two separate hierarchical regression analyses on the number of math problems correctly solved, each with a different set of dummy codes (Aiken & West, 1991). The first regression included the mean-centered desires to belong index entered simultaneously with a set of dummy variables designed to individually contrast both the high-belonging prime condition and the no-prime control condition relative to the low-belonging prime condition in a first step (dummy1 codes: 1 = high-belonging prime, 0 = otherwise; dummy2 codes: 1 = no-prime control, 0 = otherwise), followed by the appropriate Dummy Variable × Chronic Desires to Belong interaction terms in a second step. The second regression included the mean-centered desires to belong index entered simultaneously with a set of dummy variables designed to contrast the high-belonging prime condition and the low-belonging prime condition relative to the no-prime control condition in a first step (dummy1 codes: 1 = high-belonging prime, 0 = otherwise; dummy2 codes: 1 = low-belonging prime, 0 = otherwise), followed by the appropriate Dummy Variable × Chronic Desires interaction terms in a second step.

As shown in Figure 3, the results of the first regression analysis revealed a significant Prime × Chronic Orientation interaction for the dummy variable contrasting the high-belonging and low-belonging prime conditions, $\beta = .31$, $t(163) = 3.14$, $p < .01$, indicating that the effect of the chronic desires to belong on math performance was significantly different between these two conditions. In addition, the results revealed a marginally Prime × Chronic Orientation interaction for the dummy variable contrasting the low-belonging prime and no-prime control conditions, $\beta = .22$, $t(163) = 1.91$, $p = .058$, indicating that the relationship between the chronic desires to belong and math performance also differed between these two conditions. The results of the second regression analysis revealed that the Prime × Chronic Orientation interaction did not reach conventional levels of significance for the dummy variable contrasting the high-belonging prime and no-prime control conditions, $\beta = .15$, $t(163) = 1.57$, $p = .12$, suggesting that the effect of the chronic desires to belong on math performance did not differ between these two conditions, although the coefficient was directionally consistent with the primed interference hypothesis. The results for the dummy variable contrasting the low-belonging prime and the no-prime control condition in the second regression were identical to those reported above for the first regression. No main effects were significant ($-.2 < \beta s < 0$; $-1.4 < ts \leq 1$; $ps > .10$).

Consistent with our previous findings, simple slope analyses conducted to further examine the significant interactions (Aiken & West, 1991) revealed that in the low-belonging prime condition, the higher participants' chronic desires to belong, the fewer problems they solved, $\beta = -.33$, $t(163) = -2.54$, $p = .01$. In contrast, in the high-belonging prime condition, the lower were participants' chronic desires to belong, the fewer problems they solved, $\beta = .31$, $t(163) = 1.98$, $p = .05$. In the no-prime control condition, participants' chronic desires to belong did not predict performance, $\beta = .01$, $t(163) = 0.03$, $p = .98$. Because desire for belonging is a unidimensional motivational orientation, it was not possible to assess the separate contributions of facilitation from congruity or disruption from incongruity as we did in previous studies.

These results add to the findings of Studies 1–2 and provide additional evidence for our primed interference hypothesis. Replicating the results of the earlier studies, an incongruity between the temporarily primed need to belong and participants' chronic desires to belong led to cognitive disruption, as reflected in their performance in the subsequent arithmetic task. Using a different motivational orientation and a different cognitive task, Study 3 provides evidence for the robustness of the primed interference effect. Further, these results provide some evidence that the primed interference effect is distinct from a regulatory nonfit effect, as it is unlikely that any high or low belonging strategies that might have been activated by the prime would be applicable in solving arithmetic problems.

Study 4

Studies 1–3 have consistently demonstrated cognitive impairment when temporarily activated motivational orientations were incongruent with participants' chronic motivational orientations.

[8] When these participants were included in the analysis, the overall pattern did not change, but some of the results became nonsignificant due to the increased variance.

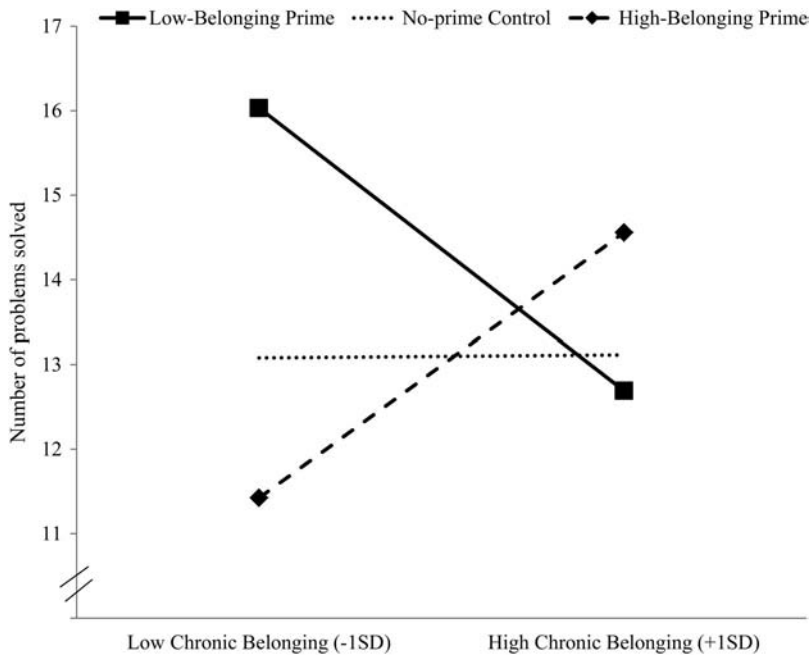

Figure 3. Mathematical problems solved as a function of participants' predominant chronic and temporarily primed desires for belonging (Study 3). Predicted values were calculated at 1 *SD* above and below the mean of the chronic desires for belonging index.

The objective of Study 4 was twofold: first, to further demonstrate the robustness of the primed interference effect using a different motivational orientation; and second, to examine whether cognitive disruption stemming from primed interference occurs even when the chronic motivational orientation has typically been found to bolster cognitive resources and cognitive performance.

Power has been defined as the capacity to control resources and outcomes, both for the self and for others (Fiske, 1993; Keltner, Gruenfeld, & Anderson, 2003; Magee & Galinsky, 2008). Whereas experiences of high-power tend to create a motivational orientation that encourages feelings of control and perceptions of greater ability to pursue one's goals, experiences of low-power tend to create a motivational orientation that fosters feelings of dependence and perceptions of greater obstacles in pursuing one's goals. Accordingly, many studies have shown that high-power orientations bolster the use of cognitive resources on cognitive tasks and facilitate goal pursuit compared to low-power orientations (DeWall, Baumeister, Mead, & Vohs, 2011; Galinsky et al., 2003; Guinote, 2007a, 2007b; Smith, Jostmann, Galinsky, & van Dijk, 2008).

In the present study, we tested whether temporarily activating a high-power orientation that is incongruent with one's chronic orientation would deplete cognitive resources, despite the general positive effects of high-power orientations on these resources. Based on the primed interference hypothesis, our prediction was that in addition to the resource depletion that would be expected among high-power individuals temporarily primed with a low-power orientation, depletion would also be observed among low-power individuals primed with a high-power orientation.

Method

Participants. Fifty-six undergraduate students (22 men, median age = 20 years, range = 18–24) received $12 for participating in the study. Participants were run in small groups of four to eight individuals.

Procedure. Participants were individually seated in front of a computer and were told they would participate in several unrelated studies conducted by different researchers. They then began by completing a battery of individual difference scales, one of which was the 30-item trait dominance and assertiveness scale developed by Ray (1981; e.g., "Do you tend to boss people around?"), anchored by 1 (*no*), 2 (*don't know*), and 3 (*yes*). Scales of dominance and assertiveness have often been used as measures of chronic power orientation (e.g., Anderson & Berdahl, 2002). As part of a subsequent study supposedly about memory for past events, participants were randomly assigned to one of three power-prime conditions (high-power prime, low-power prime, no-prime control). We used a well-validated exercise to manipulate power orientations (DeWall et al., 2011; Galinsky et al., 2003; see also Anderson & Galinsky, 2006; Galinsky et al., 2006). In particular, participants in the two power prime conditions were told that "power" meant a situation in which someone controls the ability of another person or persons to get something they want, or is in a position to evaluate those individuals. Participants in the high-power prime condition were then asked to describe "a time in which you had power over another individual or individuals," whereas those in the low-power prime condition were asked to describe "a time in which someone else had power over you." Participants in the no-prime control condition were asked to de-

scribe a typical day in their lives. Following this manipulation, participants' cognitive resources were assessed using a similar Stroop task as in Study 1, with 25% of congruent trials and 75% of incongruent trials.

Results and Discussion

Based on prior research showing that high-power orientations are associated with increased cognitive resources and goal-directed behavior (DeWall et al., 2011; Galinsky et al., 2003; Guinote, 2007a, 2007b; Smith et al., 2008), we predicted that in the no-prime control condition, participants with chronic high-power orientations would show better performance and lower Stroop-effect scores than those with chronic low-power orientations. Further, participants in the high-power prime condition should display better performance and lower Stroop-effect scores overall, especially among those with chronic high-power orientations. However, we predicted that the high-power prime effect would be attenuated among those with chronic low-power orientations. That is, we predicted that chronic power orientations would show similar patterns of Stroop-effect scores in both the no-prime and high-power prime conditions, as consistent with the independent effects of chronic and temporarily primed power suggested by the power literature, as well as with our primed interference hypothesis. However, in contrast to what the power literature would suggest, among those primed with low-power, we expected that participants with chronic high-power orientations would show greater depletion of their cognitive resources and in turn display higher Stroop-effect scores than those with chronic low-power orientations, as consistent with the primed interference hypothesis.

To examine how the temporary activation of high- or low-power orientations influenced participants' cognitive resources as a function of their chronic power orientation, a chronic power orientation index ($M = 2.35$, $SD = 0.28$, $\alpha = .79$) was first computed by reverse-scoring the appropriate items from the scale measuring dominance and assertiveness, and by averaging all the items and mean-centering the index such that a higher score indicated a higher chronic power orientation. RTs on the Stroop task greater than 3 *SD*s from the mean (0.84% of trials) as well as those for incorrect responses (2.42%) were eliminated, and the remaining RTs were log-transformed (Ratcliff, 1993). Finally, a Stroop-effect score was computed for each participant by subtracting their average RT for matched trials from the average RT for mismatched trials (see Richeson & Shelton, 2003), with higher scores indicating greater depletion of cognitive resources.

As in Study 3, we first conducted an omnibus analysis to test whether chronic power orientation and the power primes jointly influenced Stroop-effect scores. In particular, we examined whether including the interactive effects of the chronic and primed orientations in the model explains a significantly greater proportion of variance relative to the regression model that includes only the main effects. The analysis revealed a significant interaction, $F(2, 50) = 4.92$, $p = .01$.

As before, to better understand the nature of this interaction, we next conducted additional regression analyses with different dummy-coded variables designed to test all of the specific paired contrasts involving the associations between chronic power orientation and Stroop-effect scores among each of the three priming conditions (Aiken & West, 1991). The first regression included the mean-centered power orientation index entered simultaneously with a set of dummy variables designed to individually contrast both the high-power prime and the no-prime control conditions relative to the low-power prime condition (dummy1 codes: 1 = high-power prime, 0 = otherwise; dummy2 codes: 1 = no-prime control, 0 = otherwise), followed by the appropriate Dummy Variable × Chronic Orientation interaction terms in a second step. The second regression included the mean-centered power orientation index entered simultaneously with a set of dummy variables designed to individually contrast both the high-power prime and the low-power prime conditions relative to the no-prime control condition (dummy1 codes: 1 = high-power prime, 0 = otherwise; dummy2 codes: 1 = low-power prime, 0 = otherwise) in a first step, followed by the appropriate Dummy Variable × Chronic Orientation interaction terms in a second step.

As shown in Figure 4, the results of the first regression analysis revealed a significant Prime × Chronic Orientation interaction for the dummy variable contrasting the high-power and low-power prime conditions, $\beta = -.46$, $t(50) = -2.65$, $p = .01$, indicating that the relationship between the chronic power orientation and Stroop performance was significantly different between these two conditions. The analysis also yielded a significant Prime × Chronic Orientation interaction for the dummy variable contrasting the low-power prime and no-prime control conditions, $\beta = .53$, $t(50) = 2.69$, $p = .01$, indicating that the effect of chronic orientation on Stroop performance was also different between these two conditions. The results of the second regression analysis revealed, as predicted, that the Prime × Chronic Orientation interaction for the dummy variable contrasting the high-power prime and no-prime control conditions was not significant, $\beta = .05$, $t(50) = 0.27$, $p = .79$, indicating that the effect of chronic orientation on Stroop performance did not differ between these two conditions. The results for the dummy variable contrasting the low-power prime and the no-prime control condition in the second regression were identical to those reported above for the first regression. Finally, we observed a main effect of the high-power prime, $\beta = -.37$, $t(52) = -2.37$, $p = .02$, such that participants in the high-power prime condition exhibited smaller Stroop-effect scores than participants in the no-prime control condition, a result consistent with prior research showing that power enhances cognitive performance (DeWall et al., 2011; Guinote, 2007a, 2007b).[9]

Simple slope analyses (Aiken & West, 1991) conducted to further examine the significant interactions revealed that in the no-prime control condition, higher chronic power orientations were marginally associated with lower Stroop-effect scores, $\beta = -.44$, $t(50) = -1.77$, $p = .08$. Similarly, in the high-power prime condition, higher chronic power orientations were also marginally associated with lower Stroop-effect scores, $\beta = -.35$, $t(50) = -1.66$, $p = .10$. These results are consistent with the existing literature on power. However, consistent with the primed interference hypothesis, but contrary to the power literature, among participants in the low-power prime condition, higher chronic power orientations were significantly associated with larger Stroop-effect

[9] An analysis of error rates did not reveal any significant effects ($-.30 < \beta s < .30$; $-1.6 < t < 1.2$; $ps > .10$).

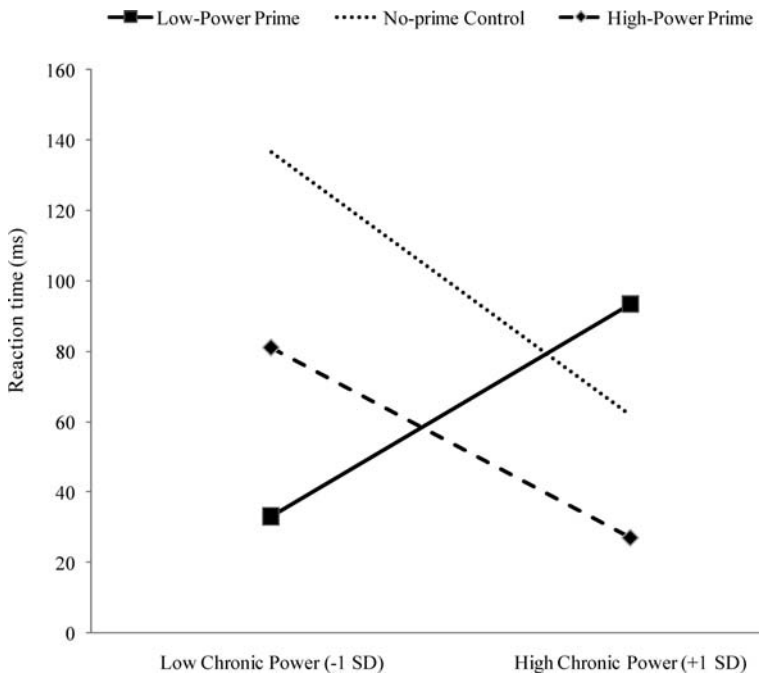

Figure 4. Stroop effect as a function of participants' predominant chronic and temporarily primed power orientations (Study 4). Predicted values were calculated at 1 *SD* above and below the mean of the chronic power orientation index.

scores, $\beta = .43$, $t(50) = 2.08$, $p = .04$. Because power is a unidimensional motivational orientation, it was not possible to assess the relative contributions of facilitation from congruity and interference from incongruity.

The current study replicated the typical findings of high-power orientation being associated with increased cognitive resources (DeWall et al., 2011; Galinsky et al., 2003; Guinote, 2007a, 2007b) in both the no-prime and the high-power prime conditions. But consistent with the primed interference hypothesis, the results showed the reverse pattern in the low-power prime condition, providing a clear demonstration of the cognitive costs following an incongruity between people's chronic and temporarily activated motivational orientations.

Thus far, we have examined the effects of primed interference on basic cognitive processes such as the inhibition of spontaneous responses (Studies 1, 2, and 4) and mental arithmetic (Study 3). The next two studies were designed to test some broader implications of primed interference on important behaviors such as analytical reasoning (Study 5) and resistance to temptation (Study 6). Another goal of Study 5 was to demonstrate that the primed interference effect was not contingent on the essay writing exercise used in the previous studies to prime temporary motivational orientations. One might argue that these exercises all activated different aspects of participants' self-concept and that the incongruity effect observed was driven by a mismatch between their chronic and current self-concepts rather than a mismatch between their chronic and current motivational orientations. To address this concern, Study 5 used a manipulation that involved different incentives for task performance to temporarily prime different motivational orientations.

Study 5

In this study, participants with chronic promotion or prevention motivational orientations were asked to complete a task that was framed either in terms of promotion-focused or prevention-focused incentives. Then they were asked to work on analytical reasoning problems taken from the GRE, a standardized test used for admissions to advanced degree programs in the United States. We predicted that participants who completed a task framed with motivational incentives that were incongruent with their chronic orientation would have fewer cognitive resources available and in turn perform worse on the GRE problems than would those who either completed a task framed with motivational incentives that were congruent with their chronic orientation, or a task that was not framed with any particular motivational incentives.

Method

Participants. One hundred and fifteen undergraduate students (45 men, median age = 20 years, range = 18–22) received $8 for participating in the study. Participants were run in small groups of four to eight individuals.

Procedure. Participants were individually seated in front of a computer and were told that they would participate in several unrelated studies conducted by different researchers. As in previous studies, they first completed the RFQ and were then introduced to a memory study. They were informed that the study consisted of two phases: a memorization phase and a recognition phase. In particular, they would first see a series of letter-strings, presented one at a time for 2 s each, and their task was to remember the

letter-strings as best as they could. Participants were then presented with 20 seven-letter nonsense syllables (e.g., *cloades*). Next, they engaged in a filler task designed to clear short-term memory, in which they were asked to identify letters as vowels or consonants.

Afterwards, participants were presented with the recognition instructions, which were designed to prime either a promotion or a prevention orientation. Drawing from prior research that has used similar regulatory focus manipulations (Förster et al., 2003; Markman, Baldwin, & Maddox, 2005; Shah et al., 1998), participants in the promotion prime condition were given gain-framed incentives: "If you correctly recognize more letter-strings than 70% of the other participants in this study, you will gain entry to a lottery for a $50 cash prize; but if you do not recognize more letter-strings than 70% of the other participants, you will not gain entry." Participants in the prevention prime condition were given loss-framed incentives: "If you do not correctly recognize more letter-strings than 70% of the other participants in this study, you will lose entry to a lottery for a $50 cash prize; but if you do correctly recognize more letter-strings than 70% of the other participants, you will not lose your entry." Participants in the no-prime control condition were simply told the following: "For participating in the memory task, you will be entered into a lottery for a $50 cash prize." At the end of the study, all participants were entered into the lottery independent of their performance.

After these instructions, participants were presented with 40 nonsense syllables (20 from the memorization phase and 20 new ones) and were asked to indicate whether the syllables had been presented earlier. Finally, ostensibly as a different study, participants were presented with 13 analytical reasoning problems from the GRE and were given 7 min to solve them (see Schmeichel, Vohs, & Baumeister, 2003).

Results and Discussion

Predominant chronic motivational orientations scores ($M = 0.46$, $SD = 1.39$) were computed as in previous studies based on participants' prevention subscale ratings ($M = 4.72$, $SD = 1.24$, $\alpha = .85$) and their promotion subscale ratings ($M = 5.18$, $SD = 0.81$, $\alpha = .69$).

As in Studies 3 and 4, all analyses were performed first by conducting an omnibus analysis of whether participants' chronic predominant promotion- or prevention-focused orientations and the different incentive primes conditions jointly influenced the outcome of interest. Additional regression analyses with different dummy-coded variables were then conducted to test all of the specific paired contrasts involving the associations between chronic orientations and GRE performance across the three priming conditions (Aiken & West, 1991). The first regression analysis included the chronic predominant orientation index entered simultaneously with a set of dummy variables designed to individually contrast both the promotion prime and the no-prime control conditions relative to the prevention prime condition (dummy1 codes: 1 = promotion prime, 0 = otherwise; dummy2 codes: 1 = no-prime control, 0 = otherwise), followed by the appropriate Dummy Variable × Chronic Orientation interaction terms in a second step. The second regression included the chronic predominant orientation index entered simultaneously with a set of dummy variables designed to individually contrast both the promotion prime and the prevention prime conditions relative to the no-prime control condition (dummy1 codes: 1 = promotion prime, 0 = otherwise; dummy2 codes: 1 = prevention prime, 0 = otherwise) in a first step, followed by the appropriate Dummy Variable × Chronic Orientation interaction terms in a second step.

An initial set of preliminary analyses was first conducted to examine participants' performance on the memory task that was used to prime promotion or prevention motivations. Neither the omnibus analysis nor the follow-up regression analyses revealed any significant effects, $ps > .10$.[10] A second set of primary analyses was then conducted to examine participants' subsequent performance on the GRE problems. Replicating previous studies, the omnibus analysis revealed a significant interaction, $F(2, 109) = 5.30$, $p < .01$. As shown in Figure 5, the first regression analyses revealed a significant Prime × Chronic Orientation interaction for the dummy variable contrasting the promotion prime and prevention prime conditions, $\beta = .45$, $t(109) = 3.26$, $p < .01$, and a marginally significant interaction for the dummy variable contrasting the prevention prime and the no-prime control conditions, $\beta = .28$, $t(109) = 1.78$, $p = .08$. In addition, the second regression analysis revealed a Prime × Chronic Orientation interaction for the dummy variable contrasting the promotion prime and no-prime control conditions, $\beta = .24$, $t(109) = 1.96$, $p = .05$; the results for the dummy variable contrasting the prevention prime and no-prime control conditions were identical to those reported for the first regression. These results indicate that the effect of participants' chronic predominant promotion or prevention orientations on GRE performance differed across all three prime conditions. No main effects were significant ($\beta s < .10$; $ts < 1$; $ps > .5$).

Follow-up simple slope analyses (Aiken & West, 1991) conducted to further examine the significant interactions revealed that in the promotion prime condition, participants with relatively greater chronic prevention orientations solved fewer problems, $\beta = .45$, $t(109) = 2.39$, $p = .02$, whereas in the prevention prime condition, participants with relatively greater chronic promotion orientations solved fewer problems, $\beta = -.40$, $t(109) = -2.22$, $p = .03$. In the no-prime control condition, participants' chronic motivational orientation was not related to their performance, $\beta = -.01$, $t(109) = -0.01$, $p = .99$. To examine whether these results were driven by interference stemming from motivational incongruity or facilitation stemming from motivational congruity, we conducted follow-up partial correlation analyses with the promotion subscale controlling for the prevention subscale and with the prevention subscale controlling for the promotion subscale within each prime condition. Consistent with our hypothesis, we found that in the prevention prime condition, participants' GRE performance was negatively correlated with their chronic promotion scores ($r = -.47$, $p < .01$) but was not correlated with their chronic prevention scores ($r = -.18$, $p = .33$). In the promotion prime condition, participants' GRE performance was negatively correlated with their chronic prevention scores ($r = -.37$, $p = .03$) but was not

[10] Although Crowe and Higgins (1997) reported a main effect of the primed motivational orientation on recognition, we did not replicate this finding. One plausible explanation is a ceiling effect: The average number of correctly recognized letter-strings was 17, with half of the participants correctly recognizing more than 18 out of 20 letter-strings.

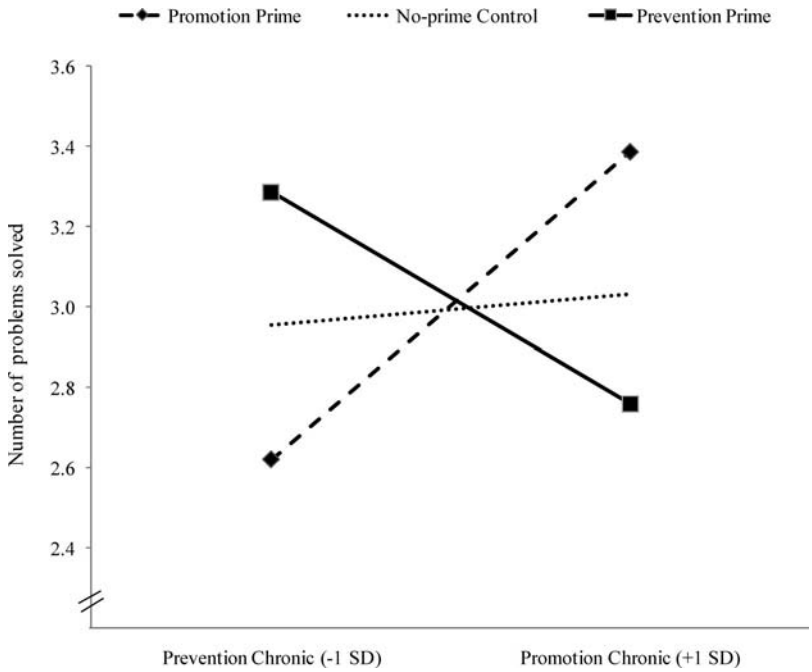

Figure 5. Graduate Record Exam analytic reasoning problems solved as a function of participants' predominant chronic and temporarily primed orientations toward promotion or prevention (Study 5). Predicted values were calculated at 1 *SD* above and below the zero point of the predominant chronic motivational orientation index.

correlated with their chronic promotion scores ($r = .19$, $p = .27$). Finally, in the no-prime control condition, neither chronic promotion nor chronic prevention scores were correlated with performance (rs $< .16$, ps $> .30$). These findings thus provided clear evidence in support of our hypothesis concerning the depletion of cognitive resources by an incongruity between chronic and temporary motivational orientations and further illustrated the wide range of consequences of primed interference.

Study 6

To further illustrate the diverse range of consequences resulting from primed interference, we conducted a final study examining the effect of incongruity between chronic and primed motivational orientations on people's ability to resist temptation. Temptations are objectives that are appealing in the short-term but are obstacles for the attainment of important long-term goals (Fishbach & Shah, 2006). Much research has shown that people's cognitive resources are an important determinant of their ability to successfully resist temptations (Baumeister et al., 1998). To test whether a prime that is incongruent with people's chronic motivational orientation would impair their ability to resist temptation, we offered participants a choice between an unhealthy but tempting snack (a candy bar) versus a healthy but less tempting snack (an apple; see Ferraro, Shiv, & Bettman, 2005; Fishbach & Shah, 2006; Fujita & Han, 2009; Hong & Lee, 2008). We predicted that the incongruity between participants' chronic and temporarily activated motivational orientations would deplete cognitive resources and thus increase people's likelihood of choosing the tempting snack over the healthy snack.

Method

Participants. Seventy-two students (37 men, median age = 19 years, range = 17–29) participated in the study. Students were approached individually in public areas on campus (e.g., the library) to participate in a short survey.

Procedure. Students were approached by the experimenter and were asked whether they would complete a survey, the purpose of which was to learn about the values of college students. Those who agreed first completed the RFQ and then received either the promotion or the prevention induction, similar to the one used in Studies 1 and 2. Upon completing the survey, participants were told that they could choose either a candy bar or an apple as a token of appreciation for their participation. A pretest among the same population ($n = 132$, 66 men, median age = 21 years, range = 19–23) revealed that students were moderately to highly concerned with staying fit and healthy ($M = 5.89$, $SD = 1.24$) on a 7-point scale (1 = *not at all*, 7 = *a lot*), suggesting that the candy bar, a tasty but unhealthy snack, would represent a tempting alternative that could create motivational conflict with participants' long-term health goals. We predicted that participants who were experiencing depletion of cognitive resources would be more likely to succumb to temptation and choose the candy bar (Ferraro et al., 2005; Fishbach & Shah, 2006; Fujita & Han, 2009; Hong & Lee, 2008). After participants indicated their choice of either the candy bar or the apple, they were given the chosen snack and thanked for their participation.

Results and Discussion

Predominant chronic motivational orientation scores ($M = 0.55$, $SD = 1.23$) were computed as in the previous studies. Participants' choice of snack (coded as 1 = chocolate bar; 0 = apple) was submitted to a binomial logistic regression in which main effects of prime (coded as 1 = promotion prime; 0 = prevention prime) and the chronic motivational orientation index were simultaneously entered in a first step, followed by the Prime × Chronic Motivational Orientation interaction in a second step. As displayed in Figure 6, results showed the predicted Prime × Chronic interaction, $exp(B) = 0.25$, Wald $\chi^2(1, N = 72) = 7.79$, $p < .01$. No other effects were significant, $exp(B\text{s}) < 1$, Wald $\chi^2(1, N = 72) < 1.5$, $p\text{s} > .20$. As predicted, simple slope analyses (Aiken & West, 1991) showed that in the promotion prime condition, participants with relatively greater chronic prevention orientations were more likely to choose the candy bar, $exp(B) = 0.44$, Wald $\chi^2(1, N = 72) = 4.65$, $p = .03$, whereas in the prevention prime condition, participants with relatively greater promotion orientations were marginally more likely to choose the candy bar, $exp(B) = 1.78$, Wald $\chi^2(1, N = 72) = 3.14$, $p = .08$. As in Study 5, partial correlation analysis with the promotion subscale controlling for the prevention subscale and with the prevention subscale controlling for the promotion subscale were conducted within each prime condition to examine whether these differences reflected an interference effect from motivational incongruity or a facilitation effect from motivational congruity. The results again supported our primed interference hypothesis. In the prevention prime condition, participants' choice of the candy bar was marginally positively correlated with their chronic promotion scores ($r = .28$, $p = .08$) but not with their chronic prevention scores ($r = –.16$, $p = .34$). In the promotion prime condition, participants' choice of the candy bar was positively correlated with their chronic prevention scores ($r = .38$, $p = .03$) but not with their chronic promotion scores ($r = –.27$, $p = .13$).

Relying on a different task that involved participants making an actual choice, Study 6 again demonstrated that an incongruity between chronic and temporarily activated motivational orientations led to cognitive impairment in the form of weaker resistance to temptation. These findings show that the primed interference effect is not limited to impairments of cognitive tasks but has broader implications for people's everyday choices and actions as well.

General Discussion

Across six studies that investigated three different types of motivational orientations (regulatory focus in Studies 1, 2, 5, and 6; belonging in Study 3, and power in Study 4), using five different tasks that assessed cognitive resources (the Stroop task in Studies 1 and 4, a lexical decision task in Study 2, a mental arithmetic task in Study 3, an analytical reasoning task in Study 5, and a choice between a tempting versus a healthy snack in Study 6), and across both student and nonstudent samples, we consistently showed that an incongruity between temporarily primed and chronically accessible motivational orientations created primed interference that depleted cognitive resources. Participants temporarily primed with motivational orientations incongruent with their chronic orientations exhibited worse performance on tasks that relied on cognitive resources, such as inhibiting incorrect but highly accessible re-

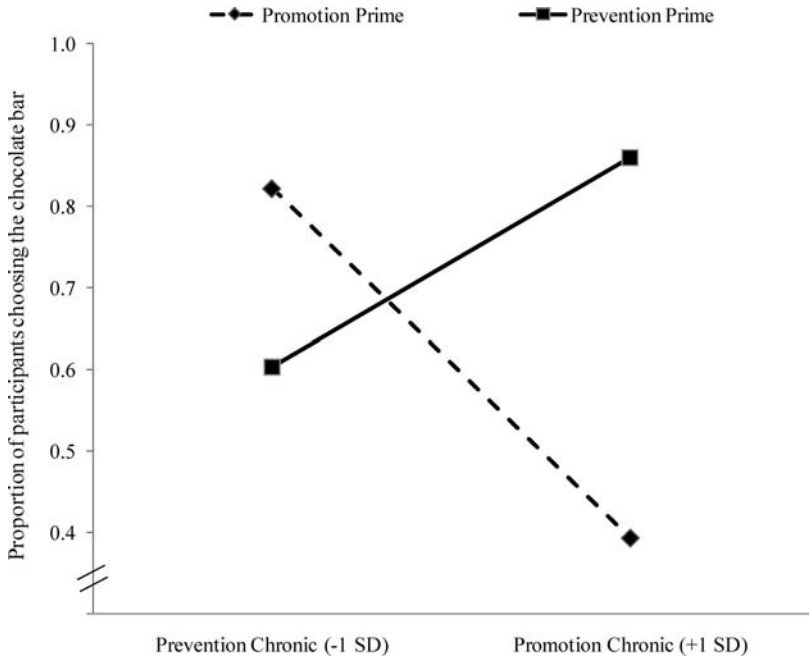

Figure 6. Proportion of participants choosing the chocolate bar over the apple as a function of participants' predominant chronic and temporarily primed orientations toward promotion or prevention (Study 6). Predicted values were calculated at 1 *SD* above and below the zero point of the predominant chronic motivational orientation index.

sponses (Studies 1, 2, and 4) and performing mental calculations that required focused attention and effort (Study 3). Our studies also documented the broader implications of primed interference for important behaviors, such as analytic reasoning (Study 5) and resisting temptation (Study 6). Furthermore, as illustrated in Studies 3–5, the incongruity-based depletion of cognitive resources was observed relative to when participants were primed with motivational orientations that were congruent with their chronic orientations as well as when they were not primed with any specific motivational orientation. Although in certain studies some of the predicted interactions and simple slopes did not reach conventional levels of significance, the pattern of results was highly consistent across a variety of motivational orientations and measures of cognitive resource depletion. Taken together, the current findings provide strong support for our primed interference hypothesis.

In Studies 1, 2, 5, and 6, by measuring and priming participants' promotion versus prevention orientations, we were able to independently and simultaneously examine the effects of congruity and incongruity between primed and chronic motivations. The results across all four studies provided consistent evidence that interference arising from incongruity impairs performance. There was little, if any, evidence that congruity facilitates performance. These results are consistent with findings in the status literature showing that an incongruity between primed status and chronic testosterone levels disrupts cognitive performance (Josephs et al., 2006). Further, our results extend these findings by showing that the primed interference effect is not unique to the dynamics of status, but applies more broadly to instances of incongruity between chronic and primed motivational orientations.

It is important to note that the primed interference effect demonstrated here does not conflict with the many studies demonstrating the general interchangeability between chronic and temporarily primed motivational orientations (e.g., Bargh et al., 2001; Chartrand & Bargh, 1996; Förster et al., 2003; Higgins et al., 1997). In fact, the results of Study 2 demonstrating that temporary primes are effective at activating the relevant motivational orientations, regardless of whether the primed orientation is congruent or incongruent with participants' chronic orientations, add to this literature. However, the current findings show that although the incongruity of temporary motivational primes does not interfere with the activation of the primed orientations, an incongruent prime consumes more cognitive resources than a congruent prime and places constraints on the resources allocated to subsequent goal pursuit activities. In summary, our results do not challenge the basic notion that chronic and primed motivational orientations are interchangeable in their short-term effects; however, they do illustrate an additional important consequence of activating an incongruent motivational prime on people's ongoing goal-directed behaviors.

This additional consequence has important implications when considering interventions to strengthen people's cognitive performance or their self-control. For example, priming a high-power orientation has been found to improve cognitive performance (DeWall et al., 2011; Galinsky et al., 2003; Guinote, 2007a, 2007b). However, our Study 4 shows that this benefit may be contingent on individuals' chronic power orientations. Although a high-power prime may be effective for people with a chronic high-power orientation, such an intervention may not be as effective for those with a chronic low-power orientation. These results may in some respects be analogous to findings that interracial interactions impair cognitive performance. Although promoting interracial contact does have a wide range of benefits (Pettigrew & Tropp, 2006), research has repeatedly shown that engaging in interracial interactions may impose cognitive costs, especially for those concerned with experiencing or conveying prejudice (Richeson & Shelton, 2003; Richeson & Trawalter, 2005). In a similar fashion, the present study suggests that although activating a high-power orientation may be generally beneficial, such an intervention may interact with people's preexisting orientations in ways that impose cognitive and behavioral costs such that for those with chronic low power orientations, priming them with a high (vs. low) power orientation depletes their cognitive resources. Because these types of costs can have a broad range of negative consequences on people's eating and spending behaviors, interpersonal relationships, and subjective well-being (Finkel, DeWall, Slotter, Oaten, & Foshee, 2009; Kehr, 2004; Vohs & Faber, 2007; Vohs & Heatherton, 2000), careful weighing of the pros and cons of various motivational interventions for different groups of individuals is warranted.

Potential Mechanisms of the Primed Interference Effect

Although the present studies have consistently illustrated the cognitive and behavioral costs of an incongruity between chronic and primed motivations, questions remain regarding exactly how this interference occurs. We have identified three potential explanations for the primed interference effects: (a) The modes of goal pursuit associated with motivational orientations incongruent with one's chronic orientations are less automatized and require more cognitive resources to enact (cf. Bargh, 1990); (b) the shift from a habitual to a temporarily activated cognitive set that occurs when an incongruent motivational orientation is primed consumes cognitive resources (cf. Brown & McConnell, 2009; Hamilton et al., 2011); and (c) people expend cognitive resources to reduce the cognitive tension they experience when motivational orientations incongruent with their chronic orientations are activated (cf. Briñol et al., 2006; Rydell et al., 2008).

It is possible that these mechanisms may independently or jointly contribute to the primed interference effects presented here. However, Study 3 demonstrated that an incongruity between participants' chronic and primed desires to belong affected the number of mathematical problems they solved, even though the particular modes of goal pursuit related to either high or low desires for social connection were unlikely to be enacted during this task. These findings suggest that executing primed goal pursuit strategies that are incompatible with chronic motivational preferences is not a necessary condition for the primed interference effect. Thus, a single mechanism involving automatized versus effortful pursuit of primed motivations cannot account for all of the present results.

Whatever the specific origin of the interference effects (i.e., effortful goal execution, shifts from habitual cognitive sets, or cognitive tension), the range of tasks that were examined in the present studies does provide some suggestive evidence as to how this interference occurs. Previous research (see Kane & Engle, 2003) has indicated that the Stroop task, as well as other tasks that require the inhibition of automatic responses, primarily relies on what has been termed *central executive* resources that are responsible for activating and integrating the various components of

working memory (see Baddeley, 1996). Therefore, the results of Studies 1, 2, and 4 suggest that the disruption of central executive resources may be one consequence of primed interference. Furthermore, because behaviors such as resisting temptation also appear to rely on central executive resources (see Baumeister et al., 1998), the results of Study 6 support this possibility as well. In addition, DeStefano and LeFevre (2004) have suggested that taxing mental arithmetic tasks that involve keeping in mind interim results, like the one used in Study 3, deplete *phonological resources* that are responsible for keeping various information active in working memory (Baddeley, 1996). Thus, the results of Study 3 suggest that the depletion of these types of resources may be another consequence of primed interference. Because solving the types of analytical reasoning problems that appear on the GRE taxes similar types of phonological and visuospatial resources, the results of Study 5 also support this possibility. The present studies therefore provide initial evidence that there may be multiple mechanisms through which primed interference occurs with broad implications for judgment and behavior. Future research could more closely examine these mechanisms and perhaps identify circumstances under which each of them may be responsible for primed interference.

As noted earlier, we believe that the primed interference effect arising from an incongruity (vs. congruity) between primed and chronic motivations is both conceptually and empirically distinct from previously demonstrated effects of regulatory nonfit (vs. fit). First, from a conceptual standpoint, regulatory fit or nonfit is defined by the relationship between a motivational orientation and the matching or mismatching means or strategies that one adopts during goal pursuit (see Cesario et al., 2008; Higgins, 2000, 2006), whereas the primed interference effect examined here arises from a mismatch between two motivational orientations that are currently accessible, one of which is chronically active and the other of which has been temporarily primed. Second, from an empirical standpoint, previous research has predicted and demonstrated that experiences of regulatory fit increase performance and self-control, whereas experiences of regulatory nonfit decrease performance and self-control (Hong & Lee, 2008). However, across four studies, we predicted and found only robust effects of an incongruity between chronic and primed regulatory orientations; we found virtually no congruity effects. Finally, in at least one of the present studies (Study 3), the primary experimental task performed by the participants (mental arithmetic) was not motivationally relevant to the chronic or primed orientations examined (desires to belong); hence, any consideration of means or strategies during the task that might have contributed to a regulatory fit or nonfit experience was unlikely to have occurred.

However, one could argue that the priming manipulations used in five of the six studies, in which people wrote essays designed to evoke a particular motivational orientation, may have induced people to spontaneously call to mind the strategies they would use to pursue these orientations. In this case, even if the task they later performed did not allow them to execute any motivationally relevant strategies, participants could have created their own regulatory fit or nonfit within the priming task. To more closely examine this alternative explanation, we asked two coders blind to all hypotheses to code the number of relevant goal-pursuit strategies participants mentioned in the essays they wrote in Studies 1–4 and 6 (i.e., number of promotion- or prevention-oriented strategies, number of high or low belonging-oriented strategies, or number of high or low power-oriented strategies, as appropriate; coders' agreement ranged between 83% and 94%). We then averaged the coders' responses and tested whether the number of strategies participants mentioned interacted with their chronic motivational orientations to predict resource depletion (i.e., the primed interference effect).

Out of the 10 possible interactions tested in these five studies, only four were significant, with two of them in the opposite direction than what would be predicted by regulatory fit or nonfit. Further, when these Strategy × Chronic Orientation interactions were included together with the Prime × Chronic Orientation interactions in all of the analyses reported above, only two of these Strategy × Chronic interactions remained significant, and both were in the opposite direction of what would be predicted by regulatory fit or nonfit, whereas four out of the five Prime × Chronic interactions remained significant. These results help to rule out self-generated regulatory nonfit as an alternative explanation for the present findings and suggest that the present demonstrations of primed interference do not rely on regulatory fit and nonfit, but instead reflect a separate motivational influence on people's cognitive processing, executive functioning, and self-regulation.

Conclusions

The current studies extend our understanding of temporarily primed motivational orientations by showing that such temporary orientations may be interchangeable with orientations that are more stable and chronic in nature only in terms of their immediate motivational consequences. Temporary orientations differ from chronic orientations in their subsequent effects on cognitive resources. In particular, temporarily activating motivational orientations that are incongruent with people's chronic orientations creates interference, depleting cognitive resources and impairing performance on subsequent tasks that rely on these resources. The primed interference effect has important implications for researchers who interchangeably use chronically accessible and temporarily primed motivational orientations to provide convergent evidence for their findings, as well as for policy makers and practitioners designing interventions to encourage certain desirable behaviors. The current research suggests that priming a motivational orientation may have consequences on decision making, self-control, and subjective well-being beyond what may be expected from the simple activation of that orientation, and calls for careful considerations of how chronic and temporary sources of accessibility may interact when studying goal pursuit.

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