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Enhanced expectancies improve performance under pressure

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Beyond skill, beliefs in requisite abilities and expectations can affect performance. This experiment examined effects of induced perceptions of ability to perform well under generic situations of challenge. Participants ($N = 31$) first completed one block of 20 trials on a throwing accuracy task. They then completed questionnaires ostensibly measuring individual differences in the ability to perform under pressure. Enhanced-expectancy group participants were told that they were well-suited to perform under pressure, while the control group received neutral information. Subsequently, all participants completed another block of 20 trials on the throwing task, with their performance videotaped and under the assumption that they could secure a prize for themselves and a paired participant with successful performance. Both groups had similar accuracy scores on the first trial block. The enhanced-expectancy group significantly increased their throwing accuracy in the higher-pressure situation (second block), whereas the control group showed no change in performance. Furthermore, beliefs regarding performance under challenge predicted throwing accuracy on the second block. The present findings provide evidence that enhancing individuals' generic expectancies regarding performance under pressure can affect their motor performance.

Keywords: perceived ability, confidence, motor skill, throwing

INTRODUCTION

Optimizing motor performance under challenging circumstances is critical for many, including athletes, coaches, musicians, workers, and patients. Theoretical attention has been devoted to the etiology of pressure-induced performance decrements (e.g., Baumeister, 1984; Eysenck and Calvo, 1992; Masters and Maxwell, 2008). Past research has also focused on approaches to optimizing pressured performance, including practicing (i.e., acclimating to the pressure) in challenging situations (Oudejans, 2008), using distraction techniques, such as listening to music (Mesagno et al., 2009), and using positive priming interventions to prevent skill degradation (Ashford and Jackson, 2010). The purpose of the present study was to build on another category of social–cognitive research that involves altering the beliefs, perceptions, and expectations of performers to positively affect performance in challenging conditions.

Personal beliefs about ability and related expectations – such as perceived ability (e.g., Lewthwaite and Wulf, 2010), self-efficacy (e.g., Feltz et al., 2008; Hutchinson et al., 2008), and conceptions of ability (e.g., Jourden et al., 1991; Wulf and Lewthwaite, 2009) – have been shown to influence motor learning and performance. Studies differ in the means by which beliefs are altered, such as social-comparative feedback about performance (Hutchinson et al., 2008; Lewthwaite and Wulf, 2010), actual performance accomplishments (Feltz et al., 2008), task instructions (Jourden et al., 1991; Wulf and Lewthwaite, 2009), video-demonstrations of a person's best performance (Clark and Ste-Marie, 2007; Ste-Marie et al., 2011), stereotype inductions (e.g., Chalabaev et al., 2008), or mindset-affecting comments regarding the performances of others to whom one might perceive similarity (e.g., Wulf et al., 2011). Other studies have related constructs such as achievement goals to expectations and their correlates (e.g., McGregor and Elliot, 2002; Adie et al., 2010).

The ability/expectancy constructs in question vary in terms of their present versus prospective focus (i.e., perceived ability versus self-efficacy expectations), in the degree of specificity with which beliefs relate to personal capabilities for the movement task in question, and in the stable versus malleable nature of the skill. In the present experiment, we examined the influence of generic (i.e., unrelated to movement or sport performance *per se*) perceptions of ability for performing under pressure, induced through false social-comparative information, on performance on a subsequent throwing task.

While past research has focused on the perception of motoric ability to perform the motor task at hand, few studies have examined the contribution of beliefs about other potentially relevant capabilities to motor performance. Motor performance not only falls within the class of movement or sport performance, but also can represent other categories of human behavior, including achievement, public, collaborative, and many other dimensions. Therefore, one goal of the present experiment was to determine if a manipulation that suggested a foundational, general, capacity for performance under pressure would affect motor performance specifically under challenging performance conditions. That is, can manipulating one's belief in the ability to maintain or increase performance in non-specific challenging situations affect subsequent motor performance under pressure?

Social comparison provides individuals with a sense of their relative ability or task mastery, and, if positive, may confer positive affect and relief from concerns about performance. Previous studies have shown that social-comparative feedback that alters perceptions of ability (Lewthwaite and Wulf, 2010) and self-efficacy (Hutchinson et al., 2008), can enhance the learning and performance of motor skills. Social comparison information can be provided explicitly as in the present experiment or implicitly (Bargh and Chartrand, 1999), and is often present naturally within sport and movement settings.

In the present experiment, we wanted to test experimentally the causal role of perceived ability for performance in challenging situations on high-pressure motor performance. We predicted that enhanced positive performance expectancies would lead to improved motor skill performance under pressure. To test this hypothesis, participants were asked to complete two blocks of overhand baseball-type throws with a tennis ball to a target. The first block of trials served as the low-pressure and comparison condition for the second block of trials. The second block was performed under pressure manipulations designed to add incentive to perform well and social evaluation. Between blocks, participants completed questionnaires and were told either that their results normatively indicated they would perform well under pressure (enhanced-expectancy group), or were not given any feedback regarding their questionnaire results (control group). We predicted that participants who received the "positive" feedback regarding their generic capability to perform under pressure would perform more effectively in the high-pressure condition. Specifically, we hypothesized that they would show greater throwing accuracy, relative to the first block, than control group participants. Further, we expected perceived ability ratings to predict high-pressure performance.

MATERIALS AND METHODS

PARTICIPANTS

Thirty-one university students (14 males, 17 females) participated in the experiment. All participants gave their informed consent before beginning the experiment, and all were naïve as to the specific purpose of the experiment. Participants were not skilled at baseball throwing and reported little to no baseball experience in pre-experimental screening.

APPARATUS AND TASK

The throwing task required participants to complete 20 throws in each of 2 blocks. The throws were made from a distance of 7 m to a target (net). The target was 100 cm × 74 cm, with the bottom of the target located 30 cm above the floor. Four concentric rectangles were placed in the middle of the net. The center rectangle was 55 cm × 30 cm, and the surrounding rectangles were 15 cm larger on each side. Throws were scored based on which section of the target the ball struck. The center section was worth four points, the next worth three, the next two, the outside section one, and a throw that missed the target completely received a score of zero.

PROCEDURE

Participants were quasi-randomly assigned to one of two conditions, with the restriction that there be about an equal number of males and females in each group: the enhanced-expectancy (seven males, eight females) and control groups (seven males, nine females). All participants were informed that they would be asked to complete 20 baseball throws, complete 2 questionnaires, and then might be asked to complete 20 more throws. After the first set of 20 throws (with the instruction to try their best), participants were asked to complete two questionnaires. Items in these questionnaires were designed to assess an individual's perception of locus of causality (General Causality Orientation Scales, GCOS; Deci and Ryan, 1985) and overall sense of volition and self-determination (Self-Determination Scale, SDS; Sheldon et al., 1996). However, the items in both questionnaires pertained to a sense of competence and autonomy in a variety of challenging situations, none of which directly mentioned athletics or movement contexts. Thus, they were selected to serve as the "measure" of an individual's purported dispositional tendency to perform well under pressure because they were relevant enough to be believable, yet not directly. The questionnaires were then scored immediately in the participants' presence. Participants were told that the questionnaires were used to determine their score on a (bogus) performance index (PI), which was allegedly a well-studied measure used to predict performance under pressure. The heightened expectancy group was then shown a normal curve of the (supposed) distribution of scores on the PI. Participants were told that people who scored 75 and below (1 SD, or more, below the mean) were likely to "choke" under pressure, while people who scored 125 and above (+1 SD above the mean) were likely to excel. They were told that only people who scored below 75 or above 125 would be asked to complete the second block of throws. Finally, participants in the enhanced-expectancy group were told they scored 159 (more than 2 SD above the mean) on the PI and were therefore very likely to do well under pressure. Control participants were told that the questionnaires were used to determine their score on the PI, and that the purpose of the experiment was to evaluate how scores on the questionnaires related to performance under pressure.

After participants in both groups were informed that they would be completing a second block of throws in a high-pressure situation, they were asked to complete a final questionnaire assessing their perceived ability for performance under pressure (manipulation check). Participants were asked to rate how much they agreed with five statements (i.e., "I feel that I perform my best when the stakes are highest"; "I do my best when the rewards are greatest"; "When the game is on the line, I will succeed"; "I play my best when there is something on the line"; "I excel when competing for a prize"). Responses to the items could range from 1 (strongly disagree) to 10 (strongly agree). Responses to this measure were averaged, providing a perceived ability score for performance under pressure[1].

[1]Even though it would have been ideal to also have a pre-test measure of perceived ability and to examine changes in perceived ability as a function of our manipulation, we were concerned that participants would detect the deception if they had been asked to complete the same questionnaire within 10 min (i.e., before and after

The pressure induction during the second set of throws was adapted from the literature related to performance under pressure (Gray, 2004; Markman et al., 2006; Otten, 2009). Participants in both groups were told they could win a secret prize if they and a randomly selected partner both improved their performance by 15% on the second block. They were told that their partner had been an earlier participant and that he/she had successfully improved his/her score. So, if the participant was able to improve, then both would win a prize; but if he or she did not improve, then neither would win. The 15% improvement goal was derived both from past research (i.e., Gray, 2004), and the authors' experience with the task and typical motor skill acquisition. It was deemed sufficiently challenging that participants could not be certain they would succeed, yet could easily believe that others had accomplished the goal. *A priori* we expected a relatively even number of participants to fail and succeed at this task. To further increase pressure, participants' performance was videotaped on the second block and they were told that their movement patterns would be analyzed and compared to other participants.

DEPENDENT VARIABLES AND DATA ANALYSIS

To determine whether the enhanced-expectancy manipulation produced its intended effect, perceived ability scores for the two groups were analyzed with an independent t-test. The primary dependent measure, throwing accuracy, was analyzed in a 2 (group: control versus enhanced-expectancy) × 2 (block: low-pressure versus high-pressure) analysis of variance with repeated measures on the second factor. A chi-square analysis was conducted to test whether one group was more successful at reaching the 15% improvement (i.e., prize-winning) goal in the high-pressure condition. Finally, a linear regression analysis was performed to examine whether perceived ability under generic challenge would predict baseball throwing performance under pressure.

RESULTS

PERCEIVED ABILITY UNDER CHALLENGE (MANIPULATION CHECK)

The manipulation of perceived ability to respond favorably to challenge was successful. After the manipulation and prior to the high-pressure performance phase, the enhanced-expectancy group ($M = 8.26$, SD = 1.1) reported significantly higher perceived ability to perform under pressure than did the control group ($M = 7.27$, SD = 1.2), $t(29) = 2.28$, $p = 0.031$.

THROWING PERFORMANCE

The control and enhanced-expectancy groups had similar throwing accuracy scores on the first block of 20 trials under low-pressure conditions and before the expectancy induction (see **Figure 1**). The control group maintained their throwing accuracy on the second 20-trial block under high-pressure conditions. In contrast, enhanced-expectancy group participants increased their throwing accuracy from the low-pressure to the high-pressure condition. This was confirmed by a significant Group × Block interaction, $F(1, 29) = 25.73$, $p < 0.001$, $\eta^2 = 0.47$. Follow-up analyses revealed that participants in the enhanced-expectancy group demonstrated significant improvement in the high-pressure condition, $t(15) = 8.016$, $p < 0.001$, whereas the control group did not, $t(14) = 1.098$, $p > 05$. Due to the enhanced-expectancy group's increased throwing accuracy on the second block, the main effect of block was also significant, $F(1, 29) = 43.19$, $p < 0.001$. There was no significant main effect of group, $F(1, 29) < 1$.

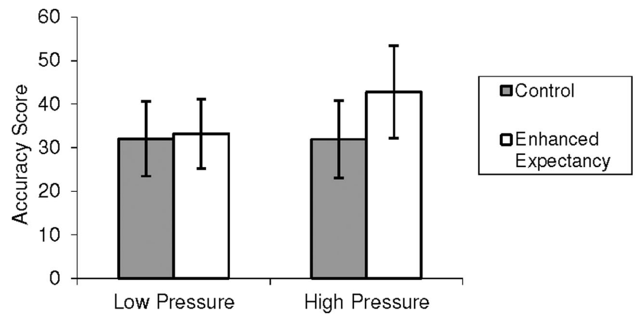

FIGURE 1 | Accuracy scores of the control and enhanced-expectancy groups in the low-pressure (Block 1) and high-pressure conditions (Block 2). (Error bars represent SE.)

Participants in the enhanced-expectancy group were significantly more successful at reaching the 15% improvement goal in the high-pressure condition, χ^2 (2, $N = 31$) = 11.77, $p < 0.001$. Compared to *a priori* expectations that an equal number of participants would succeed and fail, 14 of the 16 (87.5%) participants in the enhanced-expectancy condition achieved the improvement goal while 2 did not. Conversely, of the 15 participants in the control group, 4 (26.7%) achieved the goal while 11 did not.

The linear relationship between perceived ability under challenge and high-pressure performance was significant, $t(29) = 1.81$, $p = 0.04$ (one-tailed), $R = 0.324$, adjusted $R^2 = 0.073$. The unstandardized regression coefficient for perceived ability to perform under pressure, $b = 3.91$, indicated that for every unit increase in this perceived ability, the high-pressure performance score increased by 3.91 points.

DISCUSSION

The findings of the present experiment indicate that enhancing individuals' expectancy regarding their capabilities under pressure can benefit their motor performance in a challenging situation. In addition to identifying an additional factor – generic expectancy for performance under challenge – that may influence motor performance, these findings contribute to insights that alteration of mindsets, beliefs, or expectations can influence outcomes beyond health-related behavior (Crum and Langer, 2007) or physiological processes (Crum et al., 2011), and include motor learning (Wulf and Lewthwaite, 2009; Wulf et al., 2011) and performance.

The importance of specific motor ability beliefs for skilled motor performance has been previously demonstrated (e.g., Moritz et al., 2000; Feltz et al., 2008; Lewthwaite and Wulf, 2010).

filling out the questionnaire allegedly predicting performance under pressure and receiving bogus feedback on it). Therefore, we decided to rely on the random group assignment.

For example, Feltz et al. found that prospective beliefs in the ability to perform specific skills in given contexts have effects on subsequent performance. In contrast, the effects of more generic ability beliefs on motor performance in challenging situations have received limited attention to date (e.g., Otten, 2009). Importantly, the present findings indicate that personal belief in the ability to perform in a general category of situations (i.e., high-pressure) has an impact on motor performance as well. Informing participants that they were likely to perform well in a pressure situation resulted in a higher perceived situational ability. This enhanced-expectancy for performance under pressure, in turn, increased their throwing accuracy in such a situation, relative to the control condition. Thus, motor performance in a challenging situation was enhanced simply by inducing the belief that one thrives under pressure.

The present results indicate that the enhanced expectancy group's performance rose in the high-pressure induction while the performance of the control group did not differ from low- to high-pressure conditions. There was no direct evidence of a choking effect for either group. Several possibilities may explain this pattern. First, it is conceivable that a possible learning-related rise in performance from Block 1 to Block 2 due to practice might have occurred given some task novelty, counterbalancing any potential performance decrement in the higher-pressure condition for the control group. In this case, the expectancy boost to the experimental group may have benefited performance past this learning-pressure equilibration point. The experience or feeling of pressure was not assessed in the present experiment, so it is unclear to what extent the high-pressure situation was experienced as challenging or threatening. However, previous studies have demonstrated that conditions that heighten social evaluation (e.g., videotaping) and incentives (e.g., a partner's dependency on the participant for a prize) heighten the pressure to perform (e.g., Beilock et al., 2004; Gray, 2004) but do not always result in performance impairment. Alternatively, enhanced expectancies in the experimental group could have influenced appraisal of the pressured situation as a positive challenge rather than a negative threat (Otten, 2009). Enhanced generic ability expectancies could also have provided a boost to performers' task- or situation-specific self-efficacy that resulted in the observed performance gains, through self-regulatory activity such as affect or emotion regulation, goal-setting, increased effort, and appropriately focused attention (e.g., Carver and Scheier, 1990).

Although there is theoretical support for generic efficacy beliefs potentially influencing performance on specific tasks (Bandura, 1977), more attention has been directed to past performance on a given task as a source of confidence. However, in the absence of pertinent experiences, expectations in novel circumstances would likely be influenced by prior experiences perceived as similar to one's present situation. Interestingly, while no explicit reference was made in the manipulation of purported ability under pressure to athletic, sport, or motor skill, contexts that involve them may readily be seen as members of the set of "challenging" activities by participants. Movement contexts nearly always place performance under public scrutiny because the behavior is not played out in the workings of the mind but in the motions of the body, readily observed by others. Regardless of the potential association in participants' minds between purported skill under pressure and ensuing throwing activity, the ability to influence motor performance immediately and positively by enhancing ability perceptions or confidence, or their affective consequences, provides further evidence of the link between motivational variables and motor performance (e.g., Feltz et al., 2008; Hutchinson et al., 2008; Lewthwaite and Wulf, 2010).

The present findings raise further questions regarding the mechanism through which "pressure" affects motor performance. Baumeister et al. (1985) reported that a private expectancy for success – a belief held by oneself about oneself – seemed to inoculate a performer against pressure-induced "choking." However, a public expectancy for success, unless convincing enough to create an accompanying private expectancy, increased the likelihood performers would "choke" under pressure. The present findings suggest that performers can be convinced of a general expectancy for success in a given class of situations, and that expectancy can influence subsequent motor performance. How these expectancies influence performance is still unclear. It may be, as Baumeister et al. suggested, that enhanced expectancies reduce performance anxiety experienced during high-pressure situations, or that cognitive appraisal of the pressured situation is altered (Otten, 2009; Adie et al., 2010). A subsequent experiment might measure anxiety and cognitive appraisals of the particular performance situation after a generic expectancy manipulation to determine if these factors mediate the effect of enhancing expectancies on performance.

The practical implications of the present findings are several. While past success in challenging circumstances may exert the greatest influence on perceived ability for these situations, there are often practical impediments to relying on situation-specific past success to build confidence. For example, some persons may be unwilling to even attempt a motor skill in a situation they deem too threatening. Alternatively, relying on instances of success in high-pressure sporting situations condemns a performer's situational ability beliefs to the mercy of rare, variable, and largely unpredictable encounters.

The present experiment provides evidence that perceived ability for performance in challenging situations can be affected without requiring direct previous experience with the situation. Indeed, the relationship found in the present experiment can be seen to reverse the adage that sport builds character for life situations, suggesting that drawing upon one's perceptions of responses in challenging life situations can affect particular sport performance. Our finding may provide teachers, coaches, and mentors with opportunities to connect performers' past struggles to present assets, and may be akin to the self-affirmation interventions for stereotype and other threats (Koole et al., 1999; Martens et al., 2006). Further, enhanced perceived situational ability causes enhanced performance that may have a reciprocal effect on perceived competence or confidence, which in turn might benefit future experiences. For example, participants in the enhanced-expectancy condition were significantly more successful at meeting the 15% improvement goal than were control participants. Thus, enhancing perceived situational ability *a priori* may create momentum for performers and help ensure that future experiences affect confidence in a positive direction (e.g., Feltz et al., 2008; Cohen et al., 2009).

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