Increasing Self-Regulatory Strength Can Reduce the Depleting Effect of Suppressing Stereotypes

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Three longitudinal studies and one correlational study tested the hypothesis that increasing self-regulatory strength by regular self-regulatory exercise would reduce the intrapsychic costs of suppressing stereotypes. Participants tried to resist using stereotypes while describing or talking to a stimulus person. Participants whose habitual motivation to suppress stereotypes was low exhibited impaired Stroop and anagram performance after the suppression task, presumably because of self-regulatory depletion (i.e., a reduction of self-regulatory strength following prior use). Two weeks of self-regulation exercises (such as using one's nondominant hand or refraining from cursing) eliminated this effect. These findings indicate that self-regulatory exercise can improve resistance to self-regulatory depletion and, consequently, people can suppress stereotypes without suffering subsequent decrements in task performance.

Keywords: *ego depletion; stereotypes; motivation; self-control; self-regulation*

Self-regulation (or self-control) involves the capacity to override initial impulses or responses, including thoughts, emotions, desires, and performance tendencies. As such, it contributes powerfully to the success of humans collectively and members of society individually. Accumulating evidence suggests that being good at self-regulation is predictive of a broad range of desirable outcomes, including interpersonal popularity and good relationships, superior school performance, effective coping, better adjustment, and mental health, as well as less susceptibility to substance abuse problems, pathological eating, and criminality (Gottfredson & Hirschi, 1990; Shoda, Mischel, & Peake, 1990; Tangney, Baumeister, & Boone, 2004).

Another behavior for which self-regulation appears useful is the suppression of stereotypical thoughts. For both social and personal reasons, people may control or inhibit their stereotypical thoughts through the effortful use of self-regulation. However, evidence suggests that the capacity for self-regulation depends on a limited resource that operates like a strength or energy and becomes depleted when it is used (Muraven & Baumeister, 2000). As a consequence, the act of stereotype suppression should consume self-regulatory resources and result in self-regulatory depletion. Indeed, there is evidence that suppressing stereotypes impairs subsequent attempts at self-control (e.g., Gordijn, Hindriks, Koomen, Dijksterhuis, & Van Knippenberg, 2004). Research suggests, however, that regular exercise in self-control attenuates such impairments that result from previous attempts at self-control

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(Muraven, Baumeister, & Tice, 1999). The current work examined whether regular self-control exercise enables people to resist the depleting effect of suppressing stereotypes, as indicated by less subsequent mental fatigue and greater success on a cognitive task following an act of stereotype suppression.

Self-Regulation as a Limited Resource

Self-regulation may be powerfully adaptive and useful at increasing the flexibility and social desirability of human behavior, but the human capacity for self-regulating may be limited. The capacity for self-regulation appears to resemble a strength or energy, which becomes depleted after use (Baumeister, Heatherton, & Tice, 1994; Muraven & Baumeister, 2000). Specifically, self-regulating on an initial task impairs performance on a subsequent self-regulatory task, just as a muscle may become tired and its strength depleted after use (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Schmeichel, Vohs, & Baumeister, 2003). During this state of diminished strength or self-control depletion, the self is less able to regulate its own responses.

Increasing Self-Regulation Via Self-Regulatory Exercise

Fatigue following physical exercise is one hallmark of strength, and most human muscles exhibit that pattern. Another hallmark of strength, however, is that once the muscle recovers from exercise, it may be stronger than it was initially and, of course, athletes everywhere seek to build strength via regular exercise. If self-regulation really does conform to a strength model, then it also should be susceptible to gradual benefit from regular self-regulatory exercise.

Some findings support the idea that frequent exertion of self-control makes people less susceptible to self-control depletion. For instance, after people have performed regular exercises in self-control (e.g., trying to improve their posture, verbal mannerisms, spending habits, or physical exercise regimen), for extended periods of time (e.g., 2-4 weeks), they show less depletion after completing an unrelated self-regulatory task, as compared to people who do not engage in the self-control exercises (Muraven et al., 1999; for review, see Baumeister, Gailliot, DeWall, & Oaten, in press). The implication is that exercising self-regulation in one sphere will improve one's self-control stamina in other, very different spheres.

In each of these studies, however, participants who had performed the self-control exercises exhibited increased self-control strength only after completing an initial self-control task (i.e., when they were depleted). They did not perform better on a self-control task (e.g., a visual tracking task) prior to completing an initial self-control task (i.e., when they were not depleted). In this sense, self-regulatory exercise does not increase raw self-control strength but rather increases self-control stamina. The present investigation sought to investigate whether increasing self-control stamina by means of self-regulatory exercises would reduce the self-control-depleting impact of resisting stereotypes.

Stereotype Suppression and Self-Regulation

Suppressing stereotypes may require an effortful act of self-regulation because stereotypes can be activated automatically upon contact with a person in the target category (e.g., Devine, 1989). The prejudiced thoughts would thus arise unbidden and could bias how the individual treats the other (stereotyped) person. The act of overcoming such a tendency thus requires self-regulation because one must exert some effort to think or behave in ways that are inconsistent with the activated stereotype. Indeed, evidence confirms that suppressing stereotypes and prejudice constitutes a drain on self-regulatory resources, as indicated by subsequent impairments on tasks requiring self-regulation (e.g., Gordijn et al., 2004; Richeson & Shelton, 2003; Richeson & Trawalter, 2005).

Thus, suppressing stereotypes sometimes requires exerting self-regulatory effort and therefore consumes self-regulatory resources. Suppressing stereotypes should not require self-regulation to the same extent among all individuals, however. In particular, the degree of self-regulatory depletion following stereotype suppression should be influenced by individuals' motivation to respond without prejudice.

Individual Differences in Motivation to Respond Without Prejudice

People can be motivated to respond without prejudice for internal or external reasons (Plant & Devine, 1998). Internal motivation to respond without prejudice reflects the desire to respond consistently with personally important, nonprejudiced beliefs. In contrast, external motivation to respond without prejudice reflects the desire to control prejudiced responses for fear of social disapproval that biased statements or actions might elicit.

Individual differences in motivation to respond without prejudice should influence the degree of practice at suppressing stereotypes and, hence, influence the difficulty of suppressing stereotypes. Although the reasons for stereotype control may differ, people who are either internally or externally motivated to respond without prejudice both attempt to control their public expression of stereotypes (Plant & Devine, 1998; Plant, Devine, & Brazy, 2003). Their frequent practice at the

regulation of stereotypes should make this regulation more habitual and familiar and, hence, less effortful than it is for people whose motivation is relatively lower (e.g., see Bargh, 1994; Ericsson & Charness, 1994). As a result, the control of stereotypes may not be depleting for these people when external demands signal the need to suppress (see also Gordijn et al., 2004).

People low in both internal and external motivation, however, are likely relatively less practiced at suppressing stereotypes. In most situations, these people make little effort to respond without prejudice (Plant & Devine, 1998; Plant et al., 2003). Thus, when required to suppress stereotypes, people low in both internal and external motivation should need to exert the most self-control because they are the least practiced at and familiar with suppressing stereotypes and therefore must expend the most self-regulatory effort.

As a first step in examining these issues, a pilot study was conducted showing that participants low in internal and external motivation to respond without prejudice reported having the least amount of practice at suppressing stereotypes compared to participants high in one or both sources of motivation. In fact, they reported not suppressing stereotypes in most contexts.[1] As a result, suppressing stereotypes should be unfamiliar to these people and should therefore require a high level of controlled processing, ultimately requiring and, therefore, depleting their self-regulatory strength. To test this hypothesis in the following studies, we assessed differences between the performance of participants scoring relatively low in both internal and external motivation and the performance of those scoring relatively high in internal or external motivation to respond without prejudice.

Present Research and Predictions

The present investigation consisted of a series of studies designed to test the relationship between self-regulatory strength and stereotype suppression. Specifically, some participants performed exercises aimed at increasing their self-regulatory stamina. We measured their degree of depletion following a task in suppressing stereotypes after a 2-week period of exercise. Some participants exercised self-control either by changing how they normally spoke (Studies 1 & 2) or by using their nonpreferred hand (Studies 2 & 4), whereas participants in a control condition were not asked to perform any exercises. We also assessed how much participants had been exerting self-control on their own (Study 3).

For the stereotype suppression task (adapted from Macrae, Bodenhausen, Milne, & Jetten, 1994) used in Studies 1 to 3, participants were asked to describe a homosexual or a fat person without mentioning any stereotypes. In Study 4, participants had a brief interaction with a gay man. The dependent measure in Studies 1 to 3 involved solving anagrams. The ability to solve anagrams was an appropriate dependent measure because it did not have any direct relation to suppressing stereotypes or motivation to respond without prejudice. Success at solving anagrams has been used frequently in prior research on self-regulation (e.g., Baumeister et al., 1998; Gordijn et al., 2004). The rationale is that solving anagrams requires the person to experiment with combining words in different groupings and then breaking those apart again (overriding) to try a different combination. The dependent measure used in Study 4 was the Stroop task, which required participants to override the incipient response to read words upon their presentation.

We predicted that suppressing stereotypes would cause self-control depletion, as indicated by poorer anagram or Stroop performance. However, we predicted that only participants relatively low in internal and external motivation would appear to be depleted, as compared to participants relatively high in either or both sources of motivation. Furthermore, we predicted that exercises to strengthen self-regulation would attenuate the degree of depletion after suppressing stereotypes. Because we predicted that only participants low in internal and external motivation to respond without prejudice would exhibit signs of depletion, we expected that only they would benefit from the self-regulatory exercises.

STUDY 1

As a first step in our investigation, we recruited only participants who we expected would be depleted following stereotype suppression and would benefit from self-regulatory exercise—low Internal and External Motivation to Respond Without Prejudice Scales (low IMS/EMS)—and one group of participants that we did not expect would be depleted following suppression (low IMS/high EMS). Of interest was whether exercising self-control during a 2-week span would reduce the depletion resulting from the suppression of stereotypes among participants low in both internal and external motivation.

Method

Participants

Forty undergraduates (15 women; 30 White, 6 American Indian, 1 Asian) participated in exchange for credit toward a course requirement. Data from 2 participants were discarded from all analyses because they did not return for the second session. Participants were randomly assigned to a self-control exercise group or no-exercise control group.

Design and Procedure

Assessment of motivation to respond without prejudice. We assessed participants' motivation to respond without prejudice toward homosexuals at mass-testing sessions in the beginning of the semester. At these sessions, participants completed the IMS and EMS for homosexuality (modified from the IMS/EMS for Blacks; Plant & Devine, 1998). The IMS contains five items tapping into internal motivation to respond without prejudice (e.g., "Because of my personal values, I believe that using stereotypes about homosexuals is wrong") and the EMS includes five items tapping into external motivation ("I try to act nonprejudiced toward homosexuals because of pressure from others"). Participants responded to the items on a scale from 1 (*strongly disagree*) to 9 (*strongly agree*).

Only participants who scored in the lowest quartile for IMS were invited to participate (M IMS = 3.81, SD = 1.17). To examine the effects of external motivation, we divided participants into two groups—low-motivated participants (n = 20) and high-motivated participants (n = 18)—by performing a median split on EMS scores (Mdn = 3.60).

Session 1. Several weeks after the mass-testing sessions, participants were invited to participate in a two-session study ostensibly examining how different aspects of personality are related, as assessed by performance across different tasks. At the beginning of the first session, participants were given a list of 80 five-letter anagrams to solve to serve as a baseline measure of anagram-solving ability. They were given 5 min to complete as many anagrams as they could.

Next, participants were presented with a picture of Sammy, a young man described as a homosexual. Participants were asked to write for 5 min about what Sammy does during a typical day. However, they were told not to make any mention of stereotypes about homosexuals or any activities that they believed homosexuals tend to do. Last, participants were given another list of five-letter anagrams to solve within 5 min.

Two-week interim. At the end of the first session, participants in the exercise condition were provided with journals that stated, "For the 2 weeks in between your first and second sessions, we have some exercises for you to do each day." As described in Baumeister et al. (in press), participants were asked to exercise self-control by modifying their manner of speaking for the next 2 weeks. Specifically, they were asked to only say "yes" and "no" instead of using similar colloquialisms (e.g., "yeah," "nope"), to speak only in full and complete sentences, to avoid using sentences that began with "I," and to not use slang or swear words. Participants assigned to the no-exercise, control condition did not receive any instructions to follow during the 2 weeks and did not receive any journals.

Participants in the exercise condition were given two journals (one for each week) in which they were asked to record how well they had followed the instructions. At the end of each day, participants were asked to record how often they complied with each of the different requirements (e.g., "How often did you say 'yeah,' 'yup,' 'uh-huh,' etc., instead of saying 'yes?'") using a scale from 1 (*never*) to 9 (*all the time*).

Session 2. The second session was nearly identical to the first session. First, participants had 5 min to complete as many anagrams as they could. Next, participants were presented with the same picture of Sammy and told that he was a homosexual. Participants were asked to describe how Sammy probably dresses, how he typically behaves, what his political views might be, and what leisure activities he enjoys. Participants were told to avoid mentioning any stereotypes about homosexuals in their responses. Last, participants were given 5 min to solve a new set of anagrams. The overall design of the study was a 2 (motivation group: low motivation vs. high motivation) × 2 (exercise group: exercise vs. no-exercise) between-subjects factorial.

Results

Manipulation Checks

Stereotype suppression. To assess how well participants followed the instructions to refrain from using stereotypes, we counted the number of times each participant mentioned any of 50 features (e.g., feminine, artistic) of the homosexual stereotype using a list developed by Robinson, Montiel, Jakubowski, and Madon (1996) as well as eight additional descriptors (e.g., sexually promiscuous). On average, participants were successful in following the suppression instructions such that they made relatively few stereotypical remarks during the first (M = 1.00, SD = 1.76) and second (M = 1.63, SD = 1.74) sessions.

The number of stereotypes used in these sessions did not differ as a function of motivation or exercise group. In Session 2, however, high-motivation participants used fewer stereotypes (M = 1.00, SD = 1.19) than did low-motivation participants (M = 2.20, SD = 1.99), $F(1, 34) = 4.94$, $p < .05$.

Exercises in self-control. To determine whether participants were modifying their verbal mannerisms during the 2-week interim, we examined their responses in the journals and found that, on average, participants altered their habitual speaking patterns around half of the time

($M = 5.10$, $SD = .55$). Considering the difficulty of the exercises (e.g., speaking only in complete sentences) and the amount of time they were expected to exercise, participants were successful in following the instructions.

Self-Control Depletion

Session 1. To determine the extent of self-control depletion, we analyzed the standardized residual of the number of anagrams solved correctly at the end of the first session controlling for the number of anagrams solved at the beginning of the session.[2] A negative standard residual indicates that a participant solved fewer anagrams at the end of the session than would have been predicted based on performance at the beginning of the session, as would be expected if the person's self-regulatory resources were depleted.

A 2 (motivation group) × 2 (exercise group) between-subjects ANOVA conducted on these residuals revealed only a significant effect for motivation group, $F(1, 34) = 7.85$, $p < .01$. Consistent with predictions, low-motivation participants solved significantly fewer anagrams than did high-motivation participants (see Table 1). Thus, compared to high-motivation participants, low-motivation participants appeared to be depleted after suppressing stereotypes of homosexuality.

Session 2. To determine whether low-motivation participants would no longer be depleted relative to high-motivation participants after completing exercises in self-control, we conducted a 2 (motivation group) × 2 (exercise group) between-subjects ANOVA on the standardized residual number of anagrams solved at the end of the second session controlling for the number solved at the beginning of the session. The only significant effect was an interaction between motivation group and exercise group, $F(1, 34) = 7.02$, $p < .05$. Tests of simple contrasts indicated that low-motivation participants who had performed self-control exercises solved more anagrams after suppressing than did low-motivation participants who had not completed the self-control exercises, $F(1, 34) = 5.30$, $p < .05$ (see Table 1). For high-motivation participants, the difference between the two exercise conditions was not significant, $F(1, 34) = 2.16$, $p > .15$, and was in the opposite direction. Furthermore, these results remained unchanged in form and magnitude when controlling for the number of stereotypes used during the suppression task.

Improvements in self-control. To assess whether participants' degree of depletion following stereotype suppression had been reduced significantly after exercising self-control, we computed improvement scores by subtracting the number of anagrams solved at the end of the first session (standardized residuals) from the number of anagrams solved at the end of the second session (standardized residuals). These change scores can be used to directly test whether the 2 weeks of exercise led to increased self-regulatory strength.

TABLE 1: Anagram Performance as a Function of Exercise Group and External Motivation to Respond Without Prejudice (EMS; Study 1)

	Low EMS		*High EMS*	
	No Exercise	*Exercise*	*No Exercise*	*Exercise*
Session 1	$-.34\ (.94)_a$	$-.41\ (.83)_a$	$.79\ (1.19)_b$	$.11\ (.63)_b$
Session 2	$-.44\ (.98)_a$	$.52\ (.95)_b$	$.37\ (.96)$	$-.28\ (.83)$

NOTE: Participants' anagram performance is the standardized residual of the number of anagrams solved at the end of the session when controlling for the number solved at the start of the session. A higher number indicates better performance. Comparisons within columns and across rows with different subscripts are significantly different at $p < .05$. Numbers in parentheses are standard deviations.

We predicted that only low-motivation participants, having been depleted during the first session, would benefit from exercise. This prediction was confirmed, such that low-motivation participants who exercised improved significantly more than did each of the other groups of participants, all ps $< .05$ (see Figure 1). No other differences were significant, all ps $> .52$. We also examined the absolute degree of improvement (i.e., which participants demonstrated significantly less depletion at Session 2 compared to Session 1). Accordingly, we conducted paired-samples t tests on the standardized residual number of anagrams solved at the end of each session for the four groups. The results indicated that low-motivation participants in the exercise condition performed significantly better at Session 2 than Session 1, $t(8) = 3.24$, $p < .05$. The paired samples t tests for the other groups indicated no significant improvement, all ps $> .31$. Thus, low-motivation participants who exercised self-control improved across the two sessions, whereas participants in the other three groups did not.

Frequency of exercise. It was plausible that the greater improvement by low-motivation participants after self-control exercise occurred because they were more successful in their exercises than were the high-motivation participants. Contrary to this possibility, participants' responses in the journals indicated that the two motivation groups followed the exercise instructions to a similar degree, $t < 1$, *ns*. In addition, frequency of exercise was not related to improvement among either motivation group, both ps $> .42$.

Discussion

In both laboratory sessions of Study 1, participants had to suppress stereotypes and then solve anagrams. At

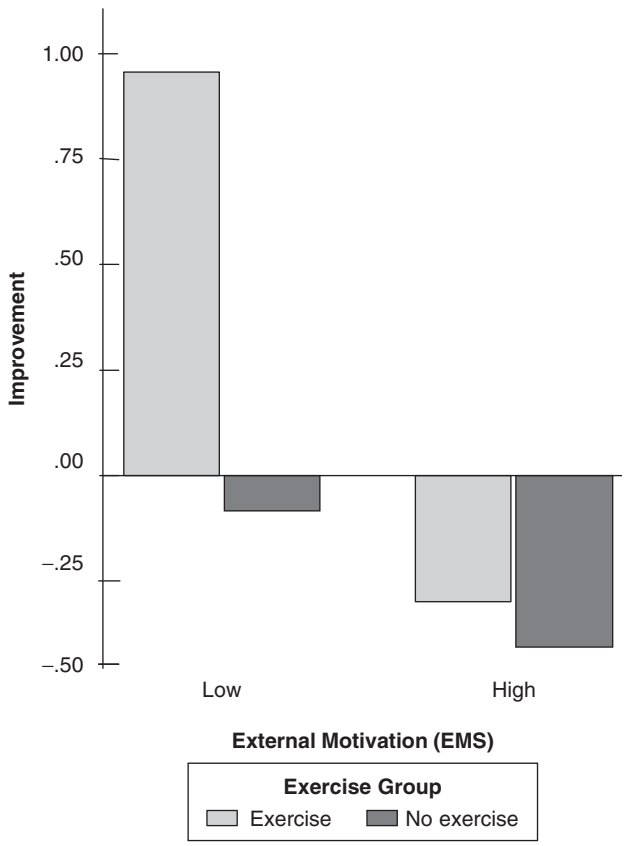

Figure 1 Improvement in degree of depletion across sessions as a function of External Motivation to Respond Without Prejudice (EMS) group and exercise group.
NOTE: Higher scores indicate greater improvement (Study 1).

the first session, participants who were less motivated to suppress stereotypes (low IMS/low EMS) performed worse than the motivated participants (low IMS/high EMS) at solving anagrams. This suggests that the act of stereotype suppression depleted some resource that was, therefore, unavailable to them during the anagram task. The specificity of this pattern to lowly motivated individuals suggests that the stereotype suppression task is most depleting to people who do not personally care about suppressing stereotypes and who do not ordinarily do so. Carrying out a task that does not match one's inclinations and is contrary to one's everyday habits likely requires a relatively high amount of self-regulation.

Some participants then performed self-control exercises for 2 weeks, whereas the rest did not. At a second laboratory session, the depleting effect of stereotype suppression (evidenced by poor subsequent anagram performance) was replicated among low-motivation participants who had not done the self-control exercises but it was eliminated among the low-motivation participants who performed the exercises. These findings fit the hypothesis that exercising self-control on a daily basis increases the capacity for self-regulation, resulting in less susceptibility to self-regulatory depletion. Put another way, the exercises increased participants' stamina to the point that they could perform a stereotype suppression task without the adverse effects they had exhibited at the initial session.

These results may seem somewhat at odds with the results of Gordijn et al. (2004), who found that participants low in internal but high in external motivation were as depleted as participants low in both motivations. One possible explanation for this discrepancy is that participants in the Gordijn et al. sample suppressed stereotypes about skinheads. External motivation to respond without prejudice toward skinheads is unlikely to be a meaningful motivational force because the norm discouraging stereotyping skinheads is not strong or salient. Thus, few people are likely to regularly regulate their stereotypes of skinheads for fear of social disapproval, thereby making it unlikely that external motivation would influence the degree of practice at suppressing stereotypes about skinheads. For other target groups (e.g., homosexuals) for which external motivation is meaningful, as evidenced by the moderate mean score on the EMS in the current work, external motivation should influence the degree of practice at and hence depletion following stereotype suppression.

STUDY 2

Study 2 replicated and extended Study 1, providing a fuller test of our hypotheses. To improve on Study 1, Study 2 included participants with the full range of IMS scores, used two different stereotype suppression tasks, changed the type of self-control exercise, and added measures of mood and arousal to the laboratory sessions.

Method

Participants

One hundred and four undergraduates (70 women) participated in exchange for course credit. Data from 5 participants who did not return for the second experimental session and 1 participant who did not follow instructions were discarded. Participants were randomly assigned either to suppress stereotypes about homosexuality while writing a paragraph about a homosexual or to suppress stereotypes about obesity while talking aloud about an obese person.

Design and Procedure

Assessment of motivation to respond without prejudice. For participants in the homosexual target group condition, we assessed their motivation to respond

without prejudice toward homosexuals at a mass-testing session. Seven participants in the homosexual target group condition did not complete the mass testing; therefore, their IMS and EMS scores were assessed at the end of the second session. Participants who suppressed stereotypes about obesity (n = 45) completed the IMS and EMS Toward Fat People Scales (Buswell & Devine, 2000) at the end of the second session. Participants scoring below the median on IMS (Mdn = 7.60)[3] and EMS (Mdn = 4.00) were assigned to the low-motivation group (n = 22). All other participants were assigned to the high-motivation group (n = 76).

Experimental sessions and exercise. The basic procedure was the same as in Study 1. In Sessions 1 and 2, participants solved anagrams before and after suppressing stereotypes. Participants in the homosexual target group condition completed the same suppression tasks used in Study 1. Participants in the fat target group condition were given the same instructions to suppress stereotypes except they were videotaped while talking about a typical day for a fat person (Session 1) and about the kinds of foods and activities fat people prefer, the types of personalities they have, and the way they normally take care of their appearance (Session 2).

During the 2-week interim between the sessions, participants in the fat target group condition were given the same self-control exercise instructions used in Study 1 (i.e., altering their habitual manner of speaking). Participants assigned to the homosexual target group condition were asked to use their nonpreferred hand (e.g., their left hand if they were right-handed) for a variety of tasks (e.g., brushing their teeth, opening doors, eating with utensils, using a computer mouse).

At the end of the second session, participants completed the Brief Mood Introspection Scale (BMIS), a manipulation check, and some basic demographic information.[4] The BMIS contains 20 items indicative of mood (e.g., happy, sad) and arousal (e.g., peppy, drowsy; Mayer & Gaschke, 1988). Participants were asked to rate each item on the extent to which that item described how they were feeling at the present moment on a scale from 1 (*definitely do not feel*) to 7 (*definitely feel*). For the manipulation check, a subset of participants were asked to indicate to what extent they tried to follow the exercise instructions on a scale from 1 (*not at all*) to 9 (*a lot*). The overall design of the study was a 2 (motivation group: low motivation vs. high motivation) × 2 (target group: homosexuals vs. fat people) between-subjects factorial.

Results and Discussion

Preliminary analyses indicated no differences as a function of which stereotype target (homosexuals or fat people) was used, so analyses collapsed across target group. Likewise, time of assessment of IMS/EMS did not appear to influence the results, and this finding is consistent with the fact that we obtained the same pattern of results across studies regardless of the time of assessment.

Manipulation Checks

Stereotype suppression. As in Study 1, we counted the number of stereotypical references to assess how well participants followed the instructions to suppress stereotypes. We counted the number of stereotypes about homosexuals based on the same list used in Study 1. For stereotypes relevant to fat people, we developed a list of traits stereotypic of fat people (e.g., physically inactive, unintelligent). On average, participants made relatively few stereotypical remarks during the first (M = .79, SD = 1.16) and second (M = 1.08, SD = 1.09) sessions. In addition, low-motivation and high-motivation participants did not differ in the number of stereotypes they used in the first or second session, both ts < 1.2, ns.

Exercises in self-control. We also examined participants' responses in the journals to assess how well they followed the exercise instructions. On average, participants followed the instructions about half of the time (M = 4.76, SD = 1.54), indicating that participants were relatively successful in following the instructions.

Self-Control Depletion

Sessions 1 and 2. We predicted that low-motivation participants would solve fewer anagrams at the end of the first session compared to the high-motivation participants. An independent samples t test on the standardized residual number of anagrams solved at the end of the session (controlling for the number solved at the start of the session) confirmed this prediction, $t(98) = -2.04$, $p < .05$. Low-motivation participants solved significantly fewer anagrams at the end of the session than did high-motivation participants (see Figure 2). Therefore, low-motivation participants appeared to be depleted in comparison to high-motivation participants.[5]

In Session 2, however, the standardized residual number of anagrams solved at the end of the session (controlling for the number solved at the start of the session) did not differ between the two motivation conditions, $t < .36$, $p = .72$ (see Figure 2). Thus, following 2 weeks of exercises in self-control, motivation was no longer significantly related to depletion.

Improvements in self-control. As in Study 1, we computed improvement scores by subtracting the number of anagrams solved at the end of the first session from the number of anagrams solved at the end of the second

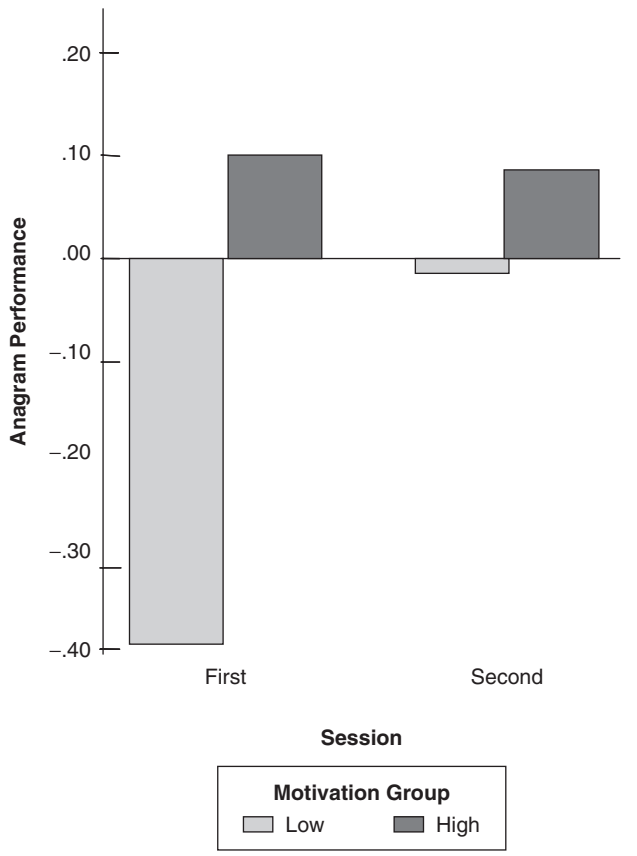

Figure 2 Anagram performance at the end of the session controlling for performance at the beginning of the session for Sessions 1 and 2 as a function of Motivation to Respond Without Prejudice group.
NOTE: Higher scores indicate solving more anagrams (Study 2).

session. We predicted and confirmed that low-motivation participants improved significantly more (M = .47, SD = 1.05) than did high-motivation participants (M = –.10, SD = 1.05), $t(98) = 2.24$, $p < .05$. Furthermore, paired samples t tests indicated that low-motivation participants performed significantly better during the second session than they had during the first session, $t(21) = 2.08$, $p < .05$. The performance of high-motivation participants did not change across the two sessions, $t < .85$, *ns*. Thus, low-motivation participants improved more than did high-motivation participants, and only they improved in an absolute sense.

To determine whether low-motivation participants who exerted more effort on the self-regulation exercises showed more improvement in their anagram performance, we examined whether the amount of effort was related to these participants' degree of improvement. Participants' effort on the self-control tasks predicted the extent of their improvement among the low-motivation, $r(13) = .49$, $p < .05$ (one-tailed) but not high-motivation participants, $p > .64$. This provides further support that the self-control exercises improved anagram performance among low-motivation participants.

Mood, arousal, and frequency of exercise. We also assessed whether the greater improvement by the low-motivation participants was attributable to differences between the conditions in mood, arousal, effort, or success at following the exercise instructions. Low- and high-motivation participants did not differ significantly in their levels of mood or arousal, the extent to which they were successful in following the exercise instructions (as assessed by their responses in the journals), or the extent to which they attempted to follow the exercise instructions, all ts < 1.67, *ns*.

Discussion

Replicating the results of Study 1, low-motivation participants in Study 2 exhibited self-regulatory impairments after suppressing stereotypes, and these impairments were eliminated by 2 weeks of self-regulatory exercise. Regular exercises in self-control appeared to increase low-motivation participants' self-control stamina.

Moreover, these effects were specific to low-motivation participants. Participants high in motivation to respond without prejudice did not exhibit signs of depletion, and their self-regulatory performance did not change after 2 weeks of self-control exercise. These results further support the notion that suppressing stereotypes is difficult primarily for people who habitually do not care or attempt to control their prejudice and that the benefits of increased self-control strength are thus apparent only among these people.

STUDY 3

Although Studies 1 and 2 supported the prediction that depletion after suppressing stereotypes can be eliminated by exercises that strengthen self-regulation, other explanations are still possible. Completing the self-control exercises may have led participants to feel more involved in the research study, which could have increased their motivation to do well at the second session. To address these and other similar possibilities, participants in Study 3 completed the same tasks as in Studies 1 and 2 but only attended one experimental session. We then assessed participants' recent self-control behaviors rather than manipulating them through assigned exercises. If self-control stamina can be increased through any type of self-regulatory exercise, then self-control stamina should be related to the extent of engagement in self-regulatory behaviors in day-to-day life.

Based on Studies 1 and 2, we predicted that low-motivation participants would be depleted and benefit by self-control exercise compared to high-motivation participants. Their level of depletion should be attenuated by the amount of their recent self-control exercise. Low-motivation participants who report recently engaging in several self-control behaviors should be less depleted than high-motivation participants who report engaging in fewer self-control behaviors.

Method

Participants

One-hundred and seventy-nine undergraduates (93 women) participated in exchange for credit toward a course requirement. Data from 7 participants who did not follow instructions (e.g., did not write anything during the suppression task) were discarded. Using IMS/EMS data obtained at the end of the session, participants were assigned to motivation group on the basis of median splits on IMS (Mdn = 6.60) and EMS (Mdn = 4.40). Participants scoring below both medians were assigned to the low-motivation group (n = 45); all other participants were assigned to the high-motivation group (n = 127).

Design and Procedure

Participants completed the same tasks as the participants in Study 1 during the first session. Participants first solved anagrams during a 5-min period, wrote about a homosexual without using stereotypes, and then solved a second set of anagrams. At the end of the session, participants completed the IMS/EMS for homosexuality, the BMIS as a measure of mood and arousal, and reported the number of self-control-related behaviors they had engaged in during the past 2 weeks. Based on existing research on common areas of self-regulatory effort (see Baumeister et al., 1994), we developed a list of eight self-regulatory behaviors in which college undergraduates were likely to have recently engaged. These behaviors were trying to quit using (or reduce consumption of) tobacco, alcohol/liquor, or drugs; trying to control one's spending behaviors, eating habits, or emotions; and forcing oneself to study or exercise. For each of these behaviors, participants indicated whether they had engaged in the behavior during the past 2 weeks. Participants' responses on these items were then summed to form an index of the frequency of self-control behavior.

Results

Manipulation Check

Examinations of participants' essays indicated that participants made relatively few stereotypical remarks (M = .22, SD = .55) and were thus successful in following the instructions. Low- and high-motivation participants did not differ in the number of stereotypes they used, $t < .65$, *ns*. In addition, the number of stereotypes used in the essay was not related to the residualized number of anagrams solved at the end of the session for either motivation group, both rs < .17, *ns*. This suggests that performance on the suppression task did not influence anagram performance.

Self-Control Depletion

Low-motivation participants (M = –.26, SD = .87) solved significantly fewer anagrams than did high-motivation participants (M = .12, SD = 1.03), $t(170) = -2.19$, $p < .05$. Thus, consistent with Studies 1 and 2, low-motivation participants exhibited signs of depletion following stereotype suppression compared to high-motivation participants.

Recent Exercise in Self-Control

Overall, participants reported having engaged in a moderate number of self-control tasks during the past 2 weeks (for high-motivation participants, M = 4.24; for low-motivation participants, M = 4.00). This number did not differ between motivation groups, $t(170) = -1.02$, *ns*, and there were no systematic differences in the types of self-control tasks they reported.

Pearson's r correlation between the standardized residual of the number of anagrams solved at the end of the session (controlling for the number solved at the beginning of the session) and the reported number of recent self-control behaviors indicated that, for low-motivation participants, there was a significant positive correlation between the two measures, $r(45) = .32$, $p < .05$. The more they had exercised self-control in recent weeks, the more anagrams they solved at the end of the session. This relationship was weak and nonsignificant among high-motivation participants, r = –.06, *ns*. Furthermore, the strength of the correlation was significantly stronger among low-motivation than high-motivation participants, $z = 2.14$, $p < .05$. Thus, for low- but not high-motivation participants, having recently engaged in more self-control behaviors was associated with less depletion (i.e., solving more anagrams) after suppressing stereotypes.

Moreover, among low-motivation participants, the relationship between the residualized number of anagrams solved at the end of the session and self-control behavior was positive and significant for each of the eight self-control behaviors, .31 ≤ all rs ≤ .64, all ps < .05. Thus, for low- but not high-motivation participants, having recently engaged in more self-control behaviors was associated with less depletion (i.e., solving more

anagrams) after suppressing stereotypes across several domains of self-control behavior.

Mood and Arousal

High- and low-motivation participants did not differ in mood or arousal, both *t*s < 1, *ns*. Furthermore, the relationships between mood or arousal and anagram performance among low-motivation participants were not significant, all *p*s > .36.

Discussion

Study 3 again found that suppressing stereotypes causes depletion among low-motivation participants. Furthermore, Study 3 suggested that frequently engaging in common, day-to-day, self-regulatory behaviors (e.g., dieting) attenuates such depletion. Among low-motivation participants, those who had been exercising more self-control were less depleted. This is consistent with Study 2 in which more effort at following the self-control exercise instructions was associated with less depletion.

These results speak against the possibility that the assigned exercises in self-control used in Studies 1 and 2 prevented depletion by increasing participants' commitment to or involvement with the experiment. Engaging in self-control exercises that were not part of the experiment was associated with less depletion. These results converge on the hypothesis that regular exercises in self-control reduce the depleting effects of stereotype suppression.

STUDY 4

The purpose of Study 4 was to build on the previous studies by using a different suppression task, a different dependent measure, and a different no-exercise control condition. Specifically, after 2 weeks of self-control exercise or no exercise, participants interacted with a gay man and then completed the Stroop task. The Stroop task required self-control because participants had to respond according to the ink color of words (e.g., red) and inhibit the response to read the words. We predicted that low-motivation participants would perform poorly on the Stroop task after interacting with a gay experimenter if they had not exercised self-control during the preceding 2 weeks, whereas low-motivation participants who exercised self-control would perform relatively well, compared to the high-motivation participants. In addition, we assessed implicit and explicit attitudes toward homosexuals to determine whether these factors might be related to Stroop performance following an interaction with a gay man.

Method

Participants

Fifty-three undergraduates (42 women; 38 White, 9 Black, 2 multiracial, 2 Asian, 1 Hispanic) participated in exchange for course credit and $10. Data from 1 female participant who made only incorrect responses on the Stroop task during the second session were discarded. Participants were randomly assigned to a self-control exercise or no-exercise condition.

Procedure

Assessment of motivation to respond without prejudice. Participants completed the IMS/EMS for homosexuality during a mass-testing session at the start of the semester. IMS/EMS scores for 17 participants who did not complete the survey were obtained during the first experimental session. As in the previous studies, participants were assigned to the low-motivation (n = 16) or high-motivation (n = 36) group on the basis of median splits on IMS (Mdn = 6.80) and EMS (Mdn = 3.60).

Session 1. During an initial experimental session, participants first completed the Implicit Association Test (IAT) for homosexuals (see Banaji, 2001) as a measure of implicit bias toward homosexuals. Participants next completed the Stroop task on the computer. To familiarize themselves with responding on the keyboard, participants first completed practice trials that were similar to the actual Stroop task. As a premeasure of Stroop performance, they then completed 30 trials for which the word *red*, *blue*, or *green* appeared on the computer screen in red-, blue-, or green-colored font that was incongruent with the meaning of the word. Participants were to indicate the color of the words by pressing one of three computer keys. Participants then completed a questionnaire packet that contained the Heterosexual Attitudes Toward Homosexuals (HATH) scale (Larsen, Reed, & Hoffman, 1980) as a measure of explicit attitudes toward homosexuals.

Last, participants were given the self-control exercise journals. As in the previous studies, participants in the exercise condition were instructed to use their nondominant hand for a variety of tasks for the following 2 weeks and to record in the journals how often they used their nondominant hand. Participants in the no-exercise condition received the same journals but were instructed only to record how often they used their nondominant hand.

Session 2. At the end of the 2 weeks, participants returned to the lab for a second session with a gay male experimenter. The experimenter did not explicitly state his sexual orientation but behaved in a stereotypic manner so

that participants would at minimum suspect that he may be a homosexual and would, therefore, attempt to control their behavior in response to questions concerning issues related to homosexuality during the interview. Furthermore, there is evidence that even on a 10-s video clip, people are surprisingly accurate at assessing people's sexual orientation (Ambady, Hallahan, & Conner, 1999).

Participants were first interviewed by the gay experimenter. They were asked to introduce themselves for 1 min and to state their opinions on various issues related to gay marriage (e.g., "Should homosexual couples be allowed to adopt children?") for the following 4 min.

Participants next completed 75 Stroop trials on the computer. The percentage of correct responses on this task served as the final dependent measure of self-regulation. Finally, participants completed a questionnaire containing three items that assessed commitment to and involvement in the study ($\alpha = .92$) and two items that assessed feelings of having fulfilled one's experimental obligation prior to the start of the second session ($\alpha = .92$).

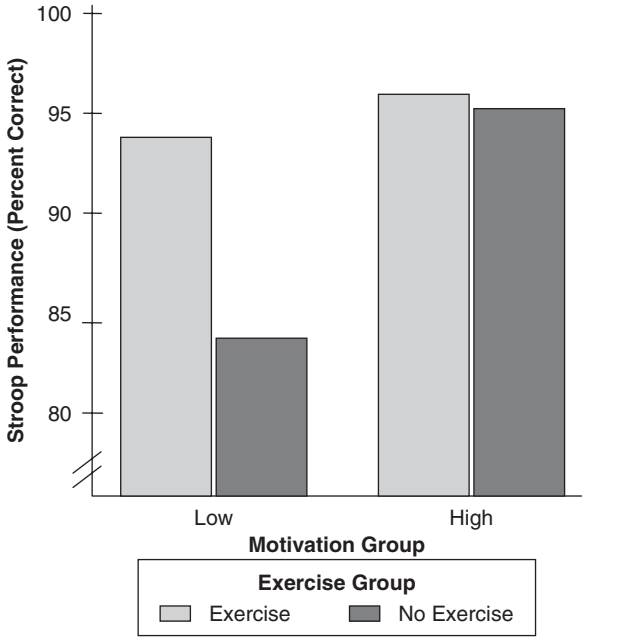

Figure 3 Stroop performance in Session 2 as a function of Motivation to Respond Without Prejudice group (Study 4).

Results and Discussion

Stroop Performance

Session 1. A 2 (motivation group) × 2 (exercise condition) ANOVA on the percentage of correct responses on the Stroop task during the first session indicated a marginally significant main effect of exercise condition, $F(1, 48) = 3.20$, $p = .08$. Participants in the exercise condition made a marginally higher percentage of correct responses ($M = 97.50$, $SD = 3.04$) than did participants in the no-exercise condition ($M = 94.04$, $SD = 6.81$). This difference in Stroop performance suggests that any differences in Stroop performance during the second session could potentially be attributable to preexisting individual differences in Stroop ability.

The main effect of motivation group and its interaction with exercise condition were not significant, Fs < 1, *ns*. This indicates that motivation to respond without prejudice is not related to self-regulation (Stroop performance) when participants have not suppressed stereotypes.

Session 2. We predicted that low-motivation participants in the no-exercise condition would exhibit the worst Stroop performance and that all other groups of participants would perform relatively well. A planned comparison on the percentage of correct responses on the Stroop task during the second session confirmed this prediction, $F(1,48) = 5.05$, $p < .05$ (see Figure 3 for means). In line with predictions and replicating the results of the previous studies, low-motivation participants in the no-exercise condition performed significantly worse than did participants in any other condition, all Fs > 3.22, ps < .04 (one-tailed). No other differences were significant, all Fs < 1, *ns*.

Thus, when not having previously exerted self-control, only the low-motivation participants performed poorly on the Stroop task following a conversation with a gay experimenter about homosexuality. The interaction with the experimenter presumably required the suppression of stereotypes and other negative reactions (Richeson & Trawalter, 2005) and therefore impaired subsequent self-regulation. The self-control exercises prevented such self-regulatory impairments among low-motivation participants, however, such that low-motivation participants in the exercise condition performed equally well as the high-motivation groups.

Furthermore, the above-planned comparison remained significant when controlling for Stroop performance during the first session and when controlling for reaction times on the Stroop during the second session, both Fs > 5.06, ps < .05. This indicates that the effects of exercise condition and motivation were probably not attributable to any differences in Stroop ability prior to the self-control exercise manipulation, and neither were they attributable to a speed-accuracy trade-off, such as if participants in the low-motivation, exercise condition made fewer correct responses because they responded faster.

Exercises in self-control. Participants' responses in the journals provided additional evidence that the self-control exercise improved self-regulatory stamina. Specifically, in

the exercise condition, the extent to which participants reported having used their nondominant hand correlated positively and significantly with Stroop performance during the second session, $r(25) = .50$, $p < .01$, when controlling for Stroop performance during the first session. This relationship was not significant in the no-exercise condition, $r < .11$, *ns*. Thus, using one's nondominant hand more frequently (i.e., having followed the exercise instructions more faithfully) was associated with better Stroop performance during the second session only among participants in the exercise condition.

Examining Alternative Explanations

A 2 (motivation group) × 2 (exercise condition) ANOVA on participants' obligation to the experiment indicated no significant effects, all Fs < 1, *ns*. This indicates that the benefit of self-regulatory exercise was likely not caused by changes to obligation to the experiment.

A two-way ANOVA on participants' commitment to the experiment indicated a significant interaction between motivation group and exercise condition, $F(1, 48) = 9.38$, $p < .05$, such that the self-control exercises increased commitment among low-motivation participants but decreased commitment among high-motivation participants. This raises the possibility that the exercises increased self-regulatory stamina among low-motivation participants by increasing their commitment to the experiment.

Additional analyses indicated, however, that low-motivation participants in the no-exercise condition performed marginally worse than all other groups of participants combined even when controlling for commitment to the experiment as well as the interaction between commitment and the key comparison, $F(1, 45) = 3.10$, $p = .09$. This suggests that commitment to the experiment may have had a slight influence on Stroop performance but that changes in Stroop performance were not largely accounted for by participants' commitment or obligation to the study.

We also conducted analyses to determine whether scores from the IAT or HATH were related to Stroop performance or the benefits of self-regulatory exercise. We found no evidence that implicit (IAT scores) or explicit attitudes toward homosexuals (HATH scores) were related to Stroop performance or the effect of self-regulatory exercise.

GENERAL DISCUSSION

Suppressing stereotypes can be hard work that depletes self-regulatory resources, particularly for people who are not accustomed to suppressing stereotypes (Gordijn et al., 2004; Richeson & Shelton, 2003; Richeson & Trawalter, 2005). We found that stereotype suppression resulted in poorer subsequent self-control performance among people whose habitual motivation to suppress stereotypes was low. For these people, suppressing stereotypes was probably unfamiliar and demanding because they normally do not regulate their prejudice (Plant & Devine, 1998; Plant et al., 2003). Furthermore, exercises aimed at strengthening self-control reduced the psychological cost of suppressing stereotypes among these people, even though the exercises themselves had nothing to do with stereotypes or prejudice. After 2 weeks of exercises aimed at strengthening self-control or after practicing self-control in their daily lives (Study 3), these participants showed significant improvements in their self-regulation after they suppressed stereotypes. In fact, their performance after self-control exercise was indistinguishable from other participants, for whom suppressing stereotypes did not appear depleting. Also, there was some evidence that the more reliably the participants performed the self-control exercises, the more they improved (i.e., Studies 2-4).

The present results have implications for self-regulation theory. They support the model of self-control as resembling a muscle that becomes fatigued after use but can be strengthened by regular self-regulatory exercise or, alternatively, as an energy source that can become depleted but more easily conserved following regular exercise. The present studies linked a variety of self-control tasks and measures, including solving anagrams, the Stroop task, and suppressing different stereotypes. The results suggest that all of these tasks use a common resource and that it is possible to improve how people use that resource. Indeed, several different forms of self-regulatory exercise (e.g., modifying one's handedness, altering one's verbal mannerisms, quitting smoking, dieting, studying) led to increased self-regulatory stamina among participants with less experience suppressing stereotypes.

Limitations and Alternative Explanations

Because the benefits of self-regulatory exercise were observed only among individuals who have relatively little practice at suppressing stereotypes (i.e., low IMS/low EMS), we would be hesitant to generalize these findings to other domains in which habitual practice might be less relevant to the target behavior. Nonetheless, many self-regulatory behaviors should be susceptible to automatization through regular practice (e.g., Bargh, 1994), and so these results may very well generalize to several other self-regulatory domains.

The multiple procedures used in these studies enabled us to address several alternative explanations. First, the results did not appear to be due to differences

in mood or arousal. Second, they cannot be attributed to differential performance on the stereotype suppression task itself. Third, they were not due to low-motivation participants being more likely to perform the assigned self-control exercises.

A fourth alternative explanation is that the self-control exercises (as compared to the no-exercise control condition) increased participants' sense of obligation or commitment to expend effort during the laboratory session. Study 3 contradicted this by finding that self-control improved as a result of self-control exercises that were not part of the study. Furthermore, Study 4 directly contradicted this explanation by showing that ratings of commitment and obligation to the experiment were unrelated to performance at the laboratory session. Study 4 also included a control condition in which participants kept journals for 2 weeks without exercising self-control, which also should have increased their commitment to the experiment. Keeping the journals did not yield any benefits, as measured at the second laboratory session. A differential commitment or obligation explanation also would presumably have predicted effects on the baseline anagram measure at the second session because participants who wanted to please the experimenter would have worked hard at the first task they were given. However, no such differences were found.

One limitation of the current work might be the use of median splits rather than regression analyses. We used a multidimensional measure of motivation to respond without prejudice rather than a single measure because either internal or external motivation should offset the depleting effect of stereotype suppression. In the current context of practice suppressing stereotypes, being high in both internal and external motivation is not necessarily better than being high in either internal or external motivation, and so a multidimensional measure of motivation was needed to distinguish among the different motivations.

Moreover, we used the median-split approach in each study, consistent with past research examining similar issues (e.g., Gordijn et al., 2004), because it was the most direct test of the hypotheses. The effects of stereotype suppression and self-control exercise should be apparent only among participants low in both internal and external motivation. Individuals high in internal motivation should be familiar with suppressing stereotypes in most situations, and individuals high in external motivation should be familiar with suppressing stereotypes when external demands signal the need. Hierarchical regression analyses could be used to test these hypotheses, although they would constitute unnecessarily stringent tests of the hypotheses. The effects of suppression and self-control exercise should be apparent among only low-motivation participants, which for many of our studies require complex interactions where only one combination of IMS/EMS differs from all of the other combinations in one experimental condition.

To be sure, hierarchical linear regression analysis could detect such an effect consistent with the hypotheses, provided a relatively large sample size (high power). To provide such a test, we meta-analyzed the results from the studies (Studies 1, 2, & 4) in which participants completed or did not complete 2 weeks of assigned self-regulatory exercise and then completed a self-regulatory task (anagrams or Stroop) after suppressing stereotypes. Self-regulatory performance (Stroop or residualized anagrams) standardized across the type of task (anagram or Stroop) during the second session served as the dependent measure. We entered into the regression equation standardized IMS and EMS scores, exercise condition (exercise vs. no exercise), and all higher order interactions. The analysis indicated a significant three-way interaction between IMS, EMS, and exercise condition, $t(182) = 2.67$, $p < .01$, b = .18. In the no-exercise condition, there was a significant interaction between IMS and EMS, $t(42) = -2.11$, $p < .05$, b = –.34. Participants scoring low in both IMS and EMS performed worse on the self-regulatory task than any other group of participants. In the exercise condition, the interaction between IMS and EMS was not significant, $t = 1.17$, *ns*. Thus, regression analyses support the hypotheses that suppressing stereotypes is depleting only for low-motivation participants and that self-regulatory exercise reduces such depletion.

Concluding Remarks

America's founding fathers declared that all men are created equal. Although their vision, radical as it was back then, was limited by racial and gender categories, more modern cultures have progressively widened the view. In recent decades, many people have come to embrace the importance of judging each person as an individual and refraining from stereotypes and other category-based judgments. To do so is not easy and, hence, self-regulation may play an important role in fighting prejudice and stereotyping. Many people must make a deliberate, conscious effort to actively control the activation and application of stereotypes when forming impressions of members of stereotyped groups.

The present results offer several grounds for optimism regarding both stereotype suppression and self-regulation. First, people who are motivated to respond without prejudice can suppress stereotypes without any cost for their subsequent self-regulatory strength. Second, it is promising to see that self-regulation can be strengthened even in a relatively short 2-week period if the person engages in frequent self-regulatory exercise. Finally, it is encouraging that building self-control

strength through self-regulatory exercise can reduce the intrapsychic cost of suppressing stereotypes.

NOTES

1. Specifically, participants completed the Internal and External Motivation to Respond Without Prejudice Scales (IMS/EMS) for homosexuality (modified from the IMS/EMS for Blacks; Plant & Devine, 1998). During a separate experimental session, participants completed eight items designed to measure practice at suppressing stereotypes (e.g., "When I'm in a place where it is not appropriate to express any stereotypes about homosexuals, I do not express any stereotypes") answered on a scale from 1 (*strongly disagree*) to 9 (*strongly agree*). Results indicated that participants low in internal and external motivation to respond without prejudice (i.e., those scoring below the median on IMS and EMS) reported suppressing stereotypes less often than did participants high in either or both sources of motivation, $F(1, 106) = 24.14$, $p < .001$. Moreover, participants low in internal and external motivation differed significantly from each of the other motivation groups.

2. Across Studies 1 to 3, participants solved 15.9% to 25.4% of the possible anagrams at either the start or end of the session. In each study, the number of anagrams solved at the start of the first and second sessions did not differ between low- and high-motivation groups, all ts < 1, *ns* (except in Study 2, Session 2, $t = -1.36$, *ns*).

3. One might wonder whether such seemingly high levels of IMS scores among lowly motivated individuals truly reflect low levels of motivation. These scores are in line with past research (e.g., Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002; Gordijn et al., 2004; Plant & Devine, 1998; Plant, Devine, & Brazy, 2003) showing that individuals who report moderate levels of internal motivation in an absolute sense but low levels relative to other participants respond in a different manner than participants higher in internal motivation. In addition, we chose to include participants with the full range of scores in the current study as opposed to preselecting more extreme groups in hopes of expanding the generalizability beyond a small proportion of participants that scored at the very bottom or top of the IMS.

4. Participants in the fat target group condition completed the demographic information at the end of the first session and they did not complete the final manipulation check.

5. One may wonder whether there were any differences in self-regulatory performance among high-motivation participants as a function of internal and external motivation. Analyses indicated that there were no such differences on any of the primary dependent measures in Studies 2 to 4.

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