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Performance Under Pressure: The Effect of Explanatory Style on Sensory-Motor Performance Under Stereotype Threat

William R. MacPhail
Claremont McKenna College

CLAREMONT McKENNA COLLEGE

PERFORMANCE UNDER PRESSURE: THE EFFECT OF EXPLANATORY STYLE ON SENSORY-MOTOR PERFORMANCE UNDER STEREOTYPE THREAT

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PROFESSOR GABRIEL COOK

AND

DEAN GREGORY HESS

BY

WILLIAM REED MACPHAIL

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Abstract

Do participants with external attribution styles outperform participants with internal explanatory styles in pressure-filled situations? Explicit-monitoring theory suggests that performance becomes impaired when conscious attention is devoted to performing a task normally carried out by automatic processes. Attributing potential failure to an external source (e.g., blaming a sudden gust of wind for a poor golf shot) can decrease the negative effects of stereotype threat, a social-psychological predicament known to engender feelings of stress similar to those experienced in pressure-filled situations, by preventing explicit monitoring from taking place. The current study examined whether individual differences in attribution style, as measured by the Attributional Style Questionnaire, affects golf-putting performance under stereotype threat. The present author hypothesized that participants with external explanatory styles would perform better than participants with internal explanatory styles under stereotype threat, because external participants would be predisposed to create external sources to attribute the cause of poor performance.

The Effect of Explanatory Style on Sensory-Motor Performance Under Stereotype Threat

The ability to perform under pressure is an important trait for many in today's society. For soldiers, police officers, firemen, and doctors, occupations where lives are literally hanging in the balance, the ability to make quick, accurate decisions under intense pressure can be the difference between life and death. But even for 'average Joes', the ability to perform under pressure can be extremely meaningful. According to a recent book, the ability to handle difficult situations is one of the most important traits CEOs look for in employees (Bryant, 2011). In the business world, those who can overcome the challenges they face are rewarded; those who cripple under the pressure are passed over for promotions and job opportunities.

While the ability to perform under pressure is an important trait in a vast array of fields, the difference between performing in the 'clutch' and 'choking' under the pressure is most often discussed in regards to athletic performance. Athletes who perform in pressure-filled situations become heroes, players who don't become laughing stocks. Golfer Jean Van de Velde fell into the latter category at the 1999 British Open. Van de Velde entered the final hole with a three-shot lead. For Van de Velde, a relatively unknown golfer, winning the British Open would have been a career-changing accomplishment. Not only would a victory secure a spot alongside golf's all-time greats, but by winning Van de Velde would stand to make millions of dollars in endorsements and prize money. The pressure on Van de Velde was immense. Still, Van de Velde had birdied the 18th hole on both of the first two rounds of the tournament, and with a three-stroke lead, he approached the 18th hole a virtual lock to win the tournament. But after his tee shot, things began to go terribly wrong for Van de Velde. His second shot flew to the

right of the hole, ricocheting off the grandstands and into a patch of thick grass. Trying to hit the ball from the heavy rough, Van de Velde mishit the ball into a small stream, forcing him to take a stroke penalty. The 18th hole had become a comedy of errors. After his fifth shot landed in a bunker, Van de Velde chipped onto the green. Finally, on his seventh shot, Van de Velde putted the ball into the hole, but by then it was too late. He had lost the lead. And after losing a one-hole playoff, he would lose the tournament. Van de Velde had choked. How could a professional golfer who had played so well suddenly play like an amateur when it mattered most? For decades psychologists have attempted to discover what causes people to struggle to perform in pressure-filled situations and what can be done to improve performance under pressure.

Much of what is known today about the processes that cause individuals to struggle to perform under pressure stems from research conducted by Claude Steele and Joshua Aronson (1995). In search of an explanation for the substandard academic performance of African Americans, Steele and Aronson (1995) conducted a series of studies resulting in the discovery of a phenomenon commonly referred to today as stereotype threat. The researchers hypothesized that economic inequality and poor schooling were insufficient alone to account for the achievement gap between African Americans and Whites, as the gap was present even after controlling for economic status, (Steele, *Atlantic Monthly*, April, 1992). In search of an answer, Steele and Aronson brought both Black and White students into their lab and administered a test of verbal ability consisting of 30 questions drawn from the Graduate Record Examination (GRE). In the "diagnostic condition", participants read that their performance on the test indicated the strength of their verbal abilities. Participants in the control condition only

read that the study was examining psychological factors, and that by taking the test participants would familiarize themselves with GRE-type questions. Consistent with their hypotheses, the researchers found that African Americans performed significantly worse in the diagnostic condition than they did in the control condition. According to the researchers, the decreased performance in the diagnostic condition was a result of 'stereotype threat', what Steele and Aronson defined as a "social-psychological predicament that can arise from widely-known negative stereotypes about one's group" (Steele & Aronson, 1995). The researchers argued that drawing an individual's attention to a stereotype that suggests that the individual's group performs poorly on a specific task also impairs the individual's performance on that task. In a subsequent study, the researchers discovered that the negative effects of stereotype threat were visible when participants merely recorded their race on a questionnaire before taking the test. The finding that such a subtle reminder of one's race prior to taking a test could induce stereotype threat suggested that stereotype threat could have significant real-world ramifications.

As it became clear that stereotype threat could account for real-world phenomenon, stereotype threat became something of a hot topic in social psychology, with a bevy of research finding that almost every group imaginable is susceptible to the power of stereotype threat. Spencer, Steele, and Quinn (1999) found that women performed worse on a test assessing mathematical ability when the test reminded participants of their gender. French researchers found that students from low socioeconomic backgrounds performed worse on a set of GRE questions when the test prompted the participants to think about their socioeconomic status (Croizet & Claire,

1998). When confronted with a stereotype concerning the mental capacity of the elderly, older individuals performed worse on a memory test (Levy, 1996). Even White students saw performance decrements on academic tasks when exposed to a stereotype that compared their academic performance to the performance of Asian Americans (Aronson, 1999). With such pervasive effects, a great portion of recent research has focused on the cognitive mechanisms that account for the negative effects of stereotype threat.

Research suggests that on cognitive tasks, placing an individual under stereotype threat impairs the threatened individual's performance by consuming resources from working memory, thus diminishing the amount of resources available to complete the task being assessed. The fewer working-memory resources available to complete a cognitive task, the more likely performance will suffer. Working memory capacity is typically assessed using an operation span task, in which participants are presented with relatively simple math problems (e.g., (2 X 3) – 5 = 1) and are asked to determine whether the equation is accurate. After answering the equation, a word appears on the computer for the participant to remember. Following a set of equation and word pairings, participants attempt to recall as many of the words as they can. The ability to correctly recall the memorized words is a proxy for working memory capacity, as it represents the ease with which an individual can solve math problems while holding particular words in memory (Schmader, Johns, & Forbes, 2008). If stereotype threat impairs working memory, participants under stereotype threat should perform worse on the operation span task when they are under stereotype threat. And indeed, Schmader and Johns (2004) found that the working memory scores of women were significantly lower when participants believed the operation span task was a measure of quantitative capacity

related to math ability than when the female participant believed the operation span task was simply a memory test. Furthermore, the decreased capacity of working memory was sufficient to account for almost all of the decreased performance on the test (Schmader & Johns, 2004). Subsequent research has supported the notion that working memory is responsible for decreased performance under stereotype threat. Beilock, Rydell, and McConnell (2006) found that placing an individual under stereotype threat only impairs performance if the task being assessed is demanding enough to require resources from working memory. As more and more research finds that exposing an individual to stereotype threat decreases the threatened individual's working memory capacity, researchers have turned their attention towards the processes by which stereotype threat impairs working memory.

In the most comprehensive model currently published, Toni Schmader, Chad Forbes, and Michael Johns (2008) identify three distinct processes in which stereotype threat decreases working memory capacity. According the researchers, the first way stereotype threat impairs working memory is by making threatened individuals feel stressed. Substantial experimental evidence indicates that exposing an individual to a negative stereotype about his or her group is a stressful experience for that individual. In Steele and Aronson's preeminent study on stereotype threat, Black participants had higher levels of blood pressure than White participants (Steele & Aronson, 1995). Additionally, women watching men and women discuss a science and math conference had higher sympathetic nervous system (SNS) activation, supporting the notion that being placed under stereotype threat is stressful to the threatened individual (Murphy, Steele & Gross, 2007). Furthermore, situations leading individuals to attempt to reconcile relations

between the self and group, which stereotypical information about one's group is likely to do, are likely stressful to threatened individuals (Elliot & Devine, 1994, as cited by: Schmader et al., 2008). Feelings of stress increase SNS activation and increase the amount of cortisol released, which may impair the functioning of the hippocampus and the prefrontal cortex (Schmader et al., 2008). Because executive functioning and working memory are mediated by the prefrontal cortex, working memory may be impaired by stressful situations (Baumeister, Twenge, & Nuss, 2002, as cited by: Schmader et al., 2008). Cortisol, as well as general arousal, affects performance in the shape of an inverted U. Moderate amounts of arousal facilitates performance, while high and low levels of cortisol inhibit performance (Schmader, Johns, & Forbes, 2008). The evidence that threatened individuals perform worse under stereotype threat suggests that the stress and arousal brought on by exposure to stereotype threat goes beyond the moderate levels that facilitate performance.

A popular explanation for the increased levels of stress experienced by stereotype-threatened participants is that threatened individuals have an increased desire to perform at a high level. If a threatened individual performs poorly, not only does their performance reflect badly on themselves, but the poor performance reflects badly on their entire group (Tagler, 2003). With an increased incentive to perform at a high level, threatened participants should show signs of putting forth higher levels of effort, and, in fact, there is evidence that threatened participants do try harder. Steele and Aronson (1995) found that, in their first study, threatened participants spent more time working on each GRE problem and reread questions more often. Furthermore, stereotype-threat manipulations are only effective at impairing performance when participants care about

their performance in the particular field being assessed (Stone, Lynch, Sjomeling, & Darley, 1999). When the participant doesn't care about her performance there is no incentive to try and disprove the stereotype, thus the participant does not feel stressed to perform at a high level. Taken together, the increased effort threatened participants give in the face of stereotype threat likely increases the pressure participants put on themselves to perform well, leading to feelings of stress.

Faced with increased levels of stress and feelings of anxiety, individuals under stereotype threat may try to suppress the anxiety they feel. However, suppressing anxiety is a conscious process requiring cognitive resources, (Muraven & Baumeister, 2000, as cited by: Schmader et al., 2008). Thus, the more an individual tries to monitor his or her emotions, the more cognitive resources that must be used, leaving fewer resources available to devote to the task. The prefrontal cortex has also been implicated in the role of thought suppression, indicating that suppressing thoughts is a process that requires executive resources, (Mitchell, Heatherton, Kelley, Wyland, Wegner, & Macrae, 2007).

Finally, Schmader, Johns, and Forbes hypothesize that stereotype threat inhibits working memory by inducing individuals to monitor the self-relevance of their performance. As previously discussed, stereotyped individuals have a strong motivation to avoid failure. Not only can the desire to avoid failure lead participants to a more cautious and systematic performance, limiting creative thinking, but striving to perform at a high level can also increase the participant's interest in performance cues (Seibt & Forster, 2004, as cited by: Schmader et al., 2008). Specifically, stereotyped individuals may be particularly attentive to information suggesting that their performance confirms the stereotype (Amodio, Harmon-Jones, Devine, Curtin, Hartley, & Covert, 2004). The

cognitive resources used to monitor performance are likely the same resources needed to carry out the assessed task. Schmader, Johns, and Forbes (2008) hypothesize that increased conscious attention devoted to monitoring performance consumes central executive resources, thus depleting resources from working memory.

While researchers examining stereotype threat were originally interested in the consequences of stereotype threat in academic settings, recent research suggests that situations invoking stereotype threat can also impair performance on tasks involving athletic skill (tasks requiring sensory-motor coordination rather than controlled processing). On a golf-putting task, male golfers performed significantly worse after reading information indicating that women are superior putters than men (Beilock et al., 2006). Other research has shown that Whites perform worse on similar putting tasks when told that their performance on the task is indicative of natural athletic ability (minorities are stereotypically assumed to have more natural athletic talent), while Blacks perform worse on the same task when told that their performance is representative of 'athletic intelligence' (Whites are stereotypically thought of as having more 'athletic intelligence') (Stone, Lynch, Sjomeling, & Darley, 1999).

Despite similar performance decrements, the process by which stereotype threat impairs performance differs on cognitive and sensory-motor tasks. As outlined above, on cognitive tasks stereotype threat hurts performance by consuming resources from working memory. But on sensory-motor tasks, stereotype threat inhibits performance by increasing self-monitoring behavior. Placing an individual under stereotype threat on a sensory-motor task still increases the pressure the threatened individual feels to perform at a high level, because the motivation to disprove the stereotype is still there.

Researchers hypothesize that the pressure to perform at a high level causes the threatened individual to pay increased attention to the movements the he or she makes (e.g., a golfer faced with a big putt focuses on his wrists during his swing) with the idea that increased focus will result in improved performance (Beilock et al., 2006). However, explicit monitoring has the perverse effect of impairing performance, as it takes relatively automatic processes- as defined as requiring minimum levels of working memory- and makes them more controlled. Conscious attention to a sensory-motor movement causes the individual to deviate from the automatic movements that have become second nature through years of experience. As processing becomes more controlled, performance suffers.

To test the validity of explicit-monitoring theory as an explanation to account for the effects of stereotype threat on sensory-motor tasks, researchers have had participants perform a second task (commonly referred to as a distracting task) in addition to the task threatened by the stereotype-threat manipulation. The experiments requiring participants to simultaneously engage in two tasks are commonly dubbed divided-attention tasks, as the presence of the second task forces participants to divide their attention between two tasks. If stereotype threat impaired performance on sensory-motor tasks by consuming resources from working memory- as stereotype threat does on cognitive tasks- the distracting task would impair performance even further, as the distracting task would consume additional resources from working memory. However, if, as explicit-monitoring theory suggests, performance was hurt because stereotype threat caused participants to explicitly monitor their performance, the distracting task would improve performance on the stereotype-threatened sensory-motor tasks by preventing participants from devoting

executive resources to monitoring the execution of the threatened task. In numerous studies, distracting tasks have been shown to improve performance under stereotype threat. Beilock et al. (2006) found that when threatened participants monitored a recording for certain target words and repeated the words aloud after they were played (distracting task), performance was significantly better than when stereotype-threatened participants performed only the threatened task. Importantly, the distracting task does not appear to have simply removed the relevance of the stereotype, because participants performed similarly well when the distracting recording consisted of stereotype-relevant words. In a putting task similar to the activity employed by Beilock et al. (2006), Lewis and Linder (1997) obtained similar results, finding that participants who simultaneously counted backwards from 100 by two while putting, putted better under pressure than participants who putted without counting backwards.

Further support for explicit-monitoring accounts of performance decrements under stereotype threat comes from studies that have succeeded in impairing performance by getting participants to explicitly-monitor their performance. When expert soccer players completed a dribbling course while recording which side of their foot they touched the ball with every time a tone sounded (to direct attention to the skill), their performance was significantly worse than when they only listened to a recording and repeated a target word (Beilock & Carr, 2002). Similarly, expert baseball players hit significantly worse when they tracked whether their bat was going up or down at various points in their swing compared to when they only monitored whether a recording played a high or low tone during their swing (Castenada & Gray, 2007). The finding that

distracting tasks can improve performance has led other researchers to investigate other ways in which performance can be insulated from the harmful effects of pressure.

In addition to distracting tasks, providing threatened participants with a plausible, external source to attribute potential failure can improve performance in pressure-filled situations. For example, Brown and Josephs (1999) told stereotype-threatened female participants that, following a computer-administered practice test, each participant would take a test diagnostic of mathematical ability. However, when the participants went to take the practice test, an experimenter informed them that the computer was malfunctioning, so they would be forced to take the math test without the benefit of the practice test. Surprisingly, women who thought they had been 'robbed' of the opportunity to take the practice test performed significantly better on the math test than threatened women who simply took the math test without ever being told that there was supposed to be a practice test, (Brown & Josephs, 1999). Brown and Joseph (1999) hypothesized that being able to blame an external source (e.g., the broken computer) if they performed poorly removed the pressure the women felt to perform at a high level. After all, if they performed poorly, they could explain away the poor performance by the fact that they didn't get the benefit of the practice test.

The presence of an external source to attribute failure can also alleviate the effects of stereotype threat on sensory-motor tasks. In a golf-putting task used by Stone et al. (1999), stereotype-threatened participants instructed to be mindful of whether the lab space made them feel tense or uneasy (under the guise that the lab had recently undergone renovations) putted better than participants put under stereotype threat but not asked to consider how features of the lab space could affect their performance (Stone et

al., 1999). The researchers hypothesized that asking participants to monitor the lab space provided the participants with an external source to devote executive resources, preventing the participants from engaging in explicit-monitoring behavior.

The tendency that individuals have to attribute the cause of an event to an internal or external source varies from person to person. Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman (1982) created the Attribution Styles Questionnaire (ASQ), which measures an individual's attribution style based on the respondent's answers to hypothetical situations on three dimensions- externality (internal-external), stability (stable-unstable), and specificity (global-specific). The ASQ has been shown to correlate positively with attributions made by individuals in response to real events. Furthermore, the test has impressive test-retest reliability, indicating that the ASQ is a valid measure of explanatory style (Peterson et al., 1982). From an individual's responses on the ASQ, scores can be calculated for each dimension for both positive and negative events. Additionally, scores on the ASQ can be used to categorize how optimistic or pessimistic an individual's explanatory style is. Individuals who explain positive events as being due to external, unstable, and specific causes, while explaining negative events as being due to internal, stable, and global causes are said to have pessimistic explanatory styles. Individuals who explain positive events as resulting from internal, stable, and global causes and negative events resulting from external, unstable, and specific causes have optimistic explanatory styles.

Previous research conducted on explanatory style as a moderating factor on athletic performance has focused on differences between athletes with optimistic and pessimistic explanatory styles. Several studies suggest that individuals with optimistic

explanatory styles perform better than pessimistic individuals following the presentation of negative information. After being given fictitious information that they swam their first trial seconds slower than usual, Olympic quality swimmers with pessimistic explanatory styles swam slower on a second trial. On the other hand, swimmers with optimistic explanatory styles did not swim significantly slower on the second swim, indicating that they were less affected by the prior 'poor performance'. Furthermore, swimmers with pessimistic explanatory styles underperformed relative to the coaches' expectations over the course of the season (Seligman, Nolen-Hoeksema, Thorton, & Thorton, 1990). Similar results have been found in the performance of club soccer players. Players with optimistic explanatory styles performed better than their pessimistic teammates (as measured by percentage of passes completed) in games in which the team was behind, suggesting that individuals with pessimistic explanatory styles do not respond to poor performances as well as those with external explanatory styles (Gordon, 2008). In light of these results, some researchers have hypothesized that pessimistic individuals, expecting failure, may decrease their effort level. However, the self-handicapping argument does not appear applicable to situations invoking stereotype threat, because, as previously discussed, threatened individuals have been found to exhibit more, not less, effort in the face of stereotype threat. Instead, having an optimistic explanatory style appears to lead to more resilient performance.

Given that other studies have found that athletes with pessimistic explanatory styles outperformed optimistic teammates, the chance that an optimistic explanatory style is positively correlated with athletic ability is slim (Davis & Zaichkowsky, 1998). The more likely explanation is that optimistic individuals perform better in the face of

adversity than individuals with pessimistic explanatory styles, but there is little difference in overall ability. While substantial research has examined the effect of optimism on athletic performance, few studies have looked at whether having an external or internal explanatory style affects performance under pressure.

The purpose of the present study was to expand the understanding of what factors influence a person's ability to perform under pressure by investigating whether having an external explanatory style may make an individual more resistant to the negative effects of stereotype threat on sensory-motor tasks. As previously discussed, when the experiment provided participants with an external source to attribute potential failure, the negative effects of stereotype threat were significantly reduced (Brown & Josephs, 1999; Stone et al., 1999). Individuals with external explanatory styles tend to attribute the cause of an event to an external source, suggesting that they naturally create external sources to which they may attribute poor performance (e.g., blaming the slanted floor for a poor putt in a lab experiment). Focusing executive resources on something other than the sensory-motor task improves performance by preventing the individual from engaging in explicit-monitoring behavior. Thus, blaming an external source for a potentially poor performance may protect the performance of external participants from the harmful effects of explicit-monitoring, as the executive resources devoted to thinking about the external source would distract the individual from explicitly monitoring his or her performance (Beilock et al., 2006; Gray, 2007).

The present study also sought to determine how a divided-attention task would affect the performance of participants with internal and external explanatory styles. Although the divided-attention condition was hypothesized to improve the performance

of both groups compared to the stereotype-threat condition, based on the assumption that participants with external explanatory styles would naturally create external sources to devote executive resources, I predicted that the distracting task would improve the performance of 'internal' participants more than the performance of 'external' participants. External participants' propensity to attribute the causes of events to external sources would already shield them from some of the negative effects of stereotype threat, thus serving the same function as the divided-attention task. Because external participants were already partly insulated from the negative effects of stereotype threat, the divided-attention task would have a more significant affect on the putting of internal participants.

Finally, to test the limits of how cognitively demanding a distracting task can be while still improving performance under stereotype threat, the present study employed a more cognitively demanding divided-attention task than those used by previous studies. Finding that a more-cognitively demanding distracting task had the same effect of improving performance would provide even stronger support for explicit-monitoring theory's explanation that performance suffers in pressure-filled situations due to cognitive resources being directed to executing the task.

Method

Participants

55 undergraduate students- 19 females and 36 males- from Claremont McKenna College participated for partial course credit or for the chance to win a $25 gift card. Participants ranged in age from 18-22 (M= 19.8). To sign up, participants were not required to have any prior golf experience, although participants with previous golf experience were recruited from outside the research pool. The mix of experienced and

inexperienced golfers resulted in a heavy-tailed kurtotic distribution of golf experience with a positive skew (M = 11, Mdn = 2). Participants' previous athletic experience was much more normally distributed, with a mean of 6.7 previous seasons of high school and college sports seasons played (Mdn = 6).

Design

A single male experimenter ran participants one at a time. Assignment to the control, stereotype-threat, and divided-attention conditions was quasi-random, based on the time-slot each participant registered for in an alternating manner (e.g., I assigned a participant who signed up at 1:00 to the control condition, the participant who signed up at 1:30 to the stereotype-threat condition, etc…). However, the experimenter assigned the final six participants to the stereotype-threat condition to ensure that there were an appropriate number of participants to run simple effect analyses. The result was a 2 (Explanatory Style: internal, external) × 3 (Experimental Condition: control, stereotype-threat, divided-attention) between-subjects factorial ANOVA.

Materials and Procedure

After filling out an informed consent form, participants took the Attributional Style Questionnaire, which had been uploaded onto a computer to ease scoring the exam (Peterson, Semmel, Baeyer, Abramson, Metalsky, & Seligman, 1982). The ASQ measures explanatory style across three dimensions: stability (stable vs. unstable), specificity (specific vs. global), and externality (external vs. internal). The test presents respondents with twelve hypothetical events and directs the test taker to explain the cause of the event. Six of the events are positive (e.g., you become very rich), and six are negative (e.g., you go out on a date and it goes badly). After recording the cause of the

event, participants rate the extent to which the cause is due to an external source (totally due to other people or the circumstances = 1) or to an internal source (totally due to me = 7) on a 1-7 scale. Questions asking participants to rate the cause they wrote down on the other two dimensions of the ASQ (stable-unstable, global-specific) were excluded, because the researcher considered them irrelevant to the independent variable under investigation (see Appendix A for the version of the ASQ administered to participants). Scores on the exam were derived by separately summing the scores of the responses for good and bad events and then adding the two totals together.

Upon completion of the ASQ, participants completed a quick demographic questionnaire, which asked participants to indicate their age, gender, previous golf experience, and seasons of high school and college sport experience (see Appendix B for a copy of the questionnaire). After finishing both questionnaires, the experimenter introduced participants to the putting task, which took place on the carpeted floor of an indoor classroom. The unique feature of the classroom was that a 14 × 9 cm hole had been installed in the floor of the room. Although the hole was rectangular instead of circular, it was considered to be a more realistic replication of the act of putting than having participants aim for a target on the surface of the floor. Experiments that utilized the latter method reported that some participants commented that it felt unnatural to aim for a target the ball could roll over (Beilock et al., 2006). Participants used a standard 34 in. (86 cm), which both left and right-handed participants could use.

The experimenter instructed participants to putt the ball as accurately as possible towards the hole. The hole was 120 in. (305 cm) away from a piece of tape on the ground, which denoted where participants were to hit the ball from. Following each putt,

the experimenter measured the distance of the ball from the middle of the hole with a standard tape measure. The experimenter scored putts that made it in the hole as being 0 in. (0 cm) away. All participants were first allowed 12 practice putts to familiarize themselves with the task. The experimenter did not measure the distance of these putts from the hole. After the participant's 12th putt, the experimenter instructed the participant to take an additional 15 putts, which the experimenter scored (pretest). However, unbeknownst to the participant, the experimenter did not begin recording the distance of the participants' putts until consecutive putts were within 50 in. (127 cm) of the hole to ensure that a base line had been achieved.

Manipulation of experimental condition. Following the pretest, the experimenter gave participants a sheet of paper under the pretense that the paper contained additional information about the purpose of the study. Participants in the control condition read that the study was investigating individual differences in putting performance. Participants in the stereotype-threat group read that the study was investigating gender differences in putting ability. Women in the stereotype-threat condition read that men tend to outperform women on the putting task; men read that women typically outperform men. Furthermore, participants read that recent studies on the putting of PGA (Professional Golfers Association) and LPGA (Ladies Professional Golfers Association) golfers supported these findings (see Appendices C, D, & E, for a full copy of all prompts). This stereotype-threat manipulation has proven to be effective in previous studies (Beilock, et al., 2006). After reading the additional information, participants putted another 15 times (posttest).

Participants in the divided-attention condition received the same stereotype-threat manipulation previously discussed. However, when performing the final 15 putts, they simultaneously engaged in a random number generation task previously shown to require central executive resources (Cook, Marsh, & Hicks, 2002; Hicks, & Marsh, 2000). Participants listened to a metronome that produced a tone every 1.5 s. Every time the metronome produced a tone, participants generated a number ranging from 1 to 10 in a random fashion. The experimenter described randomness to each participant as picking slips out of a hat and replacing the slips after they had been selected. The experimenter went on to warn participants that the numbers generated should not have any well known relationship between them (e.g., counting up or down, repeating digits, etc.). Furthermore, the experimenter told participants that their performance on the number generation task would be scored based on the randomness of the numbers they produced, so they should give the number generation task just as much attention as the putting task.

A computer was used to record participants' responses. Before participants began to putt, a baseline measure of performance on the random number generation task was taken by having participants generate 100 numbers. Previous studies have found that this is the approximate number of generations needed to establish a baseline of performance (Cook et al., 2002). Upon stating the 100^{th} number the experimenter indicated that the participant should begin putting while continuing the RNG task. Although a computer recorded participants' responses on the RNG task, participants' randomness scores were not used as a dependent variable. All participants appeared to take the RNG task seriously, so previous research indicating that the RNG task is effective at consuming executive resources was considered sufficient to conclude that the

RNG task was effective in the current experiment. Upon completion of the 15th putt, participants were fully debriefed.

Results

The difference between each participant's mean distance from the hole on the pretest and their mean distance from the hole on the posttest trials constituted the putting score. This difference score was the dependent variable in all analyses. Participants who improved from their first to their second trial had a negative putting score; participants who performed worse on the second trial than they did on their first trial had a positive putting score.

Participants' scores on the ASQ were transformed from a continuous variable to a two-group dichotomous variable. One group encompassed those with an internal explanatory style, and the second encompassed those with an external explanatory style. To create this variable, a median split was performed on ASQ scores. Participants who scored 57 and higher on the ASQ were qualified as having an internal explanatory style; participants with scores below 57 on the ASQ were entered as having an external explanatory style. The median split allowed me to perform a 2 (attribution style: internal, external) × 3 (condition: control, stereotype-threat, divided-attention) between-subjects factorial ANOVA. Results of the ANOVA revealed a significant main effect of condition on putting scores, $F(2, 49) = 3.06$, $p = .050$, $\eta^2_{partial} = .111$. LSD Post Hoc analyses revealed a significant difference between the control and stereotype-threat conditions, $p = .029$. Participants in the control condition (M = -6.6 in. (- 16.8 cm), SD = 11.9 in. (30.2 cm)) putted better than participants in the stereotype-threat condition (M = 2.6 in. (6.6 cm), SD = 10.7 in. (27.2 cm)). The putting scores for the control and divided-attention

condition (M = -2.1 in. (5.3 cm), SD = 10.5 in. (26.7 cm)) and the divided-attention and stereotype-threat conditions did not significantly differ from one another. Unexpectedly, the ANOVA also showed a marginally significant main effect of explanatory style on putting scores, $F(1, 49) = 2.91$, $p = .094$, $\eta^2_{partial} = .056$. Participants with internal explanatory styles putted worse (M= 1.41 in. (3.6 cm), SD = 10.0 (25.4 cm)) than participants with external explanatory (M = -3.2 in. (-8.13 cm), SD = 12.2 (31 cm)). There was no significant interaction between condition and explanatory style, $F(2, 49) = .734$, $p = .485$, $\eta^2_{partial} = .029$.

Although a significant interaction was not found, additional analyses were conducted to explore the simple effects of attribution style within each experimental condition. Participants with internal and external attribution styles did not significantly differ in their putting scores within either the stereotype-threat condition, $F(1,51) = .030$, $p = .860$, or the divided-attention condition, $F(1,51) = 1.07$, $p = .306$. There was, however, a marginally significant difference between explanatory styles in putting scores within the control condition, $F(1,51) = 3.14$, $p = .082$, $\eta^2_{partial} = .058$. Participants with internal explanatory styles putted worse than participants with external explanatory styles in the control condition (M= .033 in. (.1 cm), SD = 13.3 in. (33.8 cm)) and (M= -9.44 in. (24 cm), SD = 11.0 in. (27.9 cm)), respectively.

Because I hypothesized that participants would create external sources to attribute poor putting performance (i.e., attributing the cause of a negative event to an external source), I performed 2 (explanatory style: internal, external) × 3 (condition: control, stereotype-threat, divided-attention) between-subjects factorial ANOVA using only the ASQ scores from bad events. A median split categorized participants with ASQ scores of

below 26 for bad events as being external; participants with scores of 26 and greater were qualified as being internal. The results of the analysis mirrored those of the ANOVA performed using overall ASQ score. Because the conditions analyzed were the same as in first ANOVA there was an identical marginally significant main effect of condition on putting score $F(2, 49) = 2.63$, $p = .083$, $\eta^2_{partial} = .097$. However, there was not a significant main effect of ASQ score on putting score $F(1,49) = .858$, $p = .359$, $\eta^2_{partial} = .015$. Nor was there a significant interaction effect between condition and ASQ score $F(2, 49) = .123$, $p = .884$, $\eta^2_{partial} = .003$.

While the analysis failed to find a significant difference in the putting scores of internal and external participants in the stereotype-threat condition using both total ASQ score and ASQ score for only bad events, neither analysis controlled for previous golf experience. Participants who entered the experiment with no previous golf experience may have been likely to improve over the course of the experiment due to a practice effect. Thus, if external participants came into the experiment with less golf experience than internal participants, the improvement of external participants could be due to their lack of golf experience rather than an effect of the experimental condition on explanatory style. To control for the effect of previous golf experience I conducted a 2 (explanatory style: internal, external) × 3 (condition: control, stereotype-threat, divided-attention) between-subjects factorial ANCOVA, using previous golf experience as a fixed factor. The analysis revealed a non-significant interaction between ASQ and previous putting experience $F(2,52) = .368$, $p = .694$. The non-significant finding indicated that homogeneity of regression slopes was not violated, suggesting that the putting scores of

internal and external participants did not differ due to differences in previous golf experience.

Previous research on explanatory style's effect on sensory-motor performance has focused on whether having a pessimistic or optimistic explanatory style affects a participant's sensory-motor performance. Although optimism and pessimism were not part of the original research question, an exploratory analysis was performed to determine whether optimism and pessimism had an effect on putting scores. Participants' scores on the ASQ were calculated separately for both good and bad events. Optimism scores were calculated by subtracting a participant's ASQ total for bad events from their ASQ total for good events (e.g., a participant who scored 30 on positive events and 25 on negative events would have an optimism score of 5). The median optimism score was 4.6. Performing a median split, participants with scores greater than 4.6 were qualified as being optimistic; those with scores of 4.6 and below were qualified as having pessimistic explanatory styles. Following the median split, I performed a 2 (attribution style: pessimistic, optimistic) × 3 (condition: control, stereotype-threat, divided-attention) between-subjects factorial ANOVA to determine whether optimism or pessimism had a significant effect on putting scores. The analysis did not reveal a significant main effect of attribution style on putting scores, $F(1,49) = .000$, $p = .984$, nor was there a significant main effect of condition on putting scores, $F(2,49) = 2.16$, $p = .125$. There was also not a significant interaction between attribution style and condition, $F(2, 49) = .493$, $p = .614$.

Discussion

The main purpose of this study was to determine whether individuals with external explanatory styles would out-perform individuals with internal explanatory styles under the pressure of a stereotype-threat manipulation. In other words, would Jean

van de Velde have stood a better chance on the 18th hole of the British Open if he had an external explanatory style? Contrary to the study's hypothesis, the results of the study suggest that Van de Velde's explanatory style would have had little, if any, affect on his ability to withstand the pressure he faced, as the study failed to find a significant difference in the putting scores of individuals with internal and external explanatory styles under stereotype threat. Previous research testifies that external individuals do, in fact, attribute the causes of events to external sources. Making the reasonable assumption that the external participants in the present study did create external sources to attribute potential failure, the question becomes why did these external sources fail to insulate participants' performance from the negative effects of the stereotype-threat manipulation? The question is particularly interesting when noting that the external sources used by previous researchers (e.g., broken computer, directing attention to the features of the lab space) effectively improved the performance of stereotype-threatened participants (Brown & Josephs, 1999; Stone et al., 1999).

The difference in the effectiveness of the external sources in previous research compared to the present study is likely the result of how salient the external sources were to the participants. Going to take a practice test, only to find out that the computer the practice test was going to be administered on is broken is a memorable event. Thus, because the broken computer was likely on participants' minds throughout the scored test, it was easy for them to attribute potential failure to the lack of a practice test. On the other hand, the external sources created by participants during the present study may have been less salient, the less salient the external source, the fewer cognitive resources the source is likely to consume, leaving more executive resources to devote to explicit

monitoring. Given that the analysis found that external participants performed slightly better under stereotype threat than internal participants, there is certainly a theoretical ground for future research to explore the effects of explanatory style on performance under pressure. However, future studies must address the saliency of the external sources created by participants, as external sources that are not salient may not be effective at improving performance.

In addition to failing to find the expected difference between internal and external participants in the stereotype-threat condition, the study found that individuals with external explanatory styles significantly outperformed internal participants in the control condition. Despite the statistical significance of the finding, the observed difference is more likely the result of an initial difference in the putting ability of internal and external participants, rather than the result of a systematic difference in putting ability. While the present study adopted similar methodology as previous experiments in the field, previous researchers have restricted the participant pool to only those participants who had previous experience with the threatened task (Beilock et al., 2006; Lewis & Linder, 1997). Although the researcher recruited individuals owning golf expertise to participate, 20 individuals with no previous golf experience participated in the study. The worse a participant is at golf, the more likely the participant's results will be clouded by a practice effect. A participant who had never putted before would likely improve on the second trial of the experiment, regardless of experimental condition, through simple practice. While the ANCOVA analysis controlled for previous golf experience, there is evidently more to golfing ability than simply the number of times a participant has played in the past year. External participants in the control and divided-attention conditions putted

worse than any other group on their first trial (M = 50 in. (127 cm)) and (M = 44 in. (112 cm)), respectively. Because external participants in the control and divided-attention conditions came into the experiment worse putters than any other group, their improvement in the posttest trial was likely the result of a practice effect, as they had the most room to improve (see figure 3). The small sample of external participants in the control condition could have also contributed to the significant difference. In the considerable literature on performance under pressure and stereotype threat, few studies reported differences in explanatory style affecting sensory-motor performance. And, by in large, when studies did report a difference, they found that participants who attributed failure to external sources outperformed participants who attributed poor performance to internal sources (Gordon, 2008; Seligman et al., 1990). Furthermore, there are no theoretical grounds to base a hypothesis that having an external explanatory style would be beneficial to sensory-motor performance in a control-condition setting but not beneficial under a stereotype-threat manipulation. Because there was expected to be no difference between internal and external participants in the control condition, the experimenter assigned only ten participants to the control condition. With so few participants, reaching a conclusion based on data from the control condition would be premature.

While the study did not find the expected difference between the putting scores of participants with internal and external explanatory styles in the stereotype-threat condition, the study appears to have been carried out in a methodologically sound way, as the study replicated previous findings that stereotype threat harms performance on sensory-motor tasks and that the presence of a second, attention-dividing task alleviates

some of the harmful effects of the stereotype. Moreover, the current study found that using a random number generation task- a more cognitively taxing divided-attention task than previous studies have utilized- still resulted in participants in the divided-attention condition putting better than participants in the stereotype-threat condition. The fact that a more cognitively demanding divided-attention task still resulted in improved performance provides even more support for explicit-monitoring theory that performance suffers in pressure-filled situations due to conscious attention being devoted to the task, rather than because fewer cognitive resources are available to devote to the task.

In summary, the present study provides additional support for the famous proverb uttered by baseball pioneer Branch Rickey: "Full head, empty bat", (Will, Men at Work, p. 210). What Rickey put so succinctly was that when a hitter steps to the plate thinking about the act of hitting, he might as well not swing at all, because you can't hit so long as you are thinking about hitting. Originally uttered with the game of baseball in mind, Rickey's observation has proven to be serendipitous. In sensory-motor tasks ranging from golf putting to dribbling a soccer ball, the act of thinking about the movements involved in sensory-motor tasks reliably impairs performance. The next step for researchers is to determine whether there are personal characteristics that predispose an individual to being able to overcome the negative effects of stereotype threat. The failure of the present study to identify external explanatory style as such a factor should not deter future researchers from investigating the effect of explanatory style and other personal characteristics on performance under pressure. The knowledge of which individuals are best able to perform in the face of immense pressure has the potential to have a profound impact on our world. Being able to determine which individuals stand the best chance of performing under pressure would be invaluable to sporting teams in identifying the best

players to draft and acquire. But the potential benefits range far beyond the sporting world. The army, police and fire departments, hospitals, businesses, and any other field that requires employees to perform in pressure-intensive situations would benefit tremendously from determining which candidates are most likely to perform under pressure. The importance of being able to perform in pressure-filled situations will not lessen in coming years. With that reality in mind, it is imperative that psychologists identify the traits that allow individuals to perform under pressure, and find out how these traits can be applied to the rest of society.

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Table 1

Putting Scores By Condition and Explanatory Style

Dependent Variable:Difference

ASQMEdian Split	Condition	Mean	Std. Deviation	N
External	Control	-9.4429	11.04458	7
	Stereotype Threat	1.9000	10.85846	14
	Divided-Attention	-8.7800	12.85834	5
	Total	-3.2077	12.19616	26
Internal	Control	.0333	13.29110	3
	Stereotype Threat	3.5273	11.06328	11
	Divided-Attention	.1400	8.99030	15
	Total	1.4138	9.97857	29
Total	Control	-6.6000	11.89668	10
	Stereotype Threat	2.6160	10.74913	25
	Divided-Attention	-2.0900	10.49129	20
	Total	-.7709	11.22124	55

Note. The mean value represents mean difference score. Difference score was calculated by subtracting the participant's posttest score from their pretest score. Thus, a participant who improved from the pretest to the posttest would have a negative difference score; participants who performed better on the pretest trial have positive difference scores. Values for means and standard deviations are in inches.

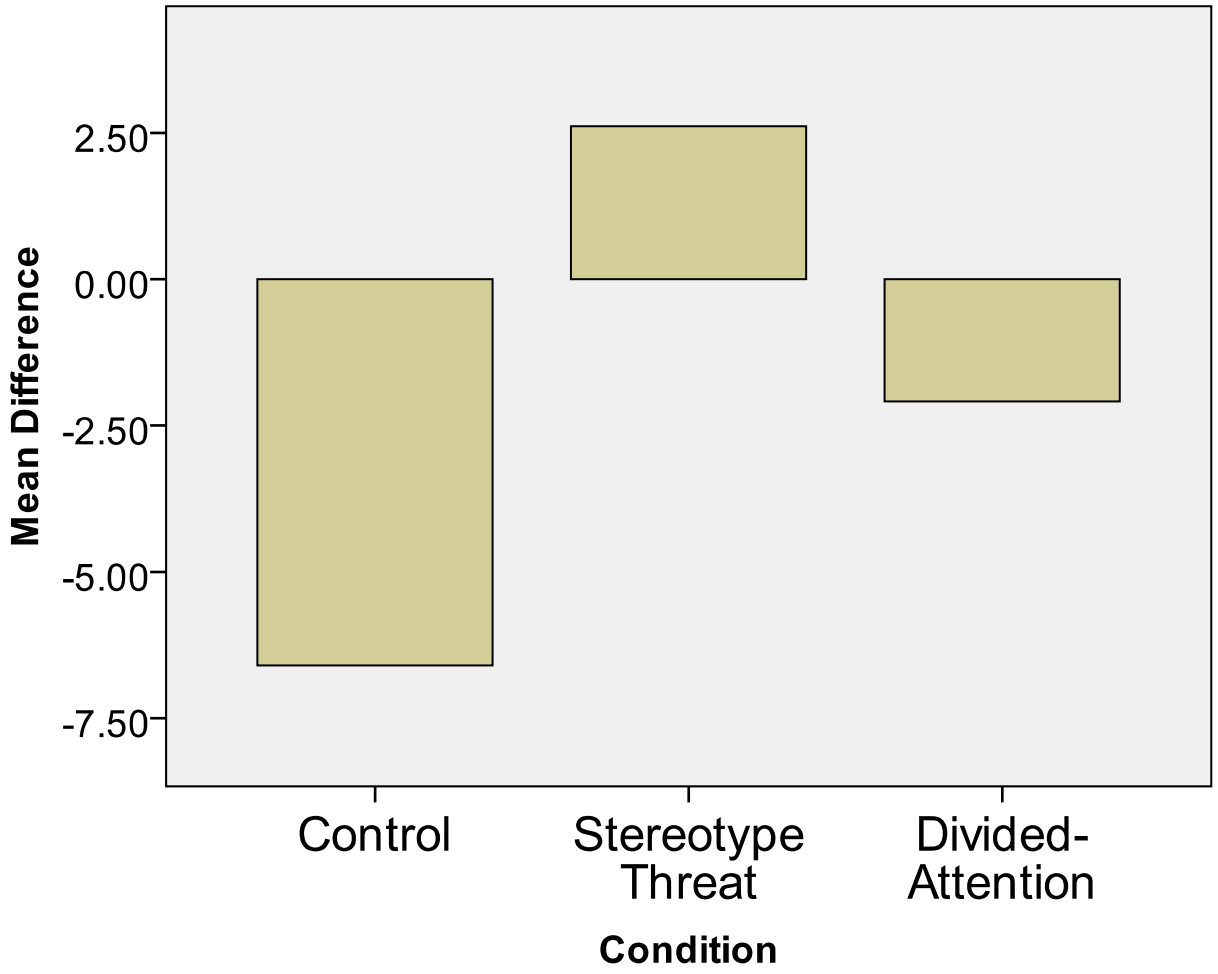

Figure 1. Mean difference represents putting score on the posttest subtracted from putting score on the pretest. Participants with negative mean differences scores improved from the pretest to the posttest; participants with positive mean difference scores performed better in the pretest.

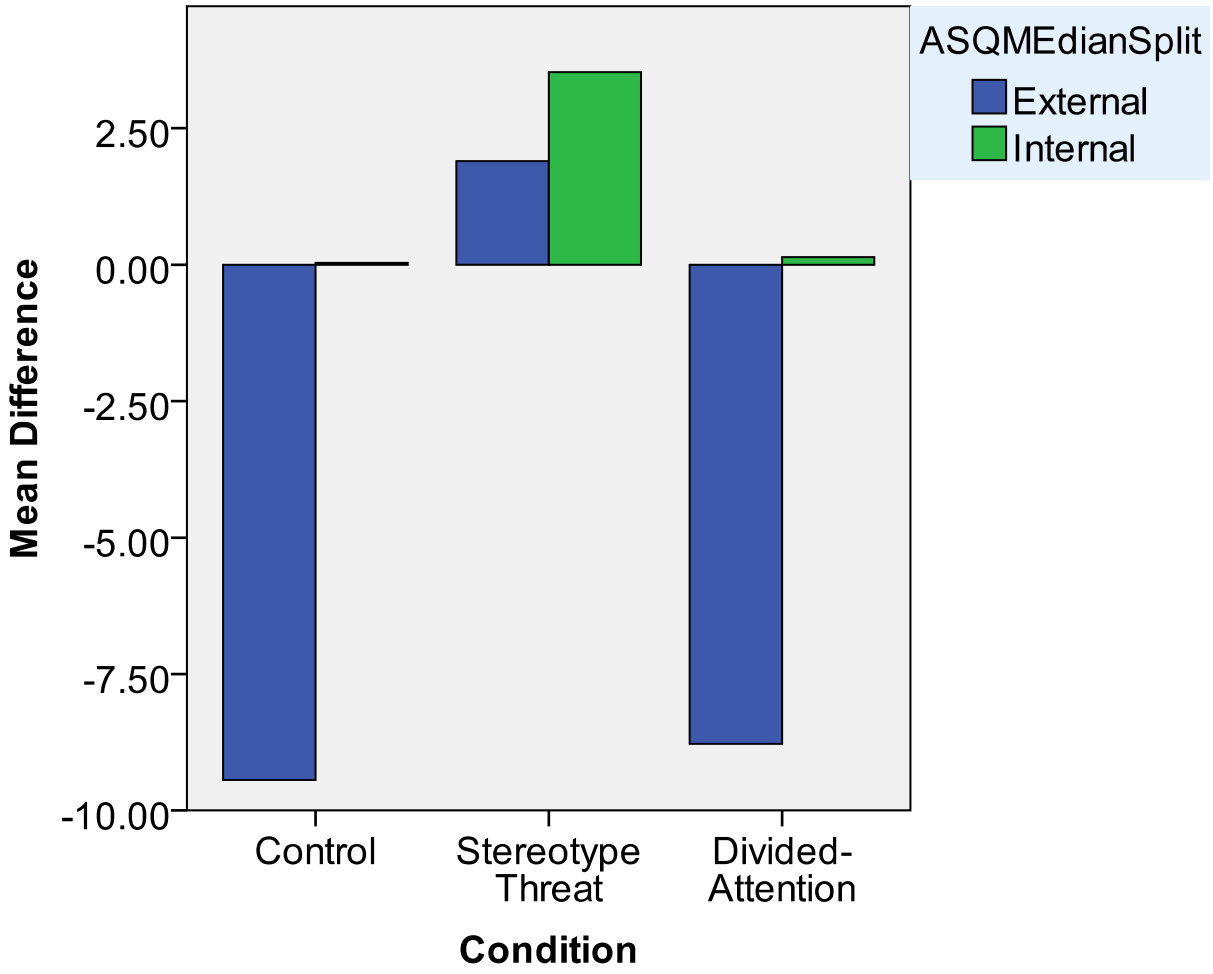

Figure 2. Mean difference represents putting score on the posttest subtracted from putting score on the pretest. Participants with negative mean differences scores improved from the pretest to the posttest; participants with positive mean difference scores performed better in the pretest. Explanatory style was calculated using an adapted version of the ASQ, and a median split was performed to transform scores on the ASQ to a dichotomous variable.

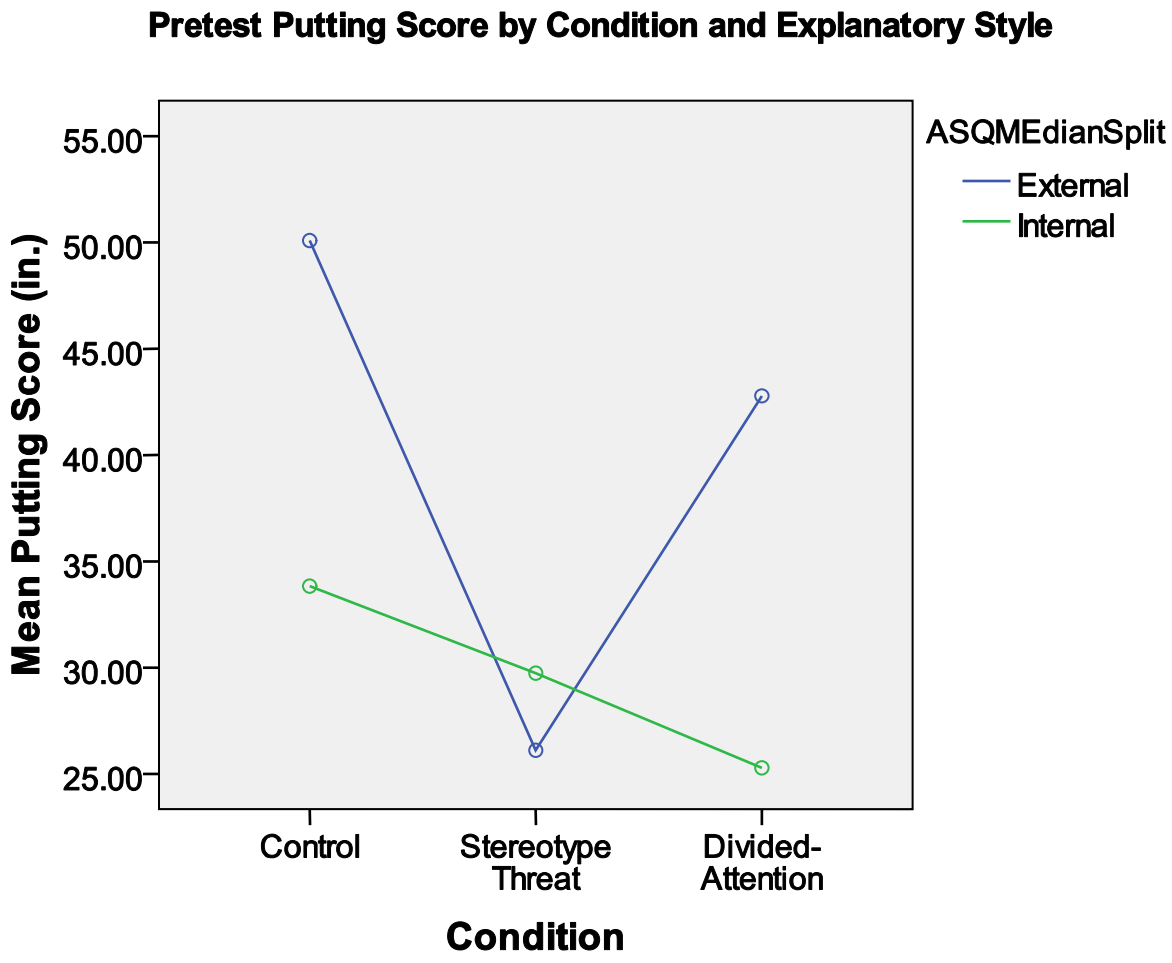

Figure 3. Mean putting score represents only scores from the pretest condition. External participants in the control and divided-attention conditions putted significantly worse in the first trial than any other condition, indicating that they may have been more likely to improve in their second putting trial due to a practice effect.

Appendix A

Directions:
1) Read each situation and vividly imagine it happening to you.
2) Decide what you believe to be the one major cause of the situation if it happened to you.
3) Write this cause in the blank provided.
4) Answer the two questions about the cause by circling one number per question. Do not circle the words.
5) Go on to the next situation

Situations

YOU MEET A FRIEND WHO COMPLIMENTS YOU ON YOUR APPEARANCE

1. Write down the one major cause: _____

2. Is the cause of your friend's compliment due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

YOU HAVE BEEN LOOKING FOR A JOB UNSUCCESFULLY FOR SOME TIME

3. Write down the one major cause: _____

4. Is the cause of your unsuccessful job search due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

YOU BECOME VERY RICH

5. Write down the one major cause: _____

_____

6. Is the cause of your becoming rich due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

A FRIEND COMES TO YOU WITH A PROBLEM AND YOU DON'T TRY TO HELP HIM/HER

7. Write down the one major cause: _____

_____

8. Is the cause of your not helping your friend due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

YOU GIVE AN IMPORTANT TALK IN FRONT OF A GROUP AND THE AUDIENCE REACTS NEGATIVELY

9. Write down the one major cause: _____

_____

10. Is the cause of the audience's negative reaction due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

YOU DO A PROJECT WHICH IS HIGHLY PRAISED

11. Write down the one major cause: _____

_____

12. Is the cause of your being praised due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7
Totally due
People or circumstances to me

YOU MEET A FRIEND WHO ACTS HOSTILELY TOWARDS YOU

13. Write down the one major cause: _____

_____

14. Is the cause of your friend acting hostile due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7
Totally due
People or circumstances to me

YOU CAN'T GET ALL THE WORK DONE THAT OTHERS EXPECT OF YOU

15. Write down the one major cause: _____

_____

16. Is the cause of your not getting all the work done due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7
Totally due
People or circumstances to me

YOUR BOYFRIEND/GIRLFRIEND HAS BEEN TREATING YOU MORE LOVINGLY

17. Write down the one major cause: _____

_____

18. Is the cause of your boyfriend/girlfriend treating your more lovingly due to something about you or about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

YOU APPLY FOR A POSITION THAT YOU WANT VERY BADLY (E.G., IMPORTANT JOB, GRADUATE SCHOOL ADMISSION, ECT.) AND YOU GET IT

19. Write down the one major cause: _____

_____

20. Is the cause of your getting the position due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

YOU GO OUT ON A DATE AND IT GOES BADLY

21. Write down the one major cause: _____

_____

22. Is the cause of the date going badly due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

YOU GET A RAISE

23. Write down the one major cause: _____

_____

24. Is the cause of your getting a raise due to something about you or something about other people or circumstances?

Totally due to other 1 2 3 4 5 6 7 Totally due
People or circumstances to me

Appendix B

Demographic Questionnaire:

1) How old are you? _____

2) How many times have you played golf in the past year? _____

3) How many seasons of high school or college sports have you played? _____

4) Circle your gender: Male Female

Appendix C

Control Group Prompt:

Additional Information

Thank you again for your participation in this study. As is probably obvious to you at this point, the current study has something to do with golf. Previous research has shown that individual differences in personality are related to putting ability. The current study seeks to enhance our knowledge about which traits are positively and negatively associated with golf putting ability. From this research we hope to be able to help golfers improve their mental state prior to putting and, in doing so, improve their golf game.

Appendix D

Prompt For a Male in the Stereotype-Threat Condition:

Additional Information and Instructions

Thank you again for your participation in this study. As is probably obvious to you at this point, the current study has something to do with golf. Previous research has shown that individual differences are related to putting ability. Specifically, gender appears to have an effect on putting ability. In previous studies, researchers have observed that women tend to outperform men on putting tasks similar to the one you just participated in, (Beilock, Smith & Ze, 2004). These findings have been supported by a recent study of PGA (Professional Golfers Association) and LPGA (Ladies Professional Golfers Association) golfers that found that women are superior short-game players to men.

This study seeks to examine whether psychological factors can account for part or all of the gender gap in putting ability by comparing psychological differences between men and women to their performance in the current putting task.

In the next set of fifteen putts, your score will be compared to that of the average female's score. For the integrity of the experiment, it is essential that you put forth your best effort.

Appendix E

Prompt For a Female in the Stereotype-Threat Condition:

Additional Information and Instructions

Thank you again for your participation in this study. As is probably obvious to you at this point, the current study has something to do with golf. Previous research has shown that individual differences are related to putting ability. Specifically, gender appears to have an effect on putting ability. In previous studies, researchers have observed that men tend to outperform women on putting tasks similar to the one you just participated in, (Beilock, Smith & Ze, 2004). These findings have been supported by a recent study of PGA (Professional Golfers Association) and LPGA (Ladies Professional Golfers Association) golfers that found that men are superior short-game players to women.

This study seeks to examine whether psychological factors can account for part or all of the gender gap in putting ability by comparing psychological differences between men and women to their performance in the current putting task.

In the next set of fifteen putts, your score will be compared to that of the average male's score. For the integrity of the experiment, it is essential that you put forth your best effort.