Stereotype fit effects for golf putting non-experts

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Abstract

Research has connected stereotype threat and regulatory fit by showing improved performance for individuals with negative stereotypes when they focused on minimizing potential losses. In the current study, non-Black participants, who were non-experts at golf putting, were told that a golf-putting task was diagnostic of natural athletic ability (i.e., negative stereotype) or sports intelligence (i.e., positive stereotype). Participants tried to maximize earned points or minimize lost points assigned after every putt, which was calculated based on the distance to a target. We demonstrate better performance for participants experiencing a fit between their global task stereotype and the task goal, and argue that regulatory fit allows for increased attention on the strategies beneficial for task performance. Interestingly, we find that performance of individuals high in working memory capacity suffers greatly when those individuals experience a regulatory mismatch.

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Negative task-relevant stereotypes often undermine performance. In classic work, Steele and Aronson (1995) demonstrate that Black participants underperform White participants on tests described as measuring intellectual ability. This performance decrement is known as a *stereotype threat* effect, and has been demonstrated in domains ranging from standardized testing (Spencer, Steele, & Quinn, 1999) to golf putting (Stone, Lynch, Sjomeling, & Darley, 1999). In this manuscript, we use the Regulatory Fit framework (Higgins, 1997) to challenge the commonly held belief that negative stereotypes are always detrimental to performance and moreover provide evidence of the mechanism behind our effects. Past work indicated that placing individuals with a positive or negative stereotype in a rewards environment that matches their stereotype (i.e., creating a *regulatory fit/stereotype fit)* improves performance because of the improved processing induced by the fit (Grimm, Markman, Maddox, & Baldwin, 2009).

However, because this work focused on classification learning and standardized testing, it remains unknown whether regulatory fit effects created from stereotypes influence a procedural motor task. Cognitive research has long understood that there are profound differences between cognitive tasks which rely on declarative knowledge (e.g., standardized testing) and procedural tasks which rely on motor knowledge (e.g., expert golf putting). For example, patients with amnesia are able to perform procedural tasks, but not declarative tasks that require deliberate and conscious access to memory (Baddeley, 1990; Cohen & Squire, 1980). We are interested in the early stages of procedural learning where tasks are moving from being consciously controlled, with extensive reliance on working memory, to being more automatic and performed outside of conscious awareness. In the current manuscript, we show improved performance for golf-putting non-experts who are experiencing a regulatory fit induced from stereotypes and investigate mechanisms for our effect. We start by reviewing work on stereotype threat and then regulatory focus and fit before describing the current study in more detail.

Stereotype Threat

While there have been demonstrations of stereotype threat and *stereotype lift* (i.e., improved performance from a positive stereotype: Walton & Cohen, 2003) in motor tasks (e.g., Chalabaev, Stone, Sarrazin, & Croizet, 2008), investigations of the influence of stereotypes on performance in golf are most relevant to the current study. Seminal work was conducted by Stone et al. (1999), who based their manipulation on evidence that different racial stereotypes apply to individuals in athletic contexts (Stone, Perry, & Darley, 1997). There is a pervasive stereotype that Black athletes have high levels of natural athletic ability while White athletes have high levels of sports intelligence (see Stone et al., 1999 for a lengthy discussion of commonly held athletic racial stereotypes) As described in Stone et al., racial sports stereotypes first appeared in published works in the 1800s, and appear in modern sports journalism and films, like *White Men Can't Jump*. When White athletes succeed attributions are made to their sports intelligence, but when Black athletes succeed their natural athletic ability is credited. Stone et al. reasoned that these culturally-held stereotypes could reduce the performance of the negatively-stereotyped group. To examine this prediction, Stone et al. tested White and Black participants on a 10-hole golf course measuring the number of strokes to complete it. Black participants finished the course in fewer shots when the task was framed as assessing natural athletic ability (i.e., positive stereotype) as compared to sports intelligence (i.e., negative stereotype), and the opposite pattern obtained for the White participants.

Regulatory Focus and Fit

Recent work has connected stereotype threat effects with regulatory focus (Grimm et al., 2009; Seibt & Forster, 2004). Regulatory focus is a motivational mechanism that influences sensitivity to potential losses and gains in the environment (Higgins, 1987; 1997). According to Higgins (1987, 1997), when an individual is striving to meet a goal, the individual does so with a particular motivational orientation that guides processing. Individuals sensitive to gains and non-gains in the environment have a *promotion focus,* and individuals sensitive to losses and non-losses have a *prevention focus.* Orthogonal to this distinction, people have self-regulatory strategies for regulating goal attainment that work according to the hedonic principle –people approach pleasure and avoid pain (Higgins, 1997; Shah & Higgins, 1997). While stable personality characteristics can determine an individual's regulatory focus, strong situational factors can induce a focus that overrides the chronic focus (Higgins, 2000; Shah, Higgins, & Friedman, 1998).

One such situational factor is the presence of positive or negative stereotypes. Seibt and Forster (2004) demonstrated that a positive stereotype induces a promotion focus and a negative stereotype induces a prevention focus. When presented with a negative stereotype, individuals remembered more avoidance-related statements, while those presented with a positive stereotype remembered more approach-related statements. Furthermore, they argued that positive stereotypes increased elaborative and creative processing and negative stereotypes increased vigilant processing (i.e., protecting against errors in a speed/accuracy tradeoff). In related work on achievement goals, there is evidence that individuals with negative stereotypes adopt or endorse performance-avoidance goals (Brodish & Devine, 2009; Chalabaev, Sarrazin, Stone, & Cury, 2008; Elliot & Church, 1997). Chalabaev et al. (2008) showed that priming female soccer players with a stereotype highlighting poor athletic ability led to an increase in performance-avoidance goal endorsement as compared to performance-approach goal endorsement.

In addition to the influence of regulatory focus states, *regulatory fit theory* (Higgins, 2001; 2003) proposes that regulatory focus states interact with goal-pursuit strategies to influence performance. Specifically, a *regulatory match* occurs when the regulatory focus matches either the task context or the manner of engagement (Higgins, 2000; 2008). For example, a promotion focus increases sensitivity to gains and non-gains while a prevention focus increases sensitivity to losses and non-losses; placing a promotion-focused individual in a task that emphasizes gains creates a regulatory match. There is a vast literature on the benefits of regulatory match states demonstrating improvements in disparate areas such as anagram performance (Shah et al., 1998), classification learning (Grimm, Markman, Maddox, & Baldwin, 2008), and soccer penalty shooting (Plessner, Unkelbach, Memmert, Baltes, & Kolb, 2008). Relying on previous work on regulatory fit (Higgins, 2005; Keller & Bless, 2006; Maddox, Baldwin, & Markman, 2006; Shah et al., 1998), Grimm et al. (2009) showed that it is the match between the regulatory focus induced by the stereotype and the reward structure of the task that governs performance in classification learning and standardized testing. In classification learning, participants in a regulatory match tested classification rules more efficiently (i.e., explored the possible rule space more effectively), and therefore performed better than participants not in match state. Moreover, a recent study by Kutzner, Forderer, and Plessner (2013) found that regulatory fit, created by pairing chronic focus with a regulatory focus task frame (i.e., promotion = aspiration; prevention = obligation), improved the performance of expert golfers. They argue that a regulatory fit reduced attention away from the task to improve performance.

Current Study

As in Grimm et al. (2009), we propose that the stereotype interacts with the reward structure of the environment because of the regulatory focus induced by the stereotype (see Figure 1). Critically, we extend the work by Grimm et al. into a new domain, procedural golf putting and examine the claim by Kutzner et al. (2013) that regulatory fit states focus attention away from the task. We use the same research paradigm as Stone et al. (1999) and prime non-Black participants to believe that we are studying natural athletic ability (e.g., negative stereotype) or sports intelligence (e.g., positive stereotype). Participants completed a golf putting task on an indoor putting green either gaining or losing points based on the distance each putt is from a target.

There is substantial research demonstrating that the cognitive processing required in procedural tasks is very different from the processing required for declarative tasks, such as those investigated by Grimm et al. (2009) (e.g., Baddeley, 1990; Cohen & Squire, 1980; Beilock et al., 2006). Motor skill performance involves both explicit and implicit control mechanisms (Masters, 1992). When the skill is first learned, performance is governed more by explicit mechanisms that allow for a focus on skill-based knowledge. This stage of learning is heavily dependent on working memory resources as working memory allows for the temporary storage and manipulation of information. In contrast, once the skill is learned, performance is governed by implicit mechanisms that exist outside of conscious awareness. Moreover, prior work on regulatory fit with stereotypes used purely symbolic tasks that lacked representations of motor knowledge. Based on this research alone, it is not clear if regulatory fit states are general enough to impact both symbolic representation and embodied representation. It is therefore important to understand the implications of experiencing a regulatory fit during the development of procedural skills because it is not clear whether motivation will have the same effect.

Furthermore, it is important to determine the relationship between regulatory fit and working memory. Diamond (2013) emphasizes that executive functioning is an effortful set of processes requiring attention, such as working memory processes, inhibition, and cognitive flexibility. When first learning a classification task, participants in a regulatory fit focus on the rules for good task performance (Grimm et al., 2009, Experiment 2). Likewise, golf putting novices have not developed proceduralized routines for putting and, thus, a task-based focus allows them to position their body correctly and swing effectively while the motor system learns to putt. This task-based focus relies heavily on working memory resources because it is necessary to hold in memory the actions that occurred on the prior swing so that adjustments can be made based on the swing's outcome. Unlike experts who have a high amount of domain-specific and procedural knowledge which they access outside of conscious awareness (Ericson & Charness, 1994), novices rely on this conscious processing. For experts, their extensive procedural knowledge allows them to minimize the use of attentional resources (Kanfer & Ackerman, 1989) and not consciously guide their actions (Wood, Quinn, & Kashy, 2002). This means that being consciously flexible, in terms of strategy switching, is less likely to influence expert performance; their motor programs for good performance have already been established. However, novices need to focus attentional and memory resources to perform well.

We approach the study of the mechanism behind regulatory fit effects in golf in two ways. First, we used novice golfers to test for whether they would show regulatory fit effects. Using prior work on strategy shifts in regulatory fit, we predict that a regulatory match will improve performance for golf putting novices relative to performance of participants experiencing a regulatory mismatch. If we find regulatory fit effects, this challenges the claim that regulatory fit is diverting attentional resources away from the task, as diverting attention is clearly disadvantageous for novices. Thus, we predict that we will replicate Stone et al. in our gains condition: non-Black participants will perform well in the sports intelligence (i.e., positive stereotype with a regulatory match) condition relative to the athletic ability condition (i.e., negative stereotype with a regulatory mismatch). In our losses condition, however, we predict that these effects will reverse: participants will perform better in the athletic ability condition (i.e., negative stereotype with a regulatory match) as compared to the sports intelligence condition (i.e., positive stereotype with a regulatory mismatch).

Second, we both measured working memory and manipulated the working memory task demands of our putting task. Working memory has been linked to stereotype threat effects. Participants completed the Operation Span Working Memory Task (OSpan) to assess baseline working memory capacity, and, as in Beilock et al. (2006), completed putts under Single-task and Dual-task conditions. We used the OSpan to replicate Beilock et al.'s procedure. Schmader and Johns (2003) demonstrated declines in working memory capacity when women experienced stereotype threat in a math-testing context, but did not find declines for men who were not experiencing stereotype threat. Similarly, Rydell, McConnell, and Beilock (2009) found that presenting a positive stereotype increased the working memory capacity and performance of women on a math test. Of greatest relevance to the current study, Beilock et al. (2006) examined the relationship between working memory and stereotype threat in expert golfers. Beilock et al. argued that golf putting is not harmed when working memory is reduced for putting experts, but is harmed when the attention of the individual is focused on a process that normally runs outside working memory. They found that experiencing stereotype threat reduced golf putting performance but that this performance decrement was eliminated by asking expert golfers to focus on a secondary dual task, which was intended to shift the content of working memory to the dual task, thereby allowing the golf putting task to be performed without working memory.

Using Beilock et al.'s framework, we assume that our novices, who need working memory resources, will perform better on the single-task blocks as compared to the dual-task blocks. The open question is what is the relationship between regulatory fit and working memory capacity? As previously stated, worse performance is predicted for participants in a mismatch as regulatory mismatches are associated with reduced resources. We believe this mismatch will be worse for participants high in working memory capacity because they have developed strategies that rely on working memory as this is one of their assets. However ,it is also possible that a mismatch will be worse for participants low in working memory because removing any resources is problematic for performance.

Method

Participants and Design

Seventy non-Black (56 White and 14 Asian) male undergraduate students at a mid-sized east coast college participated for course credit and gave informed consent. Participants were randomly assigned to the athletic or intelligence stereotype and within these groups half were randomly assigned to the gains or losses reward structures. All participants completed two blocks of putts: one using a Single-task paradigm and one using a Dual-task paradigm yielding a 2 (Stereotype: Athletic, Intelligence) × 2 (Reward Structure: Gains, Losses) x 2 (Block: Single-task, Dual-task) mixed-participants design with Block within participants (see Figure 2). For the putting task, there were no significant ethnicity differences so we present the data analyses below without separating the data.

Prior to the task, we collected an experience measure to verify our participants were inexperienced golfers. As expected, participants rated themselves as having limited experience with golf (*M* = 1.39 (*SD* = 1.18) on a 9-point scale for "How much experience do you have playing golf": *1 = no experience and 9 = very experienced*). After the task, our participants also reported low agreement with the statement "I am good at golf" (*M* = 3.01 (*SD* = 1.67) on a 9-point scale: *1 = strongly disagree and 9 = strongly agree*). Moreover, we collected a measure of golf importance to connect to prior work on stereotype threat. Participants reported low agreement with the statement "It is important to me that I am good at golf" (*M* = 2.29 (*SD* = 1.80) on a 9-point scale: *1 = strongly disagree and 9 = strongly agree*). Many studies on stereotype threat use participants who rate items like this highly (see Lawrence, Marks, & Jackson, 2008). To foreshadow, we found significant effects despite the relative low importance of our task for our participants. Participants reported playing golf or mini-golf an average of 2.64 (*SD* = 1.68) times in the last 6 months.

Materials and Procedure

Participants were tested individually in a room with two computers and an indoor golf putting surface. Participants first completed the Operation Span Working Memory Task (Conway & Engle, 1994) as in Beilock et al. (2006), which required participants to solve simple math problems while trying to remember letters. This task measures an individual's working memory capacity. A computer presented a sequence of simple math problems (e.g., (2*1) + 3) each followed by a possible answer. The participants decided if the answers were correct or not. After the participant decided if a math problem was correct or not, a letter (e.g., "Q") flashed on the screen for two seconds. After each sequence of math problems followed by letters, the participant recalled the letters presented after the prior math problems. The participants completed 15 trials of math problems followed by letters. The exact number of math problems and numbers varied per trial (3 to 7 per trial). The percentage of math problems the participants accurately answered correctly was tracked throughout the task. A participant's working memory capacity was calculated by summing the letters recalled in the correct order. Participants averaged 193.12 correctly recalled letters, while performing the math portion of the task with an average of 97.11% correct.

Next, participants completed questionnaires typically used to assess regulatory focus and related constructs. Participants first completed the Regulatory Focus Questionnaire (RFQ: Higgins et al., 2001), a measure of chronic focus, then the Beck Anxiety Inventory (BAI: Beck, Epstein, Brown, & Steer, 1988), the Penn State Worry Questionnaire (PSWQ: Meyer, Miller, & Metzger, 1990), and the E and P Scales (Eysenck, Eysenck, & Barrett, 1985), as measures of Extraversion and Impulsive Antisocial Sensation Seeking (IMPASS), respectively (Pickering & Gray, 2001).

Participants were then told that they were going to take golf putts on an indoor putting surface and try to land the ball on a target 6 feet away from a starting tee location. Around the target were concentric circles that varied in color (red, blue, and green) and distance from the target (one, two, and three inches). Putts were taken from a tee connected to a sensor unit produced by P3ProSwing. The unit recorded putting data for every putt that was relayed to and stored on a computer. For each putt, we recorded the club speed (mph), the ball speed (mph), and the deviation (inches) from where the ball was struck relative to the sweet spot on the putter.

We modified the stereotype prime used by Stone et al. (1999). For participants in the Athletic conditions, the test was described as "designed to measure personal factors related to natural athletic ability, for example one's natural ability to perform complex tasks that require hand-eye coordination, such as shooting, throwing, or hitting a ball or other moving objects." For participants in the Intelligence condition, the sentence in the instructions presented above was replaced with "The test is designed to measure personal factors related to the ability to think strategically during an athletic performance" (please see Appendix for full primes).

Furthermore, participants in the gains condition were informed they would earn 4 points for each great putt (on the target or within the red circle), 3 points for each putt within the blue circle, 2 points for each putt within the green circle, and 1 point for each putt outside all of the circles. Participants were told to try to get 38 points in each block of putts, which is equivalent to performing just over the average of the point rewards (2.5 points) earned on every putt (15 putts per block). Participants in the losses condition were told they would lose 1 point for each great putt (on the target or within the red circle), 2 points for each putt within the blue circle, 3 points for each putt within the green circle, and 4 point for each putt outside all of the circles. Participants were told to try to lose no more than 38 points in each block of putts. After these instructions, we asked participants to continue to the next screen by pressing a key to designate their racial classification. Next, participants rated their expected performance, liking of the task, motivation to complete the task, and amount of prior golf experience using 1 to 9 scales.

Participants completed two kinds of putting blocks (Single-task and Dual-task) and received 15 practice putts for each kind prior to the stereotype prime and reward induction to ensure that any performance changes in the Dual-task block could be attributed to the working memory load instead of unfamiliarity with the task procedures. In the Single-task block, participants took 15 putts. After each putt, the participant noted the number of points gained/lost on that putt by entering the value into a computer program. Participants tracked their progress using a vertically oriented “point meter” on the right side of the screen. The 0 point was marked on the meter as was the criterion line. In the gains task, the point meter started at 0, located at the bottom of the point meter, and the criterion line was labeled “38 points”. In the losses task, the point meter started at 0 but 0 was located at the top of the point meter and the criterion was labeled “-38 points”. When participants made a good putt (at least within 2 inches of the target) and entered the value, they heard a “ching” sound and the word “Great!” appeared on the screen. When participants were more than 2 inches from the target, they heard a buzzer. After every block of putts, participants got feedback as to whether or not they succeeded in meeting the block goal: earning more than 38 points or losing fewer than 38 points. After the task, participants rated their performance relative to other participants.

In the Dual-task block was modeled after the dual-task used in Beilock et al. (2006; originally from Gray (2004)) and consisted of participants putting, as in the Single-task block while simultaneously listening to a recorded set of one-syllable nouns being played from a CD Player (e.g., been, like, stage). The participants were given one of two target words (Dean or Thorn), and were asked to monitor the words, and when they heard the target word, they were instructed to repeat the word aloud. The selection of target words was randomized across participants. The participants heard an average of 24.5 target words per dual-task block, and identified an average of 22.6 of those target words. Thus, the failure rate of target words was 5.3%, which is similar to the results of Beilock et al. (2006). There was no statistically significant difference between the target words Dean and Thorn.

Results

First we analyzed task performance data using working memory performance as a continuous predictor and then as a categorical predictor. We used an alpha level of .05 to determine statistical significance. All post hoc comparisons used the error term from the overall ANOVA. Next, we examined the impact of individual difference measures (as assessed by our questionnaires).

Putting Performance

We examined the performance of participants using the timing of their first on-target putt as this measure seemed most aligned with being able to quickly focus attention and develop a task-appropriate strategy, and we included metrics of working memory capacity as continuous predictors. We analyzed the putts using a Stereotype (Intelligence, Athletic Ability) x Reward Structure (Gains, Losses) x Block (Single-task, Dual-task) mixed-factor Analysis of Covariance with Block within participants and performance on the working memory test, performance on the associated math problems, and performance on identifying target words on the dual task as covariates. There was neither a main effect of Stereotype nor a main effect of Reward or Block; therefore performance did not change significantly between the Single-task and Dual-task blocks of trials. The interaction of Stereotype and Reward was reliable, $F(1,63) = 7.40$, $p = .008$, partial $\eta 2 = .105$ (see Figure 3). Participants primed with Athletic Ability performed worse in Gains ($M = 3.93$, $SE = .44$) as compared to Losses ($M = 2.87$, $SE = .46$), but this difference was marginally reliable, $F(1,63) = 3.50$, $p = .066$. For participants primed with Intelligence, they performed better in Gains ($M = 3.06$, $SE = .45$) as compared to Losses ($M = 4.42$, $SE = .46$), $F(1,63) = 4.64$, $p = .035$. None of the other interactions reached significance. We find similar effects analyzing the number of points earned/not lost during the experiment (Stereotype x Reward interaction: $F(1,63) = 4.06$, $p = .05$, partial $\eta 2 = .061$), the number of putts that landed on the target

(Stereotype x Reward interaction: $F(1,63) = 4.42$, $p = .04$, partial $\eta 2 = .066$), and the proportion of good putts (on target or in next outer ring) in the block (Stereotype x Reward interaction: $F(1,63) = 4.41$, $p = .04$, partial $\eta 2 = .066$).

We also examined whether participants with a larger working memory capacity performed differently than those with a lower working memory capacity. A higher working memory test score was associated with better performance on identifying target words on the dual task ($r = .26$, $p = .028$) and better performance on the math problems ($r = .25$, $p = .035$). Better performance on math problems was also negatively correlated with ball distance to the target (Single: $r = -.25$, $p = .034$; Dual: $r = -.26$, $p = .029$)

We classified participants as high or low working memory using a median split. We analyzed the timing of the first good putt using a Working Memory Capacity (Low, High) x Stereotype (Intelligence, Athletic Ability) x Reward Structure (Gains, Losses) x Block (Single-task, Dual-task) mixed-factor Analysis of Variance with Block within participants and found a main effect of working memory capacity, $F(1,62) = 4.98$, $p = .029$, partial $\eta 2 = .074$, such that participants with a low working memory capacity performed better ($M = 3.17$, $SE = .28$) as compared to participants with a high working memory capacity ($M = 4.10$, $SE = .31$); the interaction of Stereotype and Reward remained reliable, $F(1,62) = 11.51$, $p = .001$, partial $\eta 2 = .157$. Moreover, there was a significant three-way interaction between Stereotype, Reward, and Working Memory Capacity, $F(1,62) = 7.79$, $p = .007$, partial $\eta 2 = .112$ (see Figure 4) for the timing of the first good putt. For participants with a high working memory capacity, there was an interaction of Stereotype and Reward, $F(1,62) = 11.72$, $p = .002$, partial $\eta 2 = .295$. Participants primed with Athletic Ability performed worse in Gains ($M = 5.36$, $SE = .81$) as compared to Losses ($M = 3.01$, $SE = .71$), $F(1,62) = 4.60$, $p = .036$. Participants primed with

Intelligence performed better in Gains (*M* = 2.56, *SE* = .75) as compared to Losses (*M* = 5.44, *SE* = .75), *F*(1,62) = 7.29, *p* = .008. In contrast, for participants with a low working memory capacity, there was no interaction of Stereotype and Reward, *F*(1,62) = .34, *p* = .57, partial η2 = .010, nor any other effects. This three-way interaction did not exist for the other measures of performance.

Relationship between Working Memory and Other Measures

We used a Stereotype x Reward Structure x Block x Working Memory mixed-factor ANOVA to examine measures from the ProSwing: distance to the sweet spot on the club, ball speed, and club speed. For distance to the sweet spot, there was only a main effect of Block, *F*(1,62) = 182.46, *p* < .001, partial η2 = .75. Participants hit the ball closer to the sweet spot on the putter in the Single-task block (*M* = 2.20, *SE* = .08) as compared to the Dual-task block (*M* = 3.45, *SE* = .08). This same block effect exists for the other putting measures: club speed (Block main effect: Single-task block (*M* = 2.16, *SE* = .07) vs. Dual-task block (*M* = 3.26, *SE* = .04), *F*(1,62) = 172.79, *p* < .001, partial η2 = .74), and ball speed (Block main effect: Single-task block (*M* = 2.10, *SE* = .07) vs. Dual-task block (*M* = 3.34, *SE* = .04), *F*(1,62) = 306.76.18, *p* < .001, partial η2 = .83). Using the working memory measures as continuous predictors in an ANCOVA instead of using the median split, the effect of Block became non-significant for club speed and ball speed. For sweet spot distance the effect of block became non-significant, *F*(1,63) = 2.58, *p* = .113, partial η2 = .04, and math problem performance was a significant covariate, *F*(1,63) = 5.13, *p* = .027, partial η2 = .08.

We also analyzed our other collected measures. We ran each of the golf item responses using a Stereotype x Reward Structure ANOVA and found no significant effects. We analyzed each of our other chronic focus-related scales using a Stereotype x Reward Structure ANOVA and found a significant interaction for worry as measured by the PSWQ, $F(1,66) = 4.31$, $p = .042$, partial $\eta 2 = .061$. As such, worry was included as a covariate in the model, but was not statistically reliable for the dependent measures (e.g., the proportion of good putts, $F(1,62) = .84$, $p = .363$, partial $\eta 2 = .013$; the timing of the first on target putt, $F(1,62) = .494$, $p = .487$, partial $\eta 2 = .008$).

General Discussion

Our participants were non-expert golfers who performed a golf putting task on an indoor putting green. We found effects consistent with regulatory fit. Participants primed with a sports intelligence stereotype performed better trying to maximize earned points while participants primed with a natural athletic ability stereotype performed better trying to minimize lost points when working memory measures were included as covariates in the model. This demonstrates that regulatory fit improves early learning of a procedural task. We predicted this effect because these golfers should not yet have developed automaticity and shifted skill execution outside of conscious awareness as occurs in expert performance. Our participants needed to engage executive processes to perform the task. Interestingly, this pattern existed in both the Single-task and Dual-task blocks of trials. There was neither an attenuation of the regulatory fit effect nor a general reduction in performance for all participants. Also, interestingly, participants high in working memory capacity demonstrated stronger regulatory fit effects than those low in working memory capacity. This interaction qualified the main effect demonstrating that participants low in working memory capacity performed better generally than participants high in working memory capacity, whose performance really suffered in regulatory mismatch.

This study is an important demonstration that regulatory fit is not taking attentional resources away from participants. Our golfers performed well under regulatory fit, just like the expert golfers in Kutzner et al. (2013). This suggests that the mechanism driving the effects is not a reduction in attention. Moreover, our study is the first demonstration that regulatory mismatches are very detrimental to individuals high in working memory capacity during the learning phase of a procedural task, which require executive processing. We also found that regulatory fit effects occurred to the same extent in both Single and Dual-task blocks.

As such, it will be important to connect the current research more with research by Beilock et al. (2006) and Kutzner et al. (2013) on expert performers. Beilock, Jellison, Rydell, McConnell, and Carr (2006) argue that stereotype threat harms golf performance by increasing monitoring of performance. This is consistent with work demonstrating that an explicit focus on skill-based knowledge disrupts processing causing reduced levels of performance (Masters, 1992). Expert participants experiencing a threat focus attention on performance that has been proceduralized and should be running outside of conscious awareness (Beilock, Kulp, Holt, & Carr, 2004). As a result, Beilock et al. found that the addition of a dual task improved performance for expert golfers because this second task required attentional resources, which allowed the golf task to be governed by the appropriate proceduralized motor processes.

Instead of removing attentional resources, we suggest that both novice and expert golfers may be doing more effective strategy selection when in a regulatory fit. In Grimm et al. (2009), participants experiencing regulatory fit were more capable of testing strategies that would lead to good performance. While in a very different domain, these participants were more effective in testing classification rules to find optimal rules to classify stimuli. Researchers should examine metrics in golf putting that reflect strategy shifts. For experts, it might be possible to measure shifts away from explicit monitoring (thereby directing attention away from putting to improve performance). Whereas for novices, one could try to measure shifts in focus on a specific aspect of their movement.

For example, we were intrigued that sweet spot distance appeared to be related to working memory and therefore might be a metric to use to examine a task-specific focus. It seems reasonable that individuals experiencing a fit would be more able to adjust putter position given the previous work on improvements in strategy selection for regulatory fit participants (Grimm et al., 2009). In an exploratory study, we collected additional data from 87 participants completing 5 Single-task blocks. We analyzed the proportion of good putts using a Block x Stereotype (Intelligence, Athletic Ability) x Reward Structure (Gains, Losses) mixed-factor Analysis of Variance with Block within participants. There was neither a main effect of Stereotype nor a main effect of Reward. There was an interaction of Stereotype and Reward, $F(1,83) = 4.77$, $p = .03$, partial $\eta 2 = .054$. Participants primed with Athletic Ability performed worse in Gains ($M = .27$, $SE = .03$) as compared to Losses ($M = .37$, $SE = .03$), $F(1,83) = 4.46$, $p = .04$. For participants primed with Intelligence, they performed better in Gains ($M = .33$, $SE = .03$) as compared to Losses ($M = .29$, $SE = .03$), but this difference was not statistically reliable. Including distance to the sweet spot as a covariate reduced the Stereotype by Reward significant interaction to non-significance ($F(1,82) = 2.10$, $p = .15$). Given that we did not find sweet spot distance varying by regulatory fit condition in the current manuscript, this result may be taken with caution but we present it here to suggest an interesting avenue for future research. It may be that these effects are only identifiable with great numbers of trials.

Future work should also be done to further connect our work to studies claiming that stereotype threat lowers working memory capacity (e.g., Beilock et al, 2004; Cadinu, Maass, Rosabiana, & Kiesner, 2005; Forbes & Schmader, 2010; Schmader & Johns, 2003). Individuals with high working memory capacity are more capable of holding and manipulating strategic information than those with low working memory capacity and, therefore, likely rely more on their working memories during task performance. We demonstrated that placing participants in a regulatory mismatch hindered the performance of high working memory capacity participants. Given the lack of stereotype main effects, our results suggest that a regulatory mismatch, and not a negative stereotype, may be removing working memory resources. That said, it is possible that negative stereotypes are taking away cognitive resources and that regulatory fit states are buffering the negative effect. Future research should further examine this possibility.

There were some limitations to the current study. First, as noted above, we did not find a Block effect; performance was not worse in the Dual-task block. This could have been due to a practice effect or could have been evidence that a regulatory fit allowed participants to maintain focus on the golf putting task. Future research could test this possibility and also use a more varied set of measures of working memory. Second, consistent with work on regulatory fit, our study did not use a control group. For regulatory fit studies, it is not clear what predictions to make for a control group who doesn’t receive a focus prime; by not controlling focus, it is possible that chronic focus would become relevant or that some other situational factor would dictate a focus. Third, we did not measure the relevance of the stereotype for our specific participants. Typical of research on stereotype threat, we felt that it was important to rely on chronically held stereotypes instead of priming stereotypic expectancies. We would anticipate that our effects would have been even stronger (because of a reduction of noise in the data) if we explicitly told our participants that they were expected to perform better or worse based on their race or primed participants by explicitly measuring their chronically held stereotypes.

In conclusion, we demonstrate that it is possible to improve the performance of individuals with negative stereotypes by doing something counterintuitive -having them focus on minimizing losses. Furthermore, extending previous work, we have demonstrated that this fit between the stereotype and the rewards environment is beneficial for a motor task performed by non-experts and that fit effects are much larger for participants with a high working memory capacity. Our research suggests that fit is advantageous for learning in cases where one needs to adapt to task conditions. This work has profound implications for individuals who strive to perform well and develop procedural knowledge. For example, consider a female surgeon who may be experiencing stereotype threat as a result of her minority status in the profession or who independently has a prevention focus given the life and death outcome of her efforts. Our work suggests that her training would be improved by creating losses reward structures to incentivize her learning.

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Figure Captions

Figure 1. Regulatory fit induced by stereotypes and reward structure.

Figure 2. Study design and task flow.

Figure 3. Timing of first putt on target by participants primed with a sports intelligence or natural athletic ability stereotype in the gains or losses conditions. Error bars represent standard error.

Figure 4. Timing of first putt on target by high and low working memory capacity participants primed with a sports intelligence or natural athletic ability stereotype in the gains or losses conditions. Error bars represent standard error.

Appendix

Athletic Ability Prime

Today you will be taking an athletic test, which is a standardized measure of sports psychology called the Texas Athletic Aptitude Test (TAAT). The TAAT was developed in 1988 by exercise and sports psychology faculty at the University of Texas at Austin. This test is based on the game of golf but performance on the test has been shown to be related to performance on many physical and mental activities relevant to most college varsity sports. The test is designed to measure personal factors related to natural athletic ability, for example one's natural ability to perform complex tasks that require hand-eye coordination, such as shooting, throwing, or hitting a ball or other moving objects.

Sports Intelligence Prime

Today you will be taking an athletic test, which is a standardized measure of sports psychology called the Texas Athletic Aptitude Test (TAAT). The TAAT was developed in 1988 by exercise and sports psychology faculty at the University of Texas at Austin. This test is based on the game of golf but performance on the test has been shown to be related to performance on many physical and mental activities relevant to most college varsity sports. The test is designed to measure personal factors related to the ability to think strategically during an athletic performance.

Figure 1.

	Gains	**Losses**
Positive Stereotype (Promotion)	Match	Mismatch
Negative Stereotype (Prevention)	Mismatch	Match

Figure 2.

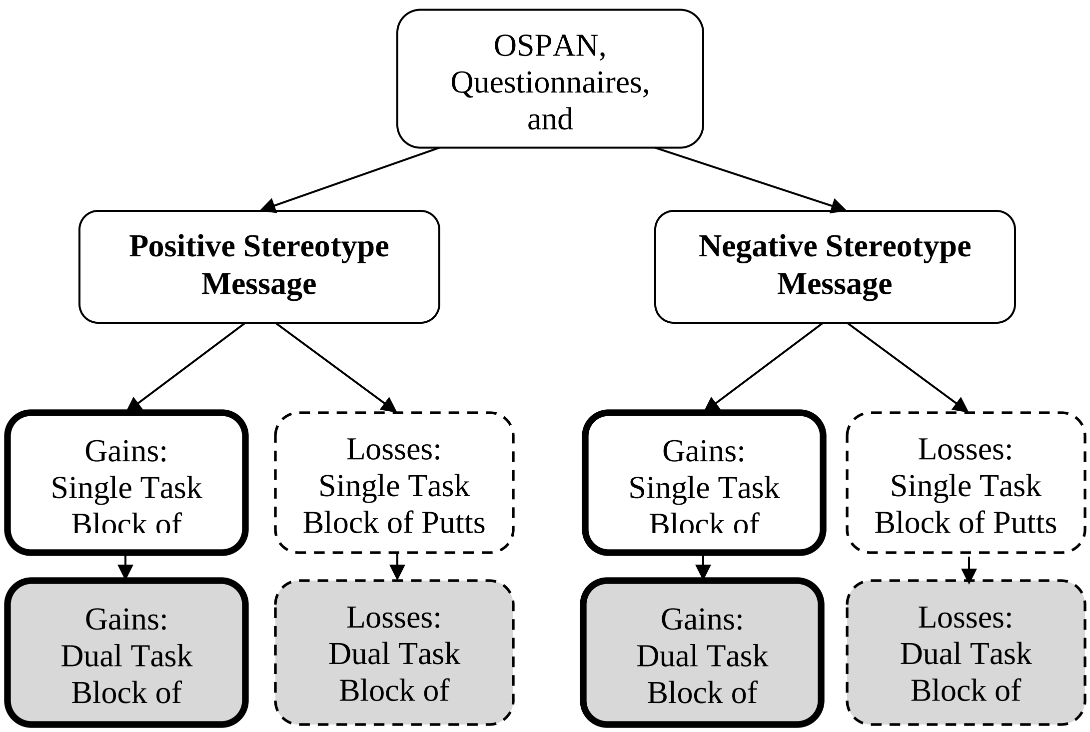

Figure 3.

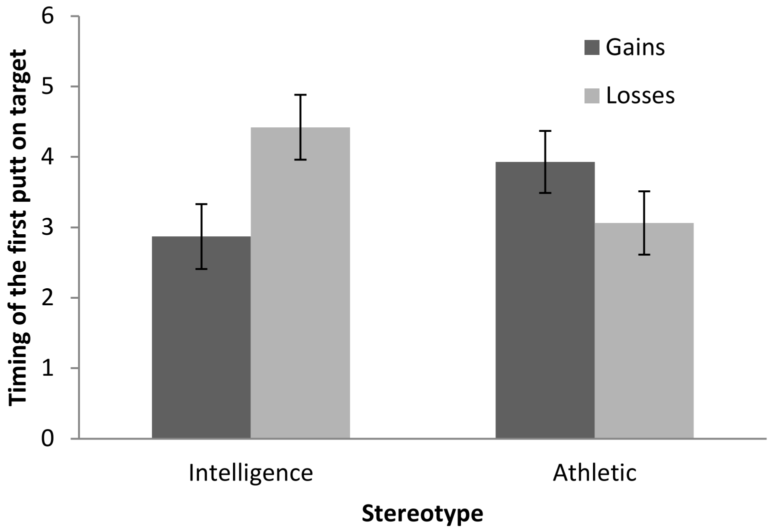

Figure 4.