Journal of Personality and Social Psychology
2006, Vol. 91, No. 3, 456–475

0022-3514/06/$12.00 DOI: 10.1037/0022-3514.91.3.456

High-Maintenance Interaction: Inefficient Social Coordination Impairs Self-Regulation

Eli J. Finkel
Northwestern University

W. Keith Campbell and Amy B. Brunell
University of Georgia

Amy N. Dalton
Duke University

Sarah J. Scarbeck
Northwestern University

Tanya L. Chartrand
Duke University

Tasks requiring interpersonal coordination permeate all spheres of life. Although social coordination is sometimes efficient and effortless (*low maintenance*), at other times it is inefficient and effortful (*high maintenance*). Across 5 studies, participants experienced either a high- or a low-maintenance interaction with a confederate before engaging in an individual-level task requiring self-regulation. Self-regulation was operationalized with measures of (a) preferences for a challenging task with high reward potential over an easy task with low reward potential (Study 1) and (b) task performance (anagram performance in Study 1, Graduate Record Exam performance in Studies 2 and 3, physical stamina in Study 4, and fine motor control in Study 5). Results uniformly supported the hypothesis that experiencing high-maintenance interaction impairs one's self-regulatory success on subsequent, unrelated tasks. These effects were not mediated through participants' conscious processes and emerged even with a nonconscious manipulation of high-maintenance interaction.

Keywords: high-maintenance interaction, social coordination, self-regulation, interdependence theory, mimicry

Imagine that you are an experienced cook who enjoys hosting dinner parties and incorporating creativity into your meal preparation. Imagine further that you have recently decided to volunteer to cook in a soup kitchen for the homeless. You arrive at 4:30 p.m. on a chilly afternoon expecting a busy evening. You plan to finish by 8 p.m., allowing 2 hr to work on an overdue manuscript before bedtime. The manager of the soup kitchen informs you that a second experienced cook, Bob, will be joining you. You anticipate that working with Bob will make the cooking tasks more efficient; you might even finish earlier than 8 p.m. It soon becomes clear, however, that you and Bob have incompatible approaches to the cooking process. You keep getting in one another's way, and you are forced to exert effort to discern what Bob is doing so the two of you can get in sync. The effort required to coordinate with Bob offsets the advantages of having two competent cooks working together; you finish at 8 p.m. When you turn your attention to manuscript writing later that evening, you are unfocused and unmotivated. You have trouble concentrating, and the quality of your writing is poor.

The goal of the present research is to demonstrate that inefficient social coordination on interpersonal tasks (e.g., cooking with others) can impair individual-level self-regulation on subsequent, unrelated tasks (e.g., concentrating effectively while working on a manuscript). Evidence supporting this link would contribute to the research literatures on both self-regulation (a central topic in social psychology) and social coordination (a largely neglected topic).

Social Coordination and High-Maintenance Interaction

Interpersonal interaction is characterized by effective *social coordination* to the degree that the interacting individuals are able to align their behaviors with one another in an efficient and effortless manner. The term *high-maintenance interaction* refers to the degree to which social coordination on an interpersonal task requires energy exertions beyond those required to perform the

Eli J. Finkel and Sarah J. Scarbeck, Department of Psychology, Northwestern University; W. Keith Campbell and Amy B. Brunell, Department of Psychology, University of Georgia; Amy N. Dalton and Tanya L. Chartrand, Fuqua School of Business, Duke University.

We gratefully acknowledge Candida Abrahamson, Galen Bodenhausen, Paul Eastwick, Sanford Finkel, Steven Graham, Madoka Kumashiro, and William Maddux for their helpful suggestions on earlier versions of this article. We also acknowledge Sarah Barber, Joseph Benitez, Kimmy Coburn, Caitlin Hogan, Courtney Holman, Julie Keller, Elizabeth Krusemark, Josh Limor, Ashley Mason, Katie McGee, Amy Mize, Jamie Saul, Luciana Silva, David Sternberg, Leslie Smith, and Eleanor Tate for their assistance with data collection.

Correspondence concerning this article should be addressed to Eli J. Finkel, Department of Psychology, Northwestern University, Swift Hall Room 102, 2029 Sheridan Road, Evanston, IL 60208-2710. E-mail: finkel@northwestern.edu

task itself. We argue that differences in the degree to which social coordination experiences are high-maintenance are consequential: These differences influence whether the interactants experience self-regulatory failure on subsequent, unrelated tasks that they perform by themselves.

Research in the interdependence theory tradition examines how the structure of interpersonal situations affects the interacting individuals (Kelley et al., 2003; Kelley & Thibaut, 1978; Thibaut & Kelley, 1959), and it provides a good framework through which to investigate phenomena associated with social coordination. *Interdependence* is defined as "the process by which interacting persons influence one another's experiences" (Rusbult & Van Lange, 1996, p. 564). This definition is broad enough to include diverse interdependence problems, including well-researched topics like conflicts of interest (e.g., Finkel, Rusbult, Kumashiro, & Hannon, 2002; Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991; Van Lange, 1999) and trust dynamics (e.g., Holmes & Rempel, 1989; Simpson, in press). We suggest that, in addition, the issue of the self-regulatory consequences of efficient versus inefficient social coordination is a central interdependence topic that has been largely neglected heretofore.

This neglect is surprising given the degree to which effective social coordination makes life easier. Many tasks are more efficiently accomplished by people working in concert than by individuals working alone, and scholars have recently noted that tasks requiring coordination are pervasive: "Most human activity involves coordinating one's actions with the actions of others" (Reis & Collins, 2004, p. 233), and "Virtually all social activity requires coordination of some sort. . . . Two colleagues completing a research paper, two professors team teaching a course, and a committee of faculty members in a doctoral dissertation defense all depend on coordination" (Thompson & Fine, 1999, p. 282). Depending on the interpersonal coordination at a given time, task performance may vary dramatically in its efficiency (e.g., Kelley et al., 2003).

Although there is a large literature examining the personal consequences of interpersonal *conflict*, very little research investigates the personal consequences of poor interpersonal *coordination*. Rusbult and Van Lange (2003) illustrated this distinction between interpersonal problems rooted in conflicts of interest and those rooted entirely in coordination difficulties by presenting two different scenarios for John and Mary as they decide where to spend their summer vacation. In the first scenario, John wants to go to a beach resort and Mary wants to go to Rome. In the second, John and Mary both want to go to Rome. Whereas the first scenario requires that John and Mary make dicey decisions to navigate through their different preferences, the second does not require that John and Mary take one another's preferences into account—after all, they have the same preferences in the first place. Rusbult and Van Lange (2003) observed that interaction in the second scenario represents

> a coordination problem—the two must agree on a date for their vacation, and one person must arrange for travel and lodging. Thus, in comparison to situations with conflicting interests, *situations with corresponding interests are relatively simple*. [italics added] . . . They entail coordinating in such a manner as to enjoy the good outcomes that are readily available to the pair. (p. 352)

We suggest that such coordination is frequently simple, not because coordinating with others is a trivial task (consider, e.g., the immense complexity of programming a robot to master the subtleties of engaging in smooth social coordination with a human being), but rather because humans acquire, as an aspect of normal development, remarkable behavioral repertoires for bringing about effective social coordination. Furthermore, once these repertoires are developed, humans generally apply them effortlessly and nonconsciously to novel social situations. As a result, well-coordinated social interaction is the norm; poor coordination is the salient exception (Hatfield, Cacioppo, & Rapson, 1994).

Although efficient coordination experiences are the norm, interaction requiring effortful attention to the complexities of such coordination remains prevalent in everyday life. For example, it can be complicated—and exhausting—to decide where several friends will go for dinner (or what movie to see thereafter), even if everybody in the group would be content with any restaurant under consideration. We suggest that when individuals have compatible goals but the interpersonal execution of these goals is inefficient enough to require heightened vigilance to issues of social coordination, their self-regulatory success on subsequent, unrelated tasks may well become impaired. Initial support for this hypothesis has emerged from a recent series of studies investigating cross-race interaction (Richeson & Shelton, 2003; Richeson & Trawalter, 2005). One study, for example, revealed that relative to nonbiased White university students, those who were racially biased had impaired performance on a Stroop color-word task after interacting with a Black confederate. A plausible explanation for these results is that the biased White students had to exert more energy to make this cross-race interaction go smoothly, and, as a result, their subsequent task performance suffered. This performance decrement is likely indicative of a more general state of impaired self-regulation experienced by biased White individuals after interacting with a Black person. This energy exertion and performance decrement interpretation fits with recent developments in the self-regulation literature, to which we now turn our attention.

Self-Regulation

Self-regulation refers to what Baumeister (1998) called the self's executive function, which "makes decisions, initiates actions, and in other ways exerts control over both self and environment" (p. 712). Self-regulation is the psychological process activated when studying on a Friday night rather than getting ice cream with friends or when forcing oneself to concentrate on a difficult task when one's mind begins to wander. It entails efforts by the self to alter its states or responses (Vohs & Baumeister, 2004) in a goal-directed manner. A large body of evidence supports the assertion that effective self-regulation is essential to living life well and to the existence of a well-functioning civilization (Baumeister, Heatherton, & Tice, 1994).

Increasingly, researchers are gaining insight into the intrapersonal processes by which individuals engage in successful self-regulation (e.g., Baumeister et al., 1994; Carver & Scheier, 1998; Gollwitzer, 1999; Higgins, 2000; Loewenstein, 1996; Mischel, Shoda, & Rodriquez, 1989; Rothman, Baldwin, & Hertel, 2004; Shah & Kruglanski, 2003). The present research builds on this literature by investigating whether the interpersonal process of

high-maintenance interaction impairs individual-level self-regulatory success on subsequent, unrelated tasks. We hope this investigation serves as one demonstration of a more general observation: A comprehensive theory of self-regulation requires enhanced insight into the processes by which individuals' self-regulatory success is influenced by interpersonal processes.

By what mechanism might high-maintenance interaction affect self-regulation? One compelling possibility is that it impairs self-regulation by depleting psychological resources. Recent theorizing suggests that successful self-regulation requires a central psychological resource called *self-regulatory strength*, which refers to "the internal resources available to inhibit, override, or alter responses" (Schmeichel & Baumeister, 2004, p. 86). In the context of high-maintenance interaction, tempting responses might include losing focus, discontinuing the interaction, or being rude; striving to achieve efficient coordination in such interaction requires that one exert self-regulatory strength to overcome these counterproductive responses. Accumulating evidence demonstrates that self-regulatory strength is a limited and depletable resource that fluctuates markedly as a function of factors such as prior willpower exertion, exhaustion, and stress (for reviews, see Muraven & Baumeister, 2000; Schmeichel & Baumeister, 2004). To the degree that individuals exert self-regulatory strength in a given situation, they will have fewer self-regulatory resources available for a separate task they perform moments later (i.e., their "strength" is sapped and they are left in a state of *self-regulatory strength depletion*). An important implication is that "a person can become exhausted from many simultaneous demands and so will sometimes fail at self-control even regarding things at which he or she would otherwise succeed" (Baumeister & Heatherton, 1996, p. 3).

Research on self-regulatory strength depletion typically uses a *two-task paradigm*, in which participants are randomly assigned to perform an initial task that either requires self-regulatory exertion or does not. After completing this first task, all participants complete the same follow-up task that also requires self-regulatory exertion. Abundant evidence demonstrates that relative to participants who first performed the task requiring no self-regulatory exertion, those who first performed the task requiring self-regulatory exertion exhibit impaired performance on the second task (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven, Collins, & Neinhaus, 2002; Muraven, Tice, & Baumeister, 1998; Vohs & Heatherton, 2000; Vohs & Schmeichel, 2003). Recent research supports the strength model of self-regulation by demonstrating that experiencing the initial task that requires self-regulatory exertion only impairs performance on follow-up tasks that also require self-regulatory exertion. For example, depletion impairs performance on complex thinking tasks (e.g., cognitive extrapolation, thoughtful reading comprehension) but not on simpler mental activities (e.g., general knowledge, memorization and recall of nonsense syllables) (Schmeichel, Vohs, & Baumeister, 2003).

The volume of evidence amassed since the late 1990s to support the strength model leaves little doubt that prior self-regulatory exertion impairs self-regulation on subsequent tasks. As this literature has matured, scholars have become increasingly interested in identifying the psychological mechanisms through which engaging in the first task impairs performance on the second one. Several findings raise the intriguing possibility that the psychological processes linking initial self-regulatory exertion to subsequent self-regulatory failure remain mysterious to those very individuals who so reliably fall prey to them. For example, evidence suggests that depletion effects are not caused by differences across experimental conditions in mood (e.g., Ciarocco, Sommer, & Baumeister, 2001; Schmeichel et al., 2003; Vohs & Schmeichel, 2003), in self-efficacy (Wallace & Baumeister, 2002), or even in subjectively experienced depletion (e.g., Muraven & Slessareva, 2003; Schmeichel et al., 2003). From this perspective, perhaps attempts to identify verbally the driving mechanisms underlying our self-regulatory strength depletion amounts to "telling more than we can know" (Nisbett & Wilson, 1977, p. 231). It is plausible, for example, that participants in the two-task paradigm are not consciously aware of how performing the first task has influenced their psychological dynamics, a state of affairs that would leave them particularly vulnerable to the effects of depletion because they would be unable to rally resources deliberately to counteract its effects (see the discussion by Finkel & Campbell, 2001).

As emphasized earlier, the primary goal of the present research is to examine whether experiencing high-maintenance interaction impairs subsequent, individual-level self-regulatory success. A secondary goal is to investigate whether participants are consciously aware of how high-maintenance interaction is influencing them. We systematically examine whether subjectively experienced depletion (the most plausible mechanism)—and mood, self-efficacy, and liking for the interaction partner (three other possible mechanisms)—mediate the effect of high-maintenance interaction on impaired self-regulation. If these systematic efforts to establish the existence of a self-report mediator reveal reliable evidence for one or more of these mechanisms, such evidence would expand researchers' knowledge of the precise pathway through which high-maintenance interaction impairs self-regulation. If these efforts reliably fail to reveal any evidence to support any of these possible mechanisms, such evidence would also expand researchers' knowledge of these processes, specifically by providing support for the notion that such interaction impairs individuals' subsequent self-regulation without their awareness.

Hypothesis and Research Overview

As observed previously, research investigating the effects of high-maintenance interaction on self-regulation is sparse. To fill this gap—and on the basis of the preceding theoretical analysis—we advance the hypothesis that in comparison to experiencing low-maintenance interaction, experiencing high-maintenance interaction results in impaired individual-level self-regulation on subsequent, unrelated tasks. We report the results of five studies manipulating whether participants experienced poorly or well-coordinated interaction with a confederate before performing an individual-level behavioral task requiring self-regulatory exertion. We operationalized self-regulatory success by assessing (a) preferences for a challenging task with high reward potential over an easy task with low reward potential (Study 1) and (b) task performance (anagram performance in Study 1, Graduate Record Examination [GRE] performance in Studies 2 and 3, physical stamina in Study 4, and fine motor control in Study 5). In all studies, we also examined whether participants were consciously aware of how high-maintenance interaction affected them.

Study 1: Maze Task

The primary goal of Study 1 was to present a first test of the hypothesis that experiencing high-maintenance interaction results in impaired self-regulation on subsequent tasks. We devised an experimental manipulation of social coordination (high- vs. low-maintenance interaction) with a same-sex stranger, examining whether individuals who experience poorly coordinated interpersonal interaction would perform worse on subsequent self-regulatory tasks relative to those who experience well-coordinated interaction. We included two different, theoretically derived measures of self-regulation (Baumeister et al., 1994; Gottfredson & Hirschi, 1990): *task motivation*, or whether participants prefer to engage in a challenging task that has the potential to be rewarding or an easy task that is unlikely to be rewarding, and *task performance*, or how well participants perform on a task of intermediate difficulty.

Study 1 participants interacted with a confederate of the experimenter whose behavior made social coordination either high maintenance (inefficient, difficult) or low maintenance (efficient, easy). After this interaction, we provided participants with the option of performing (by themselves) either a challenging task that had the potential to be rewarding or an easy task that was unlikely to be rewarding. On the basis of previous research suggesting that a central correlate of poor self-regulation is a preference for simple tasks (Gottfredson & Hirschi, 1990; Grasmick, Tittle, Bursik, & Arneklev, 1993; see also Flora, Finkel, & Foshee, 2003) and the observation that depleted individuals prefer to engage in simple tasks (e.g., watching television) rather than challenging tasks (e.g., doing homework), we expected that participants assigned to the high-maintenance condition would be less likely to select the challenging, potentially rewarding task than would those assigned to the low-maintenance condition.

After participants selected the easy or the challenging task, we presented all of them with the identical task of intermediate difficulty. Building on the idea that high-maintenance interaction impairs self-regulation (e.g., concentration, motivation), we predicted that participants assigned to the high-maintenance condition would perform worse on this task than would those assigned to the low-maintenance condition.

Method

Participants. Participants were 26 female undergraduates who volunteered to take part in the study in partial fulfillment of the requirements for an introductory psychology course. These women were 18.92 ($SD = 1.16$) years old on average, and most were Caucasian (15% African American and 85% Caucasian).

Procedure. Participants reported to the experiment and waited outside the laboratory. Waiting with them was another "participant," who was actually a confederate of the experimenter. Participants were greeted by the experimenter, who explained to them that they would first perform a task together and, subsequently, they would perform a task independently. The experimenter added that the person who signed up for Working With Others (always the participant) would be the "Tracker" in the first task and the person who signed up for Teamwork and Communication (always the confederate) would be the "Communicator."

Modifying a procedure from prior research (Engebretson, Matthews, & Scheier, 1989), the experimenter led participants to a room partially divided by a partition. On a desk on one side of the partition was a computer joystick that was ostensibly connected to the computer on the other side of the partition. The partition was arranged such that (a) the participant and the confederate were unable to see one another and (b) only the confederate was able to see the computer monitor.

The experimenter explained to the newly formed partners that they would be performing a 3-min collaborative maze task. Specifically, she told them the following:

> In this task, the goal is for the two of you to coordinate your efforts to achieve optimal performance on the task. The task requires that the Tracker [participant] trace an irregular maze using the joystick. When [the Tracker] deviates from the maze, the computer will score it as time off the maze. However, as you can see, [the Tracker's] view of the maze will be obstructed, which will force [her] to rely on the Communicator [confederate] for directions. The Communicator will only be allowed to direct the Tracker using the following terms: *left, right, up, down, diagonal, slower, faster,* and *stop*. The Tracker is not allowed to speak at all during the task—no exceptions. Performance on this task will be evaluated based on the distance traveled (or speed) and the number of errors, and it will be compared against normative scores available from previous testing.

Participants were randomly assigned to one of two conditions for this social coordination task. In the high-maintenance condition, the confederate made a scripted series of errors in her directions. Typical errors were "Wait!" and "Right . . . I mean left." The confederate made roughly one error every 10 directions and deliberately remained out of sync with the participant. In the low-maintenance condition, she followed the same script but without making errors and while staying in sync. To minimize the likelihood that individuals in the high-maintenance condition would feel that they had performed worse on the maze task than would those in the low-maintenance condition, the experimenter gave participants in both conditions the same feedback, stating that they had scored somewhat above average. To maximize the likelihood that participants would believe this feedback, we displayed it on the computer screen.

Following the maze task, the experimenter led the participant and the confederate to separate rooms to complete individual tasks. After dismissing the confederate, she returned to inform the participant that the next task would be to solve anagrams. The participant was asked to choose between (a) easy anagrams that could be fun and not too challenging to solve or (b) difficult anagrams that take more concentration but could be rewarding to solve. The participant's preference for the easy versus the challenging task served as our measure of task motivation.

After recording the participant's answer, the experimenter left the room, ostensibly to retrieve the selected anagram task. When she returned, however, she informed the participant that only a moderately challenging set of anagrams was available; that is, regardless of the participant's task preference and experimental condition, the experimenter presented every participant with the same anagram task—one of intermediate difficulty (as reported by Gilhooly & Johnson, 1978). The experimenter gave participants 5 min to solve as many of the 15 anagrams as they could. The number of correctly solved anagrams served as our measure of task performance.

Participants then completed a final questionnaire consisting of a two-item subjectively experienced depletion measure ("At the end of the task, I felt emotionally drained" and "At the end of the task, I felt tired"; $\alpha = .79$), a two-item measure of liking for the interaction partner ("Overall, I liked my partner"), and a four-item manipulation check assessing the degree to which they experienced the maze interaction as a high-maintenance interaction (e.g., "We had a difficult time communicating," "It was easy for us to coordinate our efforts"; the latter of which was reverse-scored; $\alpha = .87$).

Results and Discussion

Manipulation check. Before performing hypothesis tests, we wanted to discern whether participants in the high-maintenance

condition experienced the interaction with the confederate as more high maintenance than did those in the low-maintenance condition. Results from an independent-samples *t* test revealed that participants assigned to the high-maintenance condition indeed felt that the interaction was significantly more high maintenance ($M = 2.29$, $SD = 0.95$) than did those in the low-maintenance condition ($M = 1.63$, $SD = 0.43$), $t(24) = 2.27$, $p = .03$.

Hypothesis tests. As described above, we included two dependent measures to test our hypothesis that high-maintenance interaction results in impaired self-regulation: (a) task motivation and (b) task performance. First, as depicted in Figure 1, results from a chi-square test revealed that participants who had been assigned to the high-maintenance condition were significantly and substantially less likely to choose the challenging task than were those who had been assigned to the low-maintenance condition, $\chi^2(1) = 5.85$, $p = .02$. These results suggest that people who have recently experienced a potentially depleting social interaction prefer to engage in simple, nonchallenging tasks rather than in challenging tasks with high reward potential.

Second, as depicted in Figure 2, results from an independent-samples *t* test revealed that participants who had been assigned to the low-maintenance condition solved 56% more anagrams than did those who had been assigned to the high-maintenance condition, $t(24) = 2.31$, $p = .03$. We also performed an additional regression analysis predicting the number of anagrams solved from experimental condition, controlling for the effects of task motivation. This analysis revealed a significant effect of the experimental condition on the number of anagrams solved, $\beta = .51$, $t(23) = 2.43$, $p = .02$, which suggests that high-maintenance interaction impairs self-regulation, even after we controlled for task motivation.

Auxiliary analyses. To discern whether liking for the interaction partner accounted for the effect of the social coordination manipulation on impaired self-regulation, we conducted two multiple regression analyses predicting, respectively, task motivation (selection of the challenging vs. easy anagrams) and task performance (number of anagrams solved) from the social coordination manipulation and the liking measure. Results revealed that the social coordination manipulation predicted unique variance in both task motivation, $\beta = .47$, $t(23) = 2.47$, $p = .02$, and task performance, $\beta = -.40$, $t(23) = -2.11$, $p < .05$, whereas the liking measure did not (both $|ts| < 1.00$). To examine whether including subjectively experienced depletion in the model altered conclusions, we conducted two additional multiple regression analyses predicting, respectively, task motivation and task performance from the social coordination manipulation and the subjectively experienced depletion measure. Results revealed that the social coordination manipulation predicted unique variance in both task motivation, $\beta = .47$, $t(23) = 2.58$, $p = .02$, and task performance, $\beta = -.43$, $t(23) = -2.31$, $p = .03$, whereas the subjectively experienced depletion measure did not (both $|ts| < 1.00$). Although mediation by subjectively experienced depletion seemed plausible a priori, the nonsignificant difference on this variable as a function of experimental condition is consistent with previous findings in the depletion literature (e.g., Muraven & Slessareva, 2003; Schmeichel et al., 2003).

Summary. Taken together, the Study 1 results provide strong initial support for the notion that high-maintenance interaction causes impaired self-regulation. Participants who were randomly assigned to engage in a 3-min high-maintenance (relative to low-maintenance) interaction subsequently exhibited substantially impaired task motivation and task performance. This effect was not mediated by liking for the interaction partner or subjectively experienced depletion.

Study 2: Data Entry Task

The primary goal of Study 2 was to replicate the Study 1 findings with a method that used (a) new coordination and self-regulation tasks and (b) a no-interaction control condition. Although the Study 1 results suggest that in comparison to the effects of low-maintenance interaction, high-maintenance interaction impairs self-regulatory success, they do not enable us to discern whether (a) high-maintenance interaction is destructive, (b) low-maintenance interaction is constructive, or (c) some combination of these possibilities is the case. Given that efficient social coor-

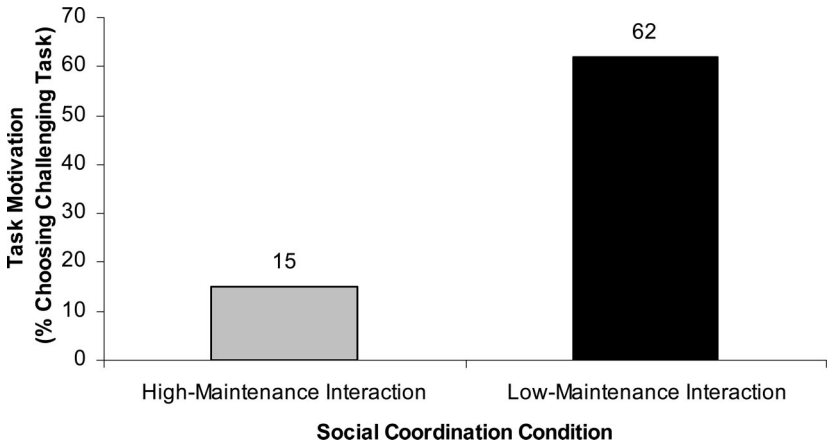

Figure 1. Study 1: The percentage of participants electing to perform the challenging anagram task (rather than the simple one) as a function of whether they had previously engaged in a high-maintenance or a low-maintenance interaction with a confederate.

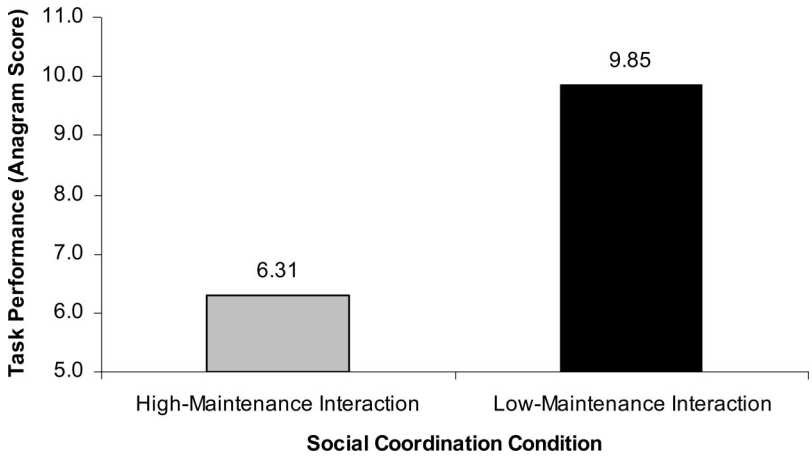

Figure 2. Study 1: The number of anagrams participants solved as a function of whether they had previously engaged in a high-maintenance or a low-maintenance interaction with a confederate.

dination is the norm (with poor coordination as the exception; see the Introduction), we predicted that high-maintenance interaction would impair self-regulation but low-maintenance interaction would not strengthen it.

In Study 2, we randomly assigned participants to perform a data entry task (a) with a confederate who made the interaction high maintenance, (b) with a confederate who made the interaction low maintenance, or (c) alone. In the two dyadic conditions, the same-sex confederate read a string of numbers to the participant, who entered them into a computer spreadsheet. After completing this task, participants spent 10 min working (alone) on analytical GRE questions.

We chose analytical GRE questions as our dependent measure for two primary reasons. First, performance on standardized tests has important real-world implications. Second, this task is cognitively demanding. To perform well, individuals must focus intently on diverse pieces of information at once, which requires motivation and persistent concentration (Yang & Johnson-Laird, 2001). As mentioned earlier, previous research has demonstrated that performance on the analytical section of the GRE is exactly the type of cognitive ability that becomes impaired when individuals experience self-regulatory strength depletion (Schmeichel et al., 2003).

Method

Participants. Participants were 58 undergraduates who volunteered to take part in the study in partial fulfillment of the requirements for an introductory psychology course.[1] We dropped 4 participants (1 because of suspicion regarding our experimental procedures, 2 because of the participants' failure to follow directions during the data entry task, and 1 because the experimenter forgot to administer the GRE measure), leaving a sample of 54 participants (37 women) who were 19.70 (SD = 1.22) years old on average and predominantly Caucasian (6% African American, 91% Caucasian, and 4% other).[2]

Procedure. The Study 2 procedures paralleled those used in Study 1. Participants reported to the experiment and waited outside the laboratory. Waiting with them was a same-sex "participant" who was actually a confederate of the experimenter. Participants were greeted by the experimenter, who explained to them that they would first perform a task together, and subsequently, they would perform a task independently. The experimenter added that the person who signed up for Working With Others (always the participant) would be the "Recorder" in the first task and the person who signed up for Teamwork and Communication (always the confederate) would be the "Communicator."

Participants were led to a room partially divided by a partition. The data to be entered were on a desk on one side of the partition, but the computer into which the data were to be entered was on the other side. The partition was arranged such that (a) the participant and the confederate were unable to see one another, (b) only the participant could see the computer monitor, and (c) only the confederate could see the data to be entered.

In the two dyadic conditions, the experimenter explained to the newly formed partners that they would be performing a collaborative data entry task and that performance on this task was predictive of future career success. Specifically, she told them the following:

> In many workplaces, people need to rely on each other to get a job done. In this task, the goal is for the two of you to coordinate your efforts to achieve optimal performance on a data entry task. The task requires that the Recorder [participant] enter the data being called out as accurately as possible. . . . Your goal is to enter as much data as you can, which will force you to rely on the Communicator [confederate] for the data. The Communicator will call out the data as it is listed on the sheet. Performance on this task will be evaluated based on your speed and accuracy, and it will be compared against normative scores available from previous work. Previous research has shown that this

[1] We discarded 15 participants because their sessions were conducted by an experimenter who experienced difficulties in running the sessions. After lab members alerted us to her consistent failure to follow experimental procedures, we examined the rate at which substantial problems (experimenter error and participant suspicion) occurred in the sessions she ran relative to this rate for the other experimenters. These problems were 3 times more likely in her sessions than in the other four experimenters' sessions combined.

[2] Although approximately one third of the Study 2 participants were male, a quirk in random assignment resulted in only 2 of these male participants being assigned to each experimental condition (with 13 assigned to the control condition). As such, we are not in a position to examine sex effects in this study, and the analyses reported later in this article collapse across participant sex. We addressed this concern in Studies 3 through 5.

task is predictive of people's later job success and reflects on how well you perform in various work environments.

After giving these directions, the experimenter left the room. The participant and the confederate performed this task for 5 min. In the alone condition, the experimenter instructed the participant on the data entry task without mentioning another person or coordination.

Participants were randomly assigned to one of three conditions for this data entry task. In the high-maintenance condition, the confederate made a scripted series of errors while calling out the data. Typical errors were "2—I mean 1" and "9, oops, sorry, I meant 4." The confederate made roughly one error for every 10 number sets. To strengthen the manipulation further, the confederate remained out of sync with the participant: He or she could hear the strokes of the keyboard and strategically avoided developing a rhythm with the participant. In the low-maintenance condition, the confederate followed the same script but without making errors and while staying in sync as the participant entered the data. In the alone (control) condition, the participant entered the data by himself or herself. After this task was completed, the experimenter gave participants in all conditions the same feedback, stating that they scored somewhat above average on the data entry task. As in Study 1, we displayed this feedback on the computer screen.

Next, the experimenter directed the participants to perform an individual task answering analytical problems taken from the GRE. She gave the participants 10 min to solve as many of the nine problems as they could; the number of correctly answered GRE problems served as our dependent measure. Unlike participants in Study 1, those in Study 2 did not choose whether they preferred to perform an easy or a challenging task; we simply presented them with the GRE task without any reference to task difficulty.

Following the GRE task, participants completed a brief questionnaire ("After the data entry task, . . ."), including a two-item subjectively experienced depletion measure ("I felt drained" and "I felt mentally exhausted"), a straightforward two-item mood measure ("I was in a bad mood," reverse-scored, and "I was in a good mood"), and a two-item self-efficacy measure ("I felt like I could accomplish my goals" and "I felt confident in my abilities"). Although previous research suggests that the effects that emerge in the two-task paradigm are not due to differences in mood (e.g., Ciarocco et al., 2001; Schmeichel et al., 2003; Vohs & Schmeichel, 2003) or self-efficacy (Wallace & Baumeister, 2002) across experimental conditions, we wanted to discern whether these constructs might account for the effect of the social coordination manipulation on impaired self-regulation in the present research. Participants then completed a three-item questionnaire assessing liking for the interaction partner ("I liked my lab partner," "My lab partner was nice," and "It was a pleasure working with my lab partner").[3] Finally, all participants completed the four-item manipulation check (as in Study 1) assessing the degree to which they experienced the interaction with the confederate as a high-maintenance interaction. The depletion ($\alpha = .88$), mood ($\alpha = .71$), self-efficacy ($\alpha = .86$), liking ($\alpha = .88$), and high-maintenance interaction ($\alpha = .86$) measures exhibited acceptable scale reliabilities.

Results and Discussion

Manipulation check. As in Study 1, we wanted to discern whether participants in the high-maintenance condition experienced the interaction with the confederate as more high maintenance than did those in the low-maintenance condition. (The control participants did not complete this measure because they never interacted with a confederate.) Results from an independent-samples t test revealed that participants assigned to the high-maintenance condition indeed felt that the interaction was significantly more high maintenance ($M = 2.15$, $SD = 0.82$) than did those assigned to the low-maintenance condition ($M = 1.44$, $SD = 0.75$), $t(27) = 2.41$, $p = .02$.

Hypothesis tests. We predicted that participants who experienced the high-maintenance data entry interaction would correctly answer significantly fewer GRE questions relative to those who experienced the low-maintenance data entry interaction or who performed the data entry task by themselves. A one-way analysis of variance (ANOVA) predicting the number of GRE questions answered correctly from the experimental manipulation revealed a significant difference between conditions, $F(2, 51) = 6.67$, $p < .01$. To gain insight into this omnibus difference, we created two dummy variables to compare (a) the low-maintenance participants with the high-maintenance participants and (b) the alone participants with the high-maintenance participants. As depicted in Figure 3, results supported our predictions: Compared with the high-maintenance participants, the low-maintenance participants correctly answered 45% more GRE questions, $F(1, 51) = 8.90$, $p < .01$, and the alone participants correctly answered 50% more, $F(1, 51) = 12.35$, $p < .001$. Also as predicted, a separate analysis failed to reveal significant differences between the low-maintenance participants and the alone participants, $F(1, 51) < 1.00$.

Auxiliary analyses. To discern whether mood and/or self-efficacy accounted for the effect of the social coordination manipulation on poor GRE performance, we conducted an additional multiple regression analysis predicting GRE score from the social coordination manipulation and both possible mediators. Results revealed that the social coordination manipulation predicted unique variance in GRE performance, $F(2, 49) = 6.79$, $p = .003$, whereas mood and self-efficacy did not, Fs$(1, 49) < 1.00$. A follow-up analysis added liking for the interaction partner to this model and also revealed that the social coordination manipulation predicted unique variance in GRE performance, $F(2, 17) = 8.12$, $p = .01$, whereas mood, self-efficacy, and liking did not, Fs$(1, 17) < 1.22$, ps $> .28$. To examine whether including subjectively experienced depletion in the model altered conclusions, we conducted a multiple regression analysis predicting GRE performance from the social coordination manipulation and the subjectively experienced depletion measure. Results revealed that the social coordination manipulation predicted unique variance in GRE performance, $F(2, 50) = 6.66$, $p = .003$, whereas the subjectively experienced depletion measure did not, $F(1, 50) < 1.00$. Overall, these results provide no support for the notion that mood, self-efficacy, liking for the interaction partner, or subjectively experienced depletion mediates the association of high-maintenance interaction with impaired self-regulation.

Summary. The results from Study 2 extended those from Study 1 in suggesting that high-maintenance interaction causes impaired self-regulation when compared with a low-maintenance condition or a control condition. These findings suggest that high-maintenance interaction impairs self-regulation but that low-maintenance interaction does not enhance it. This effect was not attributable to subjectively experienced depletion, mood, self-efficacy, or liking for the partner.

[3] A procedural error meant that only 22 of the participants completed this three-item measure.

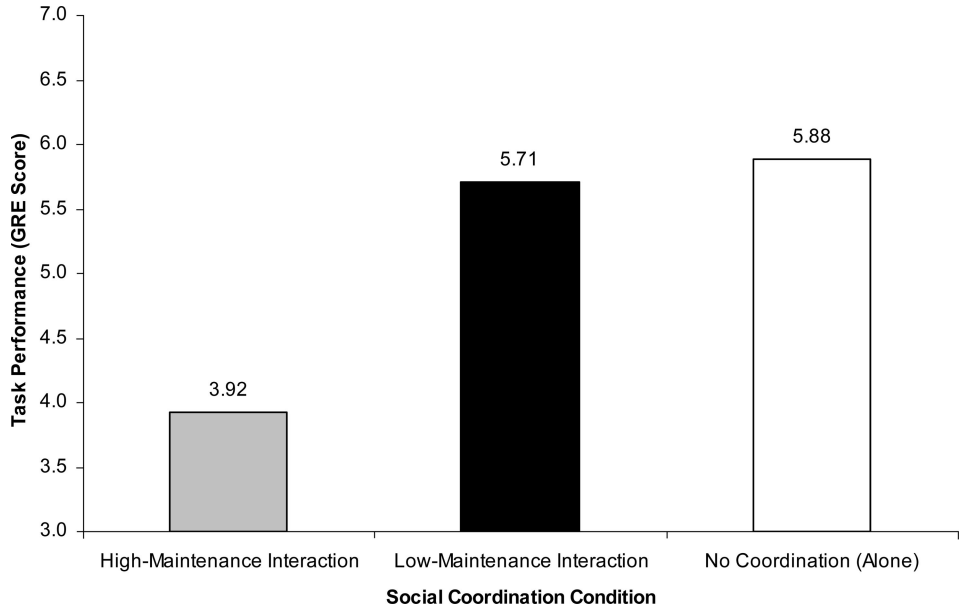

Figure 3. Study 2: The number of Graduate Record Exam (GRE) problems participants answered correctly as a function of whether they had previously engaged in a high-maintenance or a low-maintenance interaction with a confederate, or had previously performed the task alone.

Study 3: Maze Task (Revisited)

Studies 1 and 2 provide good support for the hypothesis that high-maintenance interaction causes impaired self-regulation. The primary goal of Study 3 was to provide a stronger test of the mediation and confound analyses by assessing the three possible mechanisms that seemed most plausible to us (subjectively experienced depletion, mood, and self-efficacy) between the high-maintenance manipulation and the self-regulatory task rather than after it (as done in Studies 1 and 2). Given that this goal involves establishing the stability of the effects demonstrated in Studies 1 and 2, Study 3 directly replicated procedures from these previous studies: Participants completed a maze task with a confederate (as in Study 1) and then performed a GRE task (as in Study 2).

Method

Participants. Participants were 46 undergraduates (24 women) who volunteered to take part in the study in partial fulfillment of the requirements for an introductory psychology course. These participants were 19.24 ($SD = 1.52$) years old on average, and most were Caucasian (4% African American, 7% Asian American, 87% Caucasian, and 2% other).

Procedure. The procedures for Study 3 were borrowed directly from previous studies. Participants experienced the same confederate-based maze task as used in Study 1 and the same GRE task as used in Study 2. After participating in the maze task but before participating in the GRE task, participants completed a brief questionnaire ("I feel . . .") including an elaborated, seven-item subjectively experienced depletion measure (mentally exhausted; motivated, reverse-scored; drained; energetic, reverse-scored; worn out; lazy; and focused, reverse-scored); an elaborated, seven-item mood measure (happy, content, cheerful, angry, frustrated, annoyed, and sad; the four negative mood items were reverse-scored); and a three-item self-efficacy measure (competent, capable, confident). After completing the GRE task, participants also completed the same four-item manipulation check measure used in Studies 1 and 2 to assess the degree to which they experienced the interaction with the confederate as a high-maintenance interaction. The depletion ($\alpha = .68$), mood ($\alpha = .77$), self-efficacy ($\alpha = .82$), and high-maintenance interaction ($\alpha = .71$) measures all exhibited acceptable scale reliabilities.

Results and Discussion

Manipulation check. Unlike the manipulation check findings from the identical task in Study 1 and from the conceptually similar task in Study 2, results from an independent-samples *t* test did not reveal significant differences between the high-maintenance ($M = 2.12$, $SD = 0.87$) and the low-maintenance ($M = 1.98$, $SD = 0.80$) conditions in predicting subjectively experienced high-maintenance interaction, $\beta = .08$, $|t(44)| < 1.00$, although means were descriptively in the sensible direction. We continued with hypothesis tests despite the nonsignificant manipulation check because (a) this manipulation has been effective previously (in Study 1), (b) theory dictates that the task fits the criteria for a high-maintenance interaction, and (c) significant effects of the social coordination manipulation on GRE performance in the absence of a significant manipulation check could provide preliminary support for the intriguing idea that high-maintenance interaction can impair subsequent self-regulation even when the individual fails to recognize consciously that the interaction had been a high-maintenance one.

Hypothesis tests. To test the hypothesis that participants who experienced the high-maintenance maze interaction would correctly answer significantly fewer GRE questions relative to those who experienced the low-maintenance maze interaction, we performed an independent-samples *t* test predicting GRE score from the social coordination manipulation. As depicted in Figure 4, results revealed that participants who had been assigned to the low-maintenance condition solved 35% more GRE problems than

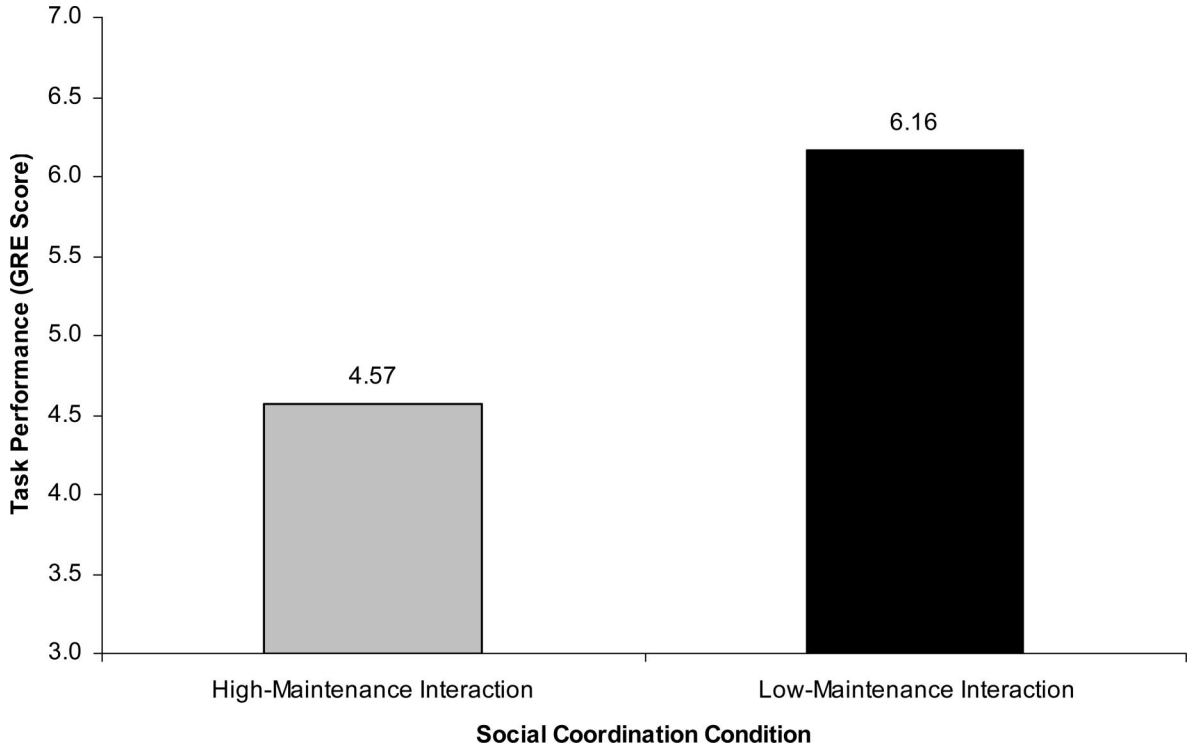

Figure 4. Study 3: The number of Graduate Record Exam (GRE) problems participants answered correctly as a function of whether they had previously engaged in a high-maintenance or a low-maintenance interaction with a confederate.

did those who had been assigned to the high-maintenance condition, $t(44) = -2.68$, $p = .01$.

An exploratory multiple regression analysis examining whether the strength of this effect differed as a function of participant sex revealed a significant Social Coordination Condition × Participant Sex interaction effect, $\beta = .31$, $t(42) = 2.28$, $p = .03$. This analysis also revealed a significant main effect for the social coordination manipulation, $\beta = -.36$, $t(42) = -2.64$, $p = .01$, but not for participant sex, $\beta = .00$, $t(42) = 0.03$, $p = .97$. Follow-up analyses revealed that the high-maintenance interaction effect was in the expected direction for both sexes but stronger for females. Given that we did not predict this sex difference, that the general trends were in the expected direction for both sexes, and that the social coordination main effect remained robust in the analysis controlling for participant sex and the interaction effect, we awaited the results of Studies 4 and 5 before drawing firm conclusions about sex differences.

Auxiliary analyses. To discern whether mood and/or self-efficacy accounted for the effect of the social coordination manipulation on GRE performance, we conducted an additional multiple regression analysis predicting GRE score from social coordination and both of these possible mediators. Results revealed that the social coordination manipulation predicted unique variance in GRE performance, $\beta = -.32$, $t(42) = -2.13$, $p = .04$, whereas mood and self-efficacy did not, $|\beta s| < .15$, $|ts(20)| < 1.00$. To examine whether including subjectively experienced depletion in the model altered conclusions, we conducted a multiple regression analysis predicting GRE performance from the social coordination manipulation and the subjectively experienced depletion measure. Results revealed that the social coordination manipulation predicted unique variance in GRE performance, $\beta = -.59$, $t(21) = -3.19$, $p = .004$, whereas the subjectively experienced depletion measure did not, $\beta = .07$, $|t(21)| < 1.00$. These results once again provide no support for the notion that mood, self-efficacy, or subjectively experienced depletion mediates the association of high-maintenance interaction with impaired self-regulation.

Summary. Complementing previous findings, then, the Study 3 results suggest that high-maintenance interaction causes impaired self-regulation. This effect was not attributable to subjectively experienced depletion, mood, or self-efficacy.

Study 4: Social Problem Solving

Studies 1 through 3 provide strong support for the hypothesis that high-maintenance interaction causes impaired self-regulation. These studies all used conceptually similar procedures: Participants, who were not allowed to speak to or see their partner, engaged in a nonemotional dyadic task with a confederate who made the interaction either high maintenance or low maintenance. The primary goal of Study 4 was to examine whether the high-maintenance interaction effect would emerge when we used substantially different procedures designed to address the limitations of those used in Studies 1 through 3. Participants in Study 4 were assigned to provide guidance or comfort to an emotionally distressed stranger (who was actually a confederate). We (a) investigated high-maintenance interaction by manipulating whether or

not this distressed stranger was receptive to participants' efforts to help and (b) hypothesized that the poor social coordination resulting from the repeated and ineffective efforts to help the stranger who was unreceptive would lead to impaired self-regulation on a subsequent, unrelated task.

The Study 4 procedures differed in three important ways from those used in the previous studies. First, participants were placed in an active instead of a passive role: Rather than being dependent in the high-maintenance interaction condition on the confederate's poor directions (as in the previous studies), participants were now in the agentic role of attempting to help the confederate with a problem, offering reasonable suggestions that simply failed to promote synchronized dialogue. Second, the experimental procedures placed no constraints on the participant's behavior: Rather than having to stay silent throughout the task, participants were now allowed to communicate freely in any way that felt appropriate to them. Third and finally, participants in Study 4 experienced an emotionally involving and ecologically valid task: Rather than engaging in minimally involving and artificial tasks (dyadic data entry without being able to see the person reading the numbers or navigating a computerized maze without being able to see the computer monitor), participants were now placed into a deeply involving context that served as a realistic analogue for situations they were likely to experience in their own lives. Furthermore, performing these tasks well in their own lives influences the quality of their interpersonal relationships. Replicating the high-maintenance interaction effect with these substantially revised procedures would rule out alternative explanations for the findings of Studies 1 though 3 (e.g., that the effect is unique to being in a passive role, to situations in which one experiences externally imposed restraints on one's communication, or to tasks that are uninvolving or artificial).

In addition to ruling out alternative explanations for the high-maintenance interaction effect and exploring its boundary conditions, the procedures used in Study 4 can shed light on the psychological dynamics underlying a particularly robust and important empirical finding in clinical psychology: that experiencing depression predicts being socially rejected (Segrin & Dillard, 1992; see also Coyne, Thompson, & Palmer, 2002). Although abundant research has investigated why these associations exist, scholars have not definitively identified what particular interpersonal dynamics result in the rejection of individuals who are experiencing depression (e.g., Coyne, 1990; Segrin & Dillard, 1992). We suggest that a heretofore unexplored reason why relationship partners tend to be rejecting is that interacting with individuals who are experiencing depression frequently requires exertions of effort that can be depleting; Study 4 represents an experimental test of this hypothesis.

Why might it be depleting to interact with individuals who are experiencing depression? We suggest that the depletion results from the attributional tendencies of individuals experiencing depression regarding their negative circumstances. Individuals experiencing depression tend to exhibit a distinctive and hopeless attribution style that increases the likelihood that attempts to help them will prove ineffective (cf. Seligman, Abramson, Semmel, & von Baeyer, 1979). To be comforted by others virtually requires that one be receptive to suggestions—or at least to the possibility that there exists some course of action that could make a difference. Individuals exhibiting the depressive attribution style, however, are unlikely to be receptive; no matter what suggestion they receive, they are unlikely to see potential for improvement. As such, repeated attempts to help them may well render the interaction decidedly unsynchronized.

What happens, in contrast, when one tries to comfort an individual who is experiencing distress but who does not exhibit the depressive attribution style? Such interaction, we suggest, is less depleting because such a person is likely to be receptive to suggestions, thereby allowing the conversation to progress in a more satisfying direction. Comforting such a person does not require repeated exertions to generate new ideas oriented toward being helpful and providing traction for progressing dialogue. Of particular relevance to the current article, interaction with a person who is distressed but not characterized by the depressive attribution style is likely to be better coordinated than that with a person who is distressed and also characterized by the depressive attribution style.

To test the idea that interacting with an individual exhibiting both distress and the depressive attribution style is more depleting than is interacting with an individual exhibiting distress but not the depressive attribution style, we designed a problem-solving task that entailed two roles: talker and advisor. Talkers (always the confederate) generated a personal problem they were willing to share and receive help with solving, and advisors (always the participant) listened to the talker share the problem and then offered suggestions or advice. The goal of the task was to work toward possible solutions to the talker's problem. Talkers (confederates) always discussed the identical distressing problem. In the low-maintenance (nondepressed) condition, they were receptive to the advisor's suggestions or advice; in the high-maintenance (depressed) condition, they were not.

In addition to this new interaction task, the present study also used handgrip stamina as a new measure of self-regulatory resources. In addition to assessing physical strength, performing well on the handgrip stamina task requires self-regulatory exertion:

> After squeezing the handgrip for a short period of time, hand muscles become fatigued and the person feels the urge to relax the muscles. Self-regulation requires overcoming this fatigue and pushing oneself to continue, similar to other forms of stamina. (Ciarocco et al., 2001, p. 1160; see also Muraven et al., 1998)

If results revealed that experiencing a high-maintenance interaction results in impaired physical stamina, this would complement our previous findings to suggest that high-maintenance interaction results in a relatively global impairment in self-regulatory functioning.

Method

Participants. Participants were 37 undergraduates who volunteered to take part in the study in partial fulfillment of the requirements for an introductory psychology course. We dropped 5 participants (3 because of suspicion regarding our experimental procedures, 1 because of equipment failure, and 1 whose handgrip times exceeded 3 standard deviations from the mean for her sex—whereas no other participant was even 2 standard deviations from it), leaving a sample of 32 participants (17 women) who were 19.52 (SD = 1.12) years old on average and predominantly Asian American and Caucasian (31% Asian American, 47% Caucasian, 9% Hispanic, and 9% other; 1 participant did not report race information).

Procedure. As described earlier, Study 4 was designed to parallel Studies 1 through 3 in its core structural features (manipulating whether social coordination was efficient or inefficient and then assessing self-regulation with a behavioral measure) but to be dissimilar in the particular procedures in which these structural features were embedded. Participants reported to the experiment and waited outside the laboratory. Waiting with them once again was a same-sex "participant" who was actually a confederate of the experimenter. The experimenter greeted the participant and the confederate and led them to a pleasant room where they were seated on an L-shaped sofa in predetermined positions so they could easily look at each other. After they were situated, the experimenter explained that she needed to finish setting things up before they could begin the experiment. She excused herself, leaving the participant and the confederate alone in the room together for 3 min. We included this seemingly impromptu acquaintance period so they could establish a modicum of rapport to facilitate the upcoming self-disclosure task (explained later). The confederate was instructed to initiate conversation if the participant did not. At this point, nobody (not even the confederate or the experimenter) knew to which experimental condition the participant had been assigned. The confederate's behavior was neutral enough to facilitate smooth and believable transitions to his or her subsequent role in either the experimental or the control condition.

When the experimenter returned, she apologized for the delay and explained the procedures for the handgrip task to the participant and the confederate. To minimize the likelihood that the participant would become suspicious that the handgrip and the self-disclosure tasks were linked, the experimenter explained that she was collecting pilot data for a sports psychologist at another university and that two assessments would be taken at separate times and then averaged to get the most accurate estimates. The first assessment took place at this time and provided a baseline measure of physical stamina preceding any experimental manipulation. The experimenter took the participant and the confederate, one at a time, to a separate room for this initial assessment to minimize evaluation apprehension and possible competitiveness. She instructed them to squeeze the handgrip closed around an eraser for as long as possible; when the eraser dropped from the handgrip, she stopped the timer.

Once the participant and the confederate had completed the baseline handgrip assessment and were again situated on the couch, the experimenter introduced the "cooperative problem-solving task." Roles for the task were ostensibly assigned randomly by having each person select a piece of paper out of a basket, but the procedure was rigged so the participant was always assigned to the role of advisor and the confederate was always assigned to the role of the talker. The experimenter explained that the talker would "begin the conversation by sharing a personal problem he has been dealing with lately."[4] She instructed the talker that the personal problem should be something that he feels comfortable discussing and reassured him that neither participant would be forced to talk about anything that makes him uncomfortable. She continued by instructing the talker to "pick a problem that has been bothering you recently and something that you could use some help solving; it can be anything from roommate trouble or relationship problems, to a conflict with parents, or something more general."

After acknowledging that it sometimes takes people a few minutes to think of a personal problem they are willing to discuss, she asked him whether anything came to mind. He responded, "Um, yeah, I think I have something I could talk about."

The experimenter then explained that the advisor's job was to listen to the talker describe the personal problem, after which the talker and the advisor would engage in a problem-solving discussion. She explained that "the advisor should feel free to offer advice or suggestions, just as you would with a friend. Together, your goal is to come up with possible solutions to the problem at hand."

Before she left, the experimenter handed each of them a sheet of paper with an outline of the instructions to remind them of their respective roles and the goal of the task. On the paper handed to the talker (confederate) was a number indicating the experimental condition for that particular session. To keep her blind, the experimenter did not know which number was linked to which condition. Once the experimenter had left the room and closed the door, the talker began describing the problem, which was scripted as follows for both conditions:

> Well, ok, this is a little weird, but I guess there *is* something I could talk about. The main problem that I've been having is adjusting to life at college—or just trying to find my place here. I don't know—I was really looking forward to coming to college, but so far I really haven't been that happy here. I haven't really liked many of my classes—so I don't have any clue what I will major in. I get along with my roommate really well, but other than that, I haven't really met that many cool people—or anyone that I really have much in common with. It just seems like maybe this isn't the right place for me. I mean, I knew that there would be an adjustment period in the beginning—when I first got here—but it seems like by now everyone I know is really happy here and I'm not, really. And my old friends from high school—who go to other schools—seem to be really settled in having a lot of fun. So I just feel like, basically, I'm not having that much fun and I'm not even learning that much. So, I'm starting to wonder if maybe I made the wrong decision in coming to Northwestern.

Before the first session, both the male and the female confederate practiced this description dozens of times until we were satisfied that each was both convincing and consistent.

Once the talker described his problem to the advisor, they proceeded to the problem-solving discussion. The talker described the same problem in both the high-maintenance and the low-maintenance conditions; these conditions were differentiated by his responses to the advisor's suggestions. In the depressed (high-maintenance) condition, his responses were generally pessimistic about the likelihood of improvement regarding the problem; he deflected the advisor's suggestions as unlikely to improve the situation. In the nondepressed (low-maintenance) condition, in contrast, he was less pessimistic and more receptive to the advisor's suggestions. Even in the nondepressed condition, though, he never became happy or exhibited signs that he thought the problem was resolved; rather, he remained distressed about the problem but was receptive to the advisor's attempts to help with problem solving. The talkers (confederates) were trained until they felt comfortable spontaneously generating responses while staying "in character." Most important, we emphasized to them that "the key difference [between the two conditions] is that you are open to suggestions and the possibility of improvement" only in the nondepressed condition.

After the talker and advisor had discussed the talker's problem for 6 min, the experimenter returned and explained that because the interaction task was now complete, the talker and the advisor would be separated to do the second handgrip measure and to complete some questionnaires. The experimenter led the confederate into another room and returned immediately to assess the participant's postinteraction handgrip score.

Participants then completed a brief questionnaire ("After conversation, I felt . . ."), including a three-item subjectively experienced depletion measure (emotionally depleted, drained, and mentally tired), a seven-item mood measure (calm, content, happy, frustrated, annoyed, angry, and sad; the four negative mood items were reverse-scored), and a two-item self-efficacy measure (capable of accomplishing my goals, confident in my abilities). Finally, participants completed a four-item manipulation check

[4] As mentioned earlier, the participant interacted with a same-sex confederate. In explaining the procedures, we describe male sessions because this focus allows us to use female pronouns (e.g., "she") to refer to the experimenter (always female) and male pronouns to refer to the participant or the confederate. It also allows us to avoid tortured pronoun combinations such as "he or she."

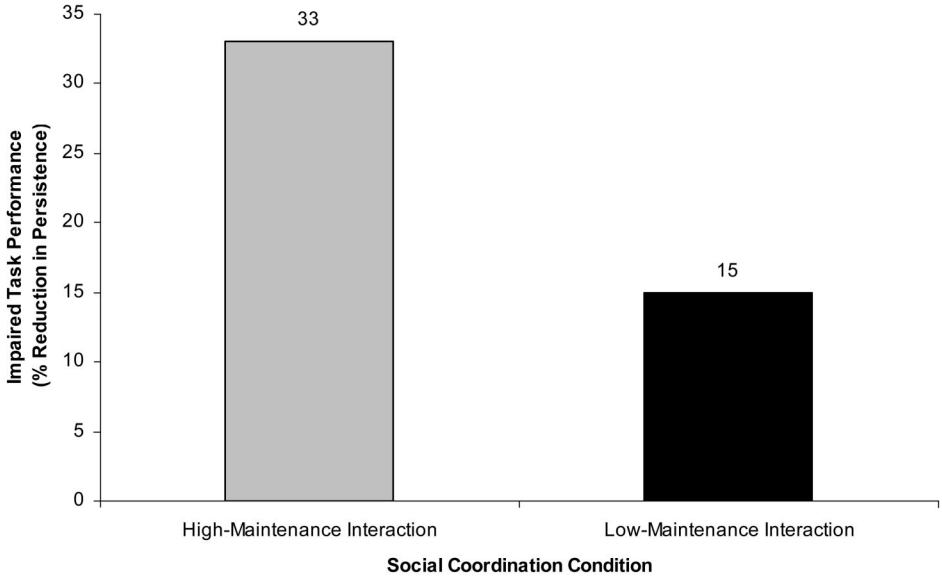

Figure 5. Study 4: The percentage reduction in physical stamina as a function of whether participants had previously interacted with a distressed person either exhibiting the depressive attribution style (high-maintenance interaction) or not (low-maintenance interaction).

modified for the current study to assess the degree to which they experienced the interaction as a high-maintenance interaction (e.g., "The conversation went very smoothly," reverse-scored; "I felt comfortable giving advice," reverse-scored). The depletion ($\alpha = .90$), mood ($\alpha = .76$), and self-efficacy ($\alpha = .87$) measures exhibited acceptable reliabilities; the reliability of the high-maintenance interaction measure was somewhat lower ($\alpha = .59$).

Results and Discussion

Manipulation check. Unlike the manipulation check findings from Studies 1 and 2 but like those from Study 3, results from an independent-samples *t* test did not reveal significant differences between the high-maintenance ($M = 2.13$, $SD = 0.80$) and the low-maintenance ($M = 1.95$, $SD = 0.50$) conditions in predicting subjectively experienced high-maintenance interaction, $\beta = .14$, $|t(29)| < 1.00$, although means were descriptively in the sensible direction. For reasons similar to those advanced in Study 3, we continued with hypothesis tests despite the nonsignificant manipulation check.

Hypothesis tests. To test the hypothesis that participants who experienced the high-maintenance problem-solving interaction would exhibit greater decrements in physical stamina from before to after this interaction relative to those who experienced the low-maintenance one, we performed a mixed-model ANOVA in which time (the first vs. the second handgrip assessment) was a within-subjects variable and the social coordination manipulation and participant sex were between-subjects variables. As predicted, results revealed a significant Time × Condition interaction effect, such that the decrement in physical stamina between the preinteraction and postinteraction assessments was larger in the high-maintenance condition ($M = 27.88$ s, $SD = 32.67$ s) than in the low-maintenance condition ($M = 8.20$ s, $SD = 27.11$ s), $F(1, 28) = 5.42$, $p = .03$. This Time × Condition interaction effect was not significantly moderated by participant sex, $F(1, 28) = 1.77$, $p = .19$. As depicted in Figure 5, participants in the high-maintenance condition showed a 33% decrement from preinteraction to postinteraction physical stamina (from 84.09 s to 56.22 s), whereas those in the low-maintenance condition showed a 15% decrement (from 54.72 s to 46.52 s).[5]

Auxiliary analyses. To discern whether mood and/or self-efficacy accounted for the effect of the social coordination manipulation on the decrement in physical stamina scores, we conducted a mixed-model multiple regression analysis in which time was a within-subjects variable, the social coordination manipulation was a dichotomous between-subjects variable, and both mood and self-efficacy were continuous between-subjects variables. Results revealed that the Time × Condition interaction effect was significant, $F(1, 28) = 5.23$, $p = .03$, whereas the Time × Mood and the Time × Self-Efficacy interaction effects were not, $Fs(1, 28) < 1.17$, $ps > .29$. To examine whether including subjectively experienced depletion in the model altered conclusions, we conducted a mixed-model multiple regression analysis in which time was a within-subjects variable, the social coordination manipulation was a dichotomous between-subjects variable, and the subjectively experienced depletion measure was a between-subjects continuous variable. Results revealed that the Time × Condition interaction effect remained (marginally) significant, $F(1, 29) = 3.93$, $p =$

[5] An auxiliary analysis examining whether the preinteraction (and premanipulation) stamina scores differed across the experimental conditions failed to reveal evidence that they did, $t(30) = 1.41$, $p = .17$. Even so, the pattern of means in this study leaves open the alternative explanation that our results are due to regression to the mean. Given that Studies 1, 2, 3, and 5 are not susceptible to this alternative explanation, the most parsimonious explanation for the Study 4 results is that experiencing the high-maintenance interaction impaired physical stamina.

.057, whereas the Time × Subjectively Experienced Depletion interaction effect was not, $F(1, 29) < 1.00$. These results once again provide no support for the notion that mood, self-efficacy, or subjectively experienced depletion mediates the association of high-maintenance interaction with impaired self-regulation.

Summary. Complementing previous findings, then, the Study 4 results suggest that high-maintenance interaction causes impaired self-regulation on a physical stamina task, an effect that was not mediated by subjectively experienced depletion, mood, or self-efficacy. Given that the social problem-solving procedures used in Study 4 are strikingly different from, and more ecologically valid than, the maze and data entry procedures used in Studies 1 through 3, we gain confidence in the generality of the adverse effects of high-maintenance interaction on subsequent self-regulation. As in Study 3, the predicted results emerged in Study 4 even though the manipulation check failed to reveal significant differences across the two conditions in the degree to which participants reported that the interaction was high maintenance. This pattern of results again raises the intriguing possibility that high-maintenance interaction can impair self-regulation even when individuals do not realize that they have experienced a high-maintenance interaction in the first place. Study 5 was designed to provide a rigorous test of this idea.

Study 5: Nonconscious Behavioral Mimicry

In addition to providing strong support for the hypothesis that high-maintenance interaction impairs individual-level self-regulation on subsequent, unrelated tasks, Studies 1 through 4 also revealed a striking lack of support for the possibility that this effect is mediated through plausible conscious processes (subjectively experienced depletion, mood, self-efficacy, or liking for the interaction partner). This reliable pattern of findings is consistent with the possibility that high-maintenance interaction impairs self-regulation without requiring high-level cognitive mediation. Building on the plausible notion that humans are constantly, nonconsciously attuned to their social coordination experiences—particularly to social coordination failures—in their everyday lives, we incorporated in Study 5 a subtle manipulation of high-maintenance interaction in which participants were not consciously aware that the social coordination had been inefficient, or even that social coordination issues were relevant. This design differed from those used in Studies 1 through 4 in that the manipulations in those previous studies involved unambiguous instances of poor social coordination; participants in the high-maintenance interaction conditions, for example, surely recognized that the confederate was guiding them poorly on the maze and data entry tasks (Studies 1 through 3) and was being unreceptive to one's well-intentioned suggestions (Study 4).

As in Studies 1 through 4, we manipulated social coordination by having participants engage in a dyadic task with a confederate. Unlike these previous studies, however, the Study 5 procedure manipulated social coordination without influencing performance on the dyadic task. Whereas successful performance on the maze task (Studies 1 and 3), the data entry task (Study 2), and even the problem-solving task (Study 4) obviously depended on the confederate's behavior across the social coordination conditions, successful performance on the task used in Study 5 did not. In addition, the Study 5 procedure manipulated poor social coordination without participants' even being aware that they were experiencing it in the first place. To accomplish this, we adapted procedures from the burgeoning literature on nonconscious behavioral mimicry (e.g., Chartrand & Bargh, 1999). In these studies, half of the participants interact with a confederate who subtly mimics their mannerisms and gestures (the low-maintenance interaction, or mimicry, condition) and the other half interact with a confederate who subtly but deliberately stays out of sync with their mannerisms and gestures (the high-maintenance interaction, or misalignment, condition).

Our decision to use behavioral mimicry and antimimicry (misalignment) procedures to manipulate social coordination nonconsciously builds on the idea (initially expressed in the Introduction) that social interaction is remarkably complex. Strategies for navigating most of this complexity are so deeply rooted in the knowledge base of a healthy adult that they are generally implemented without effort or even conscious awareness. Individuals are rarely required, for example, to concentrate effortfully on subtle but crucial aspects of social interaction such as where to stand, where to focus one's gaze, how much distance to leave between themselves and their interaction partner, what language to speak, and so on. There are, however, instances in which these bedrock components of social coordination break down, and such breakdowns vary widely in how salient they are. At the salient extreme, it would be disconcerting to negotiate a price with a plumber who insists on addressing all communication to your forearm or to collaborate with a colleague who only communicates with you while rubbing your head. Toward the nonsalient extreme, abundant evidence has been emerging to suggest that subtle behavioral coordination is a fundamental aspect of interpersonal interaction (see Bernieri, 1988; Chartrand & Bargh, 1999; Chartrand, Maddux, & Lakin, 2005; Lakin, Jefferis, Cheng, & Chartrand, 2003). For example, when individuals shake their foot or touch their face during a social interaction unrelated to these body movements, the person with whom they are interacting also engages in foot-shaking or face-touching behaviors—and these spontaneous mimicry behaviors are enacted without any conscious awareness that mimicry is taking place (Chartrand & Bargh, 1999). Despite its subtlety, however, we suggest that poorly synchronized behavioral mimicry can render otherwise efficient social interaction more complex, requiring at a nonconscious-level heightened attention to social coordination processes. The increased vigilance required during interaction characterized by such social misalignment, we argue, transforms it into high-maintenance interaction and increases the likelihood of impaired self-regulation on subsequent, unrelated tasks.

In addition to using a new method to manipulate social coordination, Study 5 also introduced a new method to assess self-regulation, a task measuring fine motor control. If results revealed that experiencing a high-maintenance interaction results in impaired fine motor control, this would provide additional evidence of the generality of self-regulatory impairment resulting from high-maintenance interaction.

Method

Participants. Participants were 29 undergraduates (18 women) who participated in exchange for $20.

Procedure. As in Studies 1 through 4, Study 5 incorporated a procedure that built on the two-task paradigm: First, participants interacted with

a (female) confederate; second, they performed a self-regulatory task on their own. The experimenter instructed the participant and the confederate to engage in a picture description task, in which they took turns describing to one another a series of 12 color pictures selected from magazines such as *Time* and *National Geographic*. The experiment was rigged such that the confederate described the same 6 of the 12 pictures in every session; this allowed her to memorize a prepared script for those pictures and deliver her descriptions with natural hesitations and vocal disfluencies to make her responses appear spontaneous. Given that the picture description task was intended to manipulate nonconscious behavioral mimicry but not intimacy, we strived to minimize the degree to which the interactants engaged in self-disclosure. As such, the experimenter informed the interactants that their task was to provide a factual description of the pictures rather than to discuss their emotional or intellectual responses to them. These procedures differed essentially from the emotionally involving ones used in Study 4 and provided the first task in which participants could talk with the confederate (in contrast to Studies 1 through 3) on a task that is not emotional in nature (in contrast to Study 4). In addition, Study 5 was the first in which the participant and the confederate occupied equivalent roles.

After explaining the procedures of the picture description task, the experimenter gave the confederate and the participant the predetermined set of pictures. The interactants then took turns describing their pictures (without showing the other person the picture they were describing) until they had described all 12 pictures. The experimenter always casually asked the confederate to begin first. During this picture description task, the experimenter maintained a neutral body position (feet flat on the floor, hands folded in her lap, and sitting upright in her chair) to avoid influencing the mimicry manipulation. The picture description task took approximately 30 min ($M = 29.07$, $SD = 5.01$) to complete.

We used this picture description task as a medium through which to incorporate our social coordination manipulation. Participants were randomly assigned to work with a confederate who either subtly mimicked or antimimicked their physical mannerisms and gestures during the task. In the mimicry condition, the confederate unobtrusively mimicked the participant with a slight variation and a delay of 1 or 2 s. For example, when participants crossed their legs, the confederate would do the same after enough of a delay so the mimicry would not be obvious. In the misalignment condition, the confederate unobtrusively engaged in antimimicry behaviors, such that her body language was always out of sync with that of the participant. For example, if participants sat still and upright in their chair, the confederate might fidget and lean forward.

Following the picture description task, the experimenter told the interactants that they would complete the rest of the experiment in separate rooms. After dismissing the confederate, the experimenter returned to the participant and informed him or her that the next task would be to play the game Operation,[6] which is a commercial board game for children that involves removing up to 12 fake body parts from a cartoon patient using a tweezer-like device (see Vohs et al., 2005, Study 7). Each of the 12 fake body parts rested in a shallow pit surrounded by metal edges. Whenever the participant inadvertently touched the tweezers against the metal edges, the game emitted a loud buzzing noise and the cartoon patient's nose glowed red. The experimenter explained that the participant's tasks were (a) to remove each of the body parts in a smooth movement in which the tweezers did not touch the metal edges and (b) to do so as quickly as possible.

Participants attempted to remove the 12 body parts in a predetermined order. If participants accidentally touched the tweezers to the metal edges, setting off the buzzing noise and the reddened nose, they were required to remove the tweezers and initiate a new attempt to remove that particular piece. Participants were allowed to give up on any particular piece and move on to the next one with the understanding that they could not go back and attempt to remove that piece again; deciding to move on without successfully removing the piece would represent a failure to perform optimally on the task.

Given that Operation is designed for children as young as 6 years of age, almost all adults are capable of removing all the pieces eventually if they have sufficient motivation and concentration to do so. As such, our central measure of impaired self-regulation was removal failures, or the number of pieces participants never removed. We also examined the effect of the mimicry manipulation on removal efficiency, or the ratio of the number of pieces successfully removed divided by the total number of removal attempts the participant made. We included this second dependent measure because it provided information relevant to the question of why high-maintenance interaction impairs self-regulation. One possibility is that individuals who have experienced a high-maintenance interaction perform poorly on subsequent tasks not because they are ineffective at performing them but rather because they do not even bother to try to perform them in the first place. If this is the case, results should reveal that participants who have experienced a high-maintenance interaction successfully remove fewer pieces even though they are just as effective at removing a piece on any given removal attempt (i.e., that they should have more removal failures, even though their removal efficiency is no worse). A second possibility is that individuals who have experienced a high-maintenance interaction perform poorly on subsequent tasks because they perform them sloppily. If this is the case, results should reveal that participants who have experienced a high-maintenance interaction make just as many (if not more) attempts to remove the body parts relative to those who have experienced the low-maintenance interaction but that each given attempt is less likely to be successful (i.e., that they should have both more removal failures and also poorer removal efficiency).

After completing the Operation task, participants completed a brief questionnaire ("When I interacted with the other participant, . . ."), including a five-item subjectively experienced depletion measure (mentally exhausted; motivated, reverse-scored; drained; energetic, reverse-scored; and worn out), a six-item mood measure (happy, content, cheerful, angry, dejected, and sad; the three negative mood items were reverse-scored), a four-item self-efficacy measure (competent, capable, confident, and self-assured) and a two-item questionnaire assessing liking for the interaction partner ("I liked the other participant," and "The other participant strikes me as someone I could be friends with"). Finally, they completed the same four-item measure used in Studies 1 though 3 to assess the degree to which they experienced the interaction with the confederate as a high-maintenance interaction. The depletion ($\alpha = .84$), mood ($\alpha = .77$), self-efficacy ($\alpha = .89$), and liking ($\alpha = .76$) measures all exhibited acceptable scale reliabilities; the high-maintenance interaction ($\alpha = .59$) measure exhibited poorer reliability than the identical measure exhibited in Studies 1 through 3.[7] Consistent with previous research using mimicry procedures (see Chartrand et al., 2005, for a review), a thorough funnel debriefing failed to identify any participants who were aware that they had been mimicked or antimimicked—or even that the study had anything to do with behavioral coordination.

Results and Discussion

The mimicry manipulation and subjective experiences of high-maintenance interaction. Before performing hypothesis tests, we wanted to discern whether participants in the high-maintenance (misalignment) condition subjectively experienced the interaction with the confederate as more high maintenance than did those in

[6] We thank Kathleen Vohs for suggesting this task.

[7] Dropping one of the four items on this high-maintenance interaction measure improved its reliability somewhat ($\alpha = .68$). When substituting in this reduced, three-item measure instead of the four-item measure, results were essentially the same. This fact, in conjunction with the fact that the four-item measure was used in Studies 1 through 3, led us to stick with the full, four-item measure.

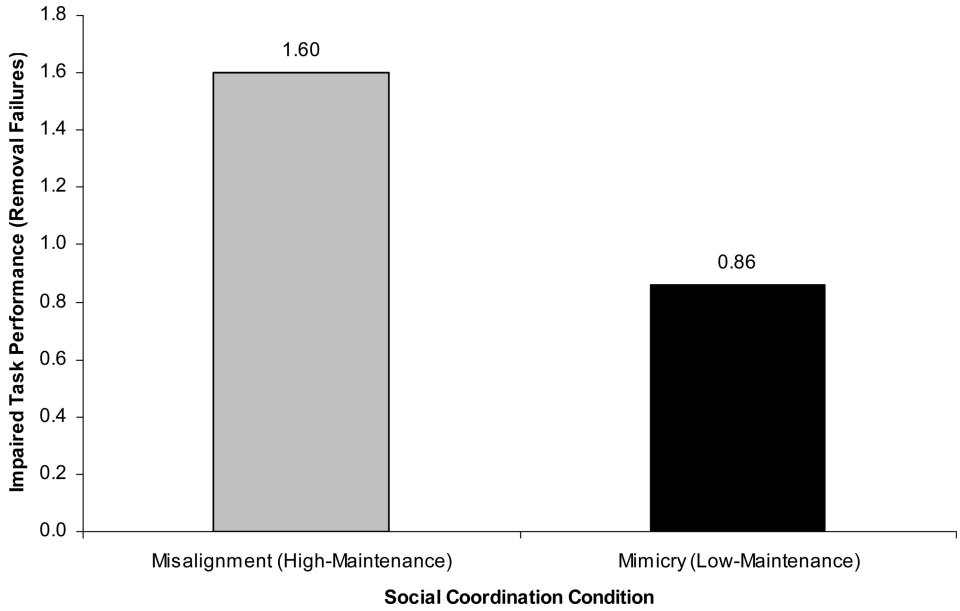

Figure 6. Study 5: The number of removal failures as a function of whether participants had previously engaged in a social interaction characterized by misalignment (high-maintenance interaction) or mimicry (low-maintenance interaction).

the low-maintenance (mimicry) condition. Consistent with the findings from Studies 3 and 4, results revealed that participants in the high-maintenance interaction (misalignment) condition (M = 2.38, SD = 0.65) did not report that the interaction was significantly more high maintenance than did those in the low-maintenance interaction (mimicry) condition (M = 2.05, SD = 0.67), $t(26) = 1.29$, $p > .20$, although means were descriptively in the sensible direction.

Hypothesis tests. We predicted that participants who were assigned to the high-maintenance interaction (misalignment) condition would exhibit a greater number of removal failures relative to those who were assigned to the low-maintenance interaction (mimicry) condition. As depicted in Figure 6, results from an independent-samples t test revealed strong support for this prediction, $t(27) = 2.85$, $p < .01$. Although participants in both conditions successfully removed most of the pieces, participants who had experienced the high-maintenance (misalignment) interaction exhibited 86% more removal failures relative to those who had experienced the low-maintenance (mimicry) interaction.

We also examined the effect of the social coordination manipulation on removal efficiency to discern whether participants who were assigned to the high-maintenance interaction (misalignment) condition performed worse than those who were assigned to the low-maintenance interaction (mimicry) condition on the Operation task because (a) they simply failed to make attempts to remove as many pieces or (b) they were less effective at removing the pieces they attempted to remove (poor removal efficiency). As depicted in Figure 7, results from an independent-samples t test revealed that participants who were assigned to the high-maintenance interaction (misalignment) condition tended to exhibit poor removal efficiency relative to those who were assigned to the low-maintenance interaction (mimicry) condition, $t(27) = -2.00$, $p < .056$. This finding reveals that relative to participants who were assigned to the high-maintenance interaction (misalignment) condition, those who were assigned to the low-maintenance interaction (mimicry) condition were 39% more likely to remove a piece successfully on any given attempt (11.14 successes in 51.14 attempts vs. 10.40 successes in 66.47 attempts).[8] Participant sex did not significantly moderate the effects of the social coordination manipulation on removal failures, $t(25) = 1.17$, $p = .25$, or on removal efficiency, $t(25) = 0.23$, $p = .82$.

Auxiliary analyses. To discern whether mood, self-efficacy, and/or liking for the interaction partner accounted for the effect of the social coordination (mimicry) manipulation on removal failures, we conducted an additional multiple regression analysis predicting removal failures from the mimicry manipulation and all three of these possible mediators. Results revealed that the mimicry manipulation still predicted unique variance, $\beta = .52$, $t(24) = 2.79$, $p = .01$, whereas mood, self-efficacy, and liking did not, $|\beta s| < .25$, $|ts(24)| < 1.11$. To examine whether including subjectively experienced depletion in the model altered conclusions, we conducted a multiple regression analysis predicting removal failures from the mimicry manipulation and the subjectively experienced depletion measure. Results revealed that the mimicry manipulation predicted unique variance in removal failures, $\beta = .51$, $t(26) = 2.91$, $p < .01$, whereas the subjectively experienced depletion measure did not, $\beta = -.13$, $|t(26)| < 1.00$. These results once again provide no support for the notion that mood, self-efficacy, liking for the interaction partner, or subjectively experienced depletion

[8] An auxiliary analysis revealed a trend such that participants in the antimimicry condition (M = 56.07, SD = 27.18) made a larger number of failed attempts than did those in the mimicry condition (M = 40.00, SD = 24.21), $\beta = .31$, $t(27) = 1.68$, $p = .105$.

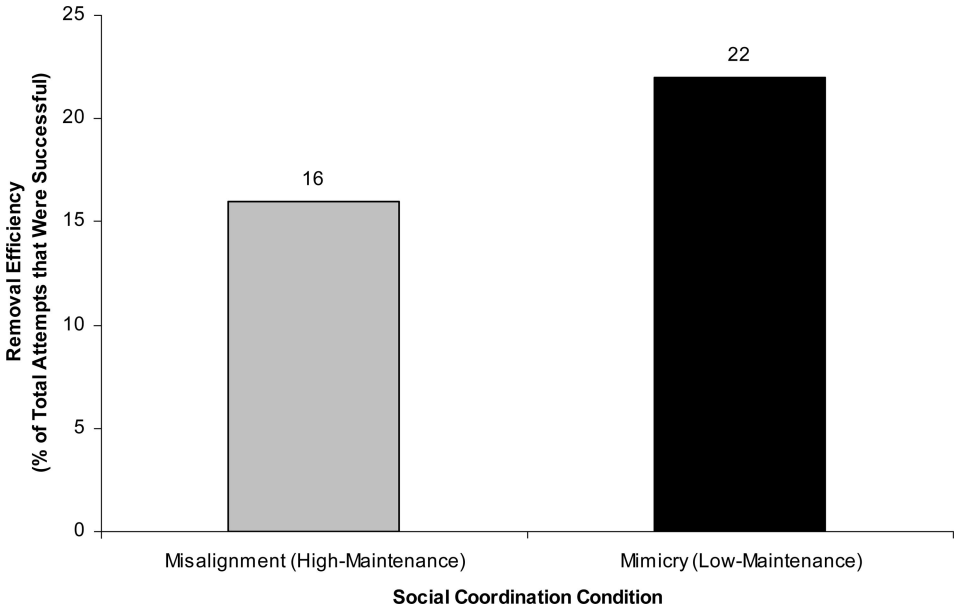

Figure 7. Study 5: Removal efficiency, or the percentage of removal attempts in which the body part was successfully removed, as a function of whether participants had previously engaged in a social interaction characterized by misalignment (high-maintenance interaction) or mimicry (low-maintenance interaction).

mediates the association of high-maintenance interaction with impaired self-regulation.

Summary. Complementing the findings from Studies 1 through 4, the Study 5 results suggest that high-maintenance interaction (as manipulated through antimimicry procedures) causes impaired self-regulation (as assessed with a measure of fine motor control). A likely reason for this impaired performance is that individuals perform subsequent tasks sloppily following high-maintenance interaction: Their likelihood of success in removing the target piece on any given trial was impaired in the high-maintenance interaction (misalignment) condition relative to the low-maintenance interaction (mimicry) condition. These effects were not attributable to subjectively experienced depletion, mood, self-efficacy, or liking for the partner, nor were they moderated by participant sex. The corpus of evidence across studies provides little reason to conclude that the high-maintenance interaction effect is systematically moderated by sex.

General Discussion

Across five studies, we manipulated social coordination to examine how high-maintenance interaction affects individual-level self-regulation on subsequent, unrelated tasks. We manipulated social coordination by having participants experience either a high- or a low-maintenance interaction on a maze task (Studies 1 and 3), a data entry task (Study 2), an emotional problem-solving task (Study 4), or an emotionless picture description task (Study 5). We assessed self-regulation with (a) measures of preferences for a challenging task with high reward potential over an easy task with low reward potential (Study 1) and (b) task performance (anagram performance in Study 1, GRE performance in Studies 2 and 3, physical stamina in Study 4, and fine motor control in Study 5). Results from all five studies supported the hypothesis that high-maintenance interaction impairs the interactants' subsequent self-regulatory success on unrelated tasks. This effect remained robust beyond the effects of subjectively experienced depletion, mood, self-efficacy, and liking for the interaction partner—and it emerged even with a nonconscious manipulation of high-maintenance interaction (Study 5).

Two of our findings paint a picture of the individual who has just endured a high-maintenance interaction as somebody with diminished achievement motivation and sloppy task performance rather than as somebody striving for excellence but coming up short. The first finding comes from Study 1 (see Figure 1): High-maintenance interaction causes individuals to prefer to engage in simple tasks that are unlikely to require much effort but also are unlikely to be rewarding. The second finding comes from Study 5 (see Figure 7): High-maintenance interaction causes individuals to perform subsequent tasks without the care and attention to detail that they would otherwise apply. These findings suggest that experiencing high-maintenance interaction causes individuals to avoid challenging tasks, if possible, or to perform them without the focus and concentration required to perform them well.

Implications

The research reported herein has immediate implications for the interdependence theory and the self-regulation traditions. Regarding the former, although (a) *interdependence* refers to the processes through which interactants influence one another's experiences and outcomes (Rusbult & Van Lange, 1996), and (b) interdependence scholars have long theorized about how social coordination can interfere with or facilitate effective functioning (e.g., Kelley et al., 2003; Thibaut & Kelley, 1959), the present article is the first empirical report to use an interdependence theory analysis of the personal consequences of poor social coordination.

More generally, relationships scholars have largely neglected issues of social coordination, focusing instead on topics such as conflict, attributions, trust, satisfaction, and commitment. As we suggested in the Introduction, social coordination is a central but neglected topic for relationships theories in general and for interdependence theory in particular.

The present research also adds our voice to the emerging chorus of scholars emphasizing the importance of incorporating social dynamics into theories of self-regulation. The most prominent theories of self-regulation focus primarily on self-regulatory dynamics taking place within a given individual (e.g., Baumeister & Heatherton, 1996; Carver & Scheier, 1998; Higgins, 2000; Mischel et al., 1989). The past several years, however, have witnessed several compelling demonstrations of the power of interpersonal relationships to influence self-regulation (e.g., Baumeister, DeWall, Ciarocco, & Twenge, 2005; Fitzsimons & Bargh, 2003; Shah, 2003). The present report complements these recent demonstrations by emphasizing that social coordination is yet another interpersonal process with important implications for self-regulation.

The Question of Mediation

Despite rigorous efforts across all five studies to find evidence that subjectively experienced depletion, mood, self-efficacy, or liking for the interaction partner might mediate the effects of the social coordination manipulations on self-regulation, none could account for these effects. This robust failure to find evidence that high-level conscious mechanisms mediate the high-maintenance interaction effect is consistent with prior attempts to find self-report mediators of the association of initial self-regulatory exertion with subsequent self-regulatory impairment (e.g., Ciarocco et al., 2001; Muraven & Slessareva, 2003; Schmeichel et al., 2003; Vohs & Schmeichel, 2003; Wallace & Baumeister, 2002), and it supports the idea that high-maintenance interaction impairs self-regulation without individuals even being aware that the interaction has influenced them. Especially strong evidence for this possibility emerged from Study 3, Study 4, and, in particular, Study 5. These studies failed to reveal significant differences across the high- and low-maintenance interaction conditions in the degree to which participants subjectively experienced the interaction as high maintenance, but they all nonetheless revealed that participants assigned to the high-maintenance interaction condition generally exhibited impaired self-regulation relative to those assigned to the low-maintenance interaction condition. There are circumstances under which scholars must entertain the possibility that the null hypothesis is correct (see Greenwald, 1975), and the pervasiveness of the null mediational effects in all five studies suggests that it may be appropriate to draw the tentative conclusion that high-maintenance interaction impairs self-regulation in the absence of high-level cognitive mediation.

Although the present studies do not provide definitive evidence that the high-maintenance interaction is mediated by self-regulatory depletion, a recent series of studies by Richeson and colleagues in the prejudice literature suggests that depletion is a likely mediator of the effect. In one study, the differential activation of a brain region known to be associated with self-regulation (the dorsolateral prefrontal cortex; DLPFC) in response to Black versus White faces significantly mediated the association of White participants' prejudice scores with their impaired Stroop performance after interacting with a Black confederate; Stroop performance was not significantly impaired after interacting with a White confederate, regardless of the participants' prejudice scores (Richeson et al., 2003). These results are consistent with a self-regulatory depletion explanation: Interracial encounters seem to require that prejudiced White people exert self-regulation (as detected through elevated DLPFC activation), which may well deplete self-regulatory resources and ultimately impair executive control performance. Evidence from a separate series of studies suggests that increasing the self-regulatory demands of interracial interactions results in greater impairment in subsequent Stroop performance, whereas decreasing such demands reduces it (Richeson & Trawalter, 2005). The body of evidence emerging from the research reported herein and that by Richeson and her colleagues indicates that (a) the driving mechanism behind the destructive self-regulatory effects of high-maintenance interaction is self-regulatory strength depletion, but (b) individuals are not consciously aware that the interactions have affected them.

These conclusions suggest that future research striving to establish the mechanisms underlying the high-maintenance interaction effect (and depletion effects more generally) could benefit from an emphasis on nonconscious mediators. The findings implicating the DLPFC as a potential mediator (Richeson et al., 2003) suggest that systematic investigations into brain activity may well reveal important discoveries not only for the high-maintenance interaction and depletion literatures but also for various cognitive neuroscience literatures. In addition, recent research implicating blood glucose as an important predictor of effective self-regulation (e.g., Fairclough & Houston, 2004) suggests that future research could benefit from exploring whether high-maintenance interaction impairs self-regulation because it depletes blood glucose levels. Moving from biological to psychological processes, it is possible that, for example, rumination (perhaps even partly at a conscious level) about the high-maintenance interaction while performing the second task in the two-task paradigm could account for impaired self-regulation. Although the present results (e.g., the Study 1 finding that participants prefer to engage in simple rather than challenging tasks after experiencing a high-maintenance interaction) suggest that this alternative explanation is unlikely to account entirely for the high-maintenance interaction effect, the field could benefit from a systematic investigation of rumination as a mediator of (or as an alternative explanation for) this and other depletion effects.

Who Is Responsible for a High-Maintenance Interaction?

What makes certain social interactions high maintenance and others low maintenance? We suggest that interaction can be high maintenance because of characteristics of (a) the self (Johanna tends to get in people's way when she cooks), (b) the partner (Bob's mistakes make the cooking process inefficient), (c) their interaction (Johanna and Bob do not communicate well when they cook together), or (d) the situation (the arrangement of the kitchen makes coordination especially challenging). The research reported herein manipulated the partner's behavior to create high-maintenance interaction, but future research could delve into any of these four categories of factors or look at the interplay between them. For example, perhaps Johanna experiences greater self-

regulatory failure on subsequent tasks after trying to cook with anybody who is indecisive, especially when the kids are crying.

A Vicious Cycle?

Recent research suggests that effective self-regulation (both high dispositional self-control and low self-regulatory strength depletion) may be an important factor helping people to engage in behaviors that promote relationship well-being (Finkel & Campbell, 2001; Vohs, 2004). The present article complements this work by demonstrating that self-regulatory success is affected by social coordination experiences. In combination, the pattern of results emerging from previous research and the present report suggest that the phenomena of high-maintenance interaction and impaired self-regulation may function together in a vicious cycle. For example, perhaps high-maintenance interaction with a romantic partner impairs self-regulation not only in personal domains, but also in interpersonal domains. This unpleasant pattern can build on itself, resulting in poor personal and interpersonal outcomes. It may provide a partial explanation for the "when it rains, it pours effect" in which personal problems (e.g., lack of productivity at work) are often accompanied by interpersonal problems (e.g., fights with one's partner). Future research could use diary methods to investigate these processes as they transpire in everyday life.

Emotionally Energizing Interaction?

Although the present research focuses on high-maintenance interaction that impairs self-regulation, we are confident that future research will also identify interpersonal processes that enhance self-regulation. Just as interaction partners can deplete us, they should also be able to replenish us. For example, perhaps an affectionate 10-min conversation with a loved one can replenish depleted self-regulatory resources. Recent evidence suggests that the loved one may not even have to be present to bolster the self: Thinking about a person with whom one has a close positive relationship (but not a negative or a distant positive relationship) makes one willing to learn threatening but valuable information about the self (Kumashiro & Sedikides, 2005). Future research could explore why close positive relationships can be replenishing or bolstering.

Limitations and Strengths

We raise two limitations of the present work. First, all studies reported in this article relied on rigged interaction between strangers. Future research could explore how these processes play out in real relationships and real-world situations. Second, as mentioned previously, we have not determined a self-report mechanism by which high-maintenance interaction impairs self-regulation. All four of our likely suspects (subjectively experienced depletion, mood, self-efficacy, and reduced liking for the interaction partner) reliably failed to mediate the effect, and the Study 5 results provide strong support for the intriguing possibility that high-maintenance interaction can impair self-regulation directly and nonconsciously. Future research could complement the present investigation by exploring behavioral, implicit-cognitive, and biological processes that may mediate the effect of high-maintenance interaction on impaired self-regulation.

We also highlight three strengths of the present work. First, strong evidence emerged to suggest that high-maintenance interaction impairs self-regulation across five studies using diverse methods of manipulating high-maintenance interaction and of assessing self-regulation. The effect is remarkably robust. Second, the experimental procedures used in these studies allow us to draw firm conclusions regarding the causal direction of this effect. And third, we have presented evidence to suggest that social coordination processes that take place outside of individuals' conscious awareness can influence interactants' self-regulation. Although the precise mechanisms through which high-maintenance interaction impairs self-regulation remain elusive, finding such consistent evidence that it can impair self-regulation outside of individuals' awareness throws open fascinating directions for future research.

Conclusion

Coordinating behavior with others can be challenging, even when we share the same goals for the interaction. Results from five studies using diverse methods suggest that high-maintenance interaction causes impaired individual-level self-regulation on subsequent, unrelated tasks—and that this process takes place outside of conscious awareness. This work serves as one example of the important role played by interpersonal processes in self-regulatory success.

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Received September 21, 2004
Revision received January 14, 2006
Accepted January 27, 2006 ■