Self-Focused Attention and Performance Failure Under Psychological Stress

Chu-Min Liao
National Taiwan College of Physical Education

Richard S.W. Masters
University of Hong Kong

Although it has often been implied that self-focused attention plays a mediating role in performance degradation under stress, the assumption that stress will evoke self-focus has received limited empirical support. Two studies were carried out to explore this relationship. The first study, using a time-to-event paradigm, showed that a higher level of self-focused attention accompanied increased anxiety levels in the buildup to competition. In the second study, basketball novices who were instructed to focus on the mechanics of the ball-shooting process during practice suffered a significant performance decrement in a subsequent stressful test phase, whereas those who were required only to do their best during practice showed no degradation in performance. It was concluded that self-focused attention may increase in response to psychological stress, and that the negative effect of self-focused attention on performance under stress is likely to be magnified by learning the skill under a high degree of self-focused attention, which can result in an overawareness of the performance process.

Key Words: time-to-event, basketball, anxiety

The relationship between stress and performance has attracted attention for several decades. The focal point of attempts to describe the mechanisms underlying the effects of stress on performance has constantly changed (see Baumeister & Showers, 1986; Gould & Krane, 1992; Jones & Hardy, 1990; Weinberg & Gould, 1995, for a review), moving from physiological arousal (Spence & Spence, 1966; Yerkes & Dodson, 1908) to the change of attentional fields (Nideffer, 1976) and, recently, to the allocation of attentional resources (Eysenck, 1992; Eysenck & Calvo, 1992; Jones, 1990). The principal component of this attentional resource-allocation approach is that stress will cause inappropriate allocation of information-processing resources that are vital for successful performance and, consequently, will undermine performance.

C-M. Liao, Dept. of Athletics, National Taiwan College of Physical Education, 16 Shuan-Shih Rd Section 1, Taichung 404, Taiwan; R.S.W. Masters, Phys Ed & Sports Sciences Unit, L. Ride Sports Ctr, 111-113 Pokfulam Rd, Univ. of Hong Kong, Hong Kong.
In line with this approach, Carver and Scheier (1981) proposed that psychological stress makes the individual become more self-focused, which impairs performance by directing attention away from the task at hand to task-irrelevant information. Evidence bolstering the Carver and Scheier argument has shown that the presence of others or a mirror (which may increase self-focus, Carver & Scheier, 1978) undermines performance on a complex task (Martens & Landers, 1972), especially when the performer is high in trait anxiety (Carver, Peterson, Follansbee, & Scheier, 1983).

Baumeister (1984) provided an alternative explanation of the performance-harming effects of self-focused attention under stress. He suggested that stress engenders the desire to perform well, which causes the actor to focus on his or her own performance processes in order to control the execution of the task. Ironically, this conscious control of execution disrupts the automatic nature of the performance. In a series of five experiments, Baumeister supported his contention by demonstrating that self-focused attention and stress similarly harmed performance. Studies that show the counterproductive effect of monitoring one's own movements while performing (Keele, 1973; Langer & Imber, 1979) have provided further support for Baumeister's argument.

More recently, Masters (1992) proposed a reinvestment hypothesis which suggested a mechanism through which self-focused attention can cause its effects. As in Baumeister's conscious-control model, Masters indicated that stress could induce conscious control, which interrupts the automaticity of execution. More important, he suggested that explicit knowledge of the mechanics of the skill possessed by the performer is central to this disruption. To ensure successful performance under stress, the performer will use or "reinvest" this knowledge (predominantly acquired in the early stages of learning) to control execution of the skill. The more explicit the performer's knowledge, according to Masters, the more likely the execution of the skill will be interrupted.

This hypothesis is consistent with the progression-regression hypothesis of skill acquisition (Fitts, Bahrick, Noble, & Briggs, 1961; Fuchs, 1962; Jagaciński & Hah, 1988), which suggests that stress will induce a regression to the early stages of skill acquisition, in which skill execution relies on verbal cues and explicit knowledge (Anderson, 1982; Fitts & Posner, 1967). Findings from the empirical work of Masters (1992) and Hardy, Mullen, and Jones (1996), that performers who possessed more explicit knowledge of their skill were more vulnerable under stress, also provide support for Masters' reinvestment hypothesis.

Although the role of self-focused attention in skill failure has been the subject of much anecdotal support, there is little empirical evidence that psychological stress induces self-focused attention. For example, although Baumeister (1984) demonstrated that self-focused attention and stress hurt performance similarly, he provided no direct evidence of the link between stress and self-focus. He acknowledged that "further research is needed to substantiate that relationship [between stress and self-focused attention]" (p. 619). Indirectly, increased levels of self-focused attention have been shown in vigorous physical activities (Wegner & Giuliano, 1980, 1983), the presence of a mirror (Carey, 1995) or video camera (Davis & Brock, 1975), depression (Salovey, 1992; Wood, Saltzberg, & Goldsamt, 1990), and failure experiences (Greenberg & Pyszczynski, 1986). The first study attempted to provide more direct evidence of the link between stress and self-focus.
The second study attempted to clarify the mediating effect of self-focused attention on the relationship between stress and performance. Both Baumeister (1984) and Masters (1992) indicated that this mediating effect might be subject to the performer’s levels of self-focused attention when learning the skill; however, the results of their studies pointed in different directions. In Baumeister’s study, individuals high in trait self-consciousness, as measured by the Self-Consciousness Scale (Fenigstein, Scheier, & Buss, 1975), performed worse in a nonstressful condition but better under stress than those who were low in self-consciousness. Baumeister attributed his findings to the acclimatization to self-focused attention of highly self-conscious individuals. Highly self-conscious individuals, according to Baumeister, are more self-focused under nonstressful situations and thus are more accustomed than low self-conscious individuals to performing under self-focused attention evoked by stress. Baumeister’s arguments hint that a skill learned under a high level of self-focused attention will be more resistant to the harmful effects of stress.

Lewis and Linder (1997) provided some support for Baumeister’s acclimatization hypothesis. They found that learning the skill of golf putting in the presence of a video camera led to stress-resistant performance. However, their findings are confounded by the presence of the camera, as performers may have acclimatized either to the stress or to the self-focused attention concomitant with the camera. Lewis and Linder provided no manipulation checks on self-focus or response to stress (e.g., change in anxiety levels) during performance, which makes it difficult to estimate the value of their findings.

In contrast to Baumeister (1984), Masters (1992) and Masters, Polman, and Hammond (1993) argued that the greater the tendency to monitor and consciously control one’s movement (reinvestment), the greater the chance of disruption. Masters et al. (1993) argued that reinvestment is a function of personality, with individuals having differential predispositions to turning their attention inward to the mechanics of their actions. They developed the Reinvestment Scale as a measure of this trait and showed that it predicts skill failure under stress, with high reinvesters being more vulnerable than low reinvesters because they are more likely to consciously try to control their movements.

Maxwell, Masters, and Eves (2000) found that high reinvesters accrue more explicit knowledge during learning than do low reinvesters. It is likely that learning a skill under a high degree of self-focus will also lead to a high awareness of the performance process (e.g., a large pool of explicit knowledge to call upon when performing the skill). In such cases the skill will be less resistant to the harmful effects of stress because it will be easier for reinvestment to disrupt the execution of the skill.

**STUDY 1**

The purpose of this study was to examine the level of self-focused attention in situations with varying degrees of stress, as indicated by the time-to-event paradigm employed in previous studies (e.g., Martens, Vealey, & Burton, 1990; Parfitt & Hardy, 1993; Parfitt, Hardy, & Pates, 1995). This paradigm has shown that levels of anxiety, used as an indication of the perceived stress of a situation, consistently vary according to the proximity of important competitive events. The time-to-event paradigm has shown that cognitive anxiety tends to be high in the
days leading up to the event, but dissipates immediately afterward, whereas somatic anxiety is low in the days beforehand and then rises dramatically in the period immediately preceding the event, before dissipating afterward.

It was predicted that self-focused attention would increase in the buildup to an event as a response to increasing stress, indicated by greater levels of anxiety, and would dissipate immediately afterward. Self-focused attention is seen here as reflecting when "the person is focusing on his thoughts, feelings, behaviors or appearance; when he is reflecting, fantasizing, or daydreaming about himself; or when he is making decisions or plans that involve himself" (Fenigstein et al., 1975, p. 522).

Method

Participants and Design

Participants were 21 university students from male (n = 10) and female (n = 11) hockey teams. Ages ranged from 19 to 22 years. Both teams reached the semi-final stages to the British Universities Sports Association National Competition. Data were collected on three occasions, two before and one after the semi-final match. Ethical approval of the study was obtained and all participants gave their informed consent.

Dependent Variables

Competitive State Anxiety. The participants’ anxiety levels were assessed with the Competitive State Anxiety Inventory-2 (CSAI-2, Martens et al., 1990). The CSAI-2 is a sport-specific, self-report inventory and consists of separate measures of state cognitive and somatic anxiety and state self-confidence (the self-confidence subscale was also presented but its scores were not used in this study). This inventory’s validity and reliability (Cronbach’s alpha coefficients range from .70 to .90) have been well established (Gould, Petlichkoff, & Weinberg, 1984; Martens et al., 1990).

Self-Focused Attention. The Private Self-Consciousness (PSC) subscale of the Self-Consciousness Scale (Fenigstein et al., 1975) was used to measure the participants’ self-focused attention. The PSC consists of 10 items that measure individuals’ tendency to be self-aware and has been found to be related to internal attribution and trait anxiety (Franzoi & Sweeney, 1986; Wells, 1985). Although the PSC was originally developed as a measure of dispositional self-focus, it has been shown to be responsive to situational influence and has been used as an indicator of state self-focus (Osberg, 1985; Wood et al., 1990).

Procedure

The data were collected 2 days before (−2 days), 1 hour before (−1 hour), and 2 days after (+2 days) the semi-final match. These time-points were determined based on the work of Parfitt and co-workers on basketball players (Parfitt & Hardy, 1993; Parfitt et al., 1995). In their work, cognitive anxiety remained relatively high at −2 days and −1 hour but dropped significantly at +2 days. Somatic anxiety, on the other hand, increased from −2 days to −1 hour and dropped significantly at +2 days.
Questionnaires were administered at a training session at −2 days, prior to warming up before the game at −1 hour, and in a team meeting at +2 days. The PSC subscale was administered first at all three sessions to eliminate “order effects” caused by the CSAI-2, as suggested by Osberg (1985). Both teams in the study lost their semi-final match.

Results

Both the CSAI-2 and PSC subscales showed adequate internal consistencies for this sample. Cronbach’s alpha coefficients at −2 days, −1 hour, and +2 days were .81, .88, and .91 for the Cognitive Anxiety subscale, .83, .75, and .72 for the Somatic Anxiety subscale, and .71, .72, and .74 for the PSC, respectively.

The data were examined using multivariate ANOVA with repeated measures on the time-to-event factor and polynomial regression analysis. The MANOVA was used to confirm the stress manipulation and to examine changes in the dependent variables caused by the impending semi-final match. F-values were obtained using the Wilks’ Λ statistic. Effect sizes (f) are reported for all univariate analyses.

For the polynomial regression analysis, an intraindividual analysis procedure suggested by Sonstroem and Bernardo (1982) was used. Specifically, means and standard deviations were computed for each participant’s CSAI-2 subscale score and PSC score at each time-point. Standard scores were then computed for all participants. This portion of the procedure in essence negated between-subject response variation. The intrainindividual standard scores were then used to test for the relationships between the CSAI-2 and PSC subscales. Previous research has indicated that cognitive and somatic anxiety may affect individuals’ behaviors differently (Burton, 1988; Gould, Petlichkoff, Simons, & Veevera, 1987; Parfitt & Hardy, 1993; Parfitt et al., 1995). For example, Burton (1988) found that somatic anxiety had an inverted-U relationship with swimming performance, whereas cognitive anxiety had a negative linear relationship. Polynomial regression analyses were therefore conducted separately on the cognitive and somatic anxiety subscales in order to establish the trend that best accounted for their respective relationships with self-focused attention.

Multivariate Analyses of Variance

The cognitive and somatic anxiety and self-focused attention scores were used as dependent variables in the repeated-measures MANOVA. The analysis revealed a significant effect of time-to-event, \( F(6, 76) = 11.17, p < .001 \). Univariate analyses suggested that all dependent variables had significant contributions to the changes of variances across time. Somatic anxiety scores, \( F(2, 40) = 30.85, p < .001, f = .98 \), made the largest contribution, followed by cognitive anxiety, \( F(2, 40) = 18.74, p < .001, f = .75 \), and self-focused attention scores, \( F(2, 40) = 5.35, p < .01, f = .42 \).

Tukey’s HSD follow-up tests indicated somatic anxiety at −1 hour to be significantly higher than at −2 days, which in turn was significantly higher than at +2 days (\( p < .01 \), see Figure 1). For cognitive anxiety, there were significantly higher scores at −2 days and −1 hour compared with +2 days, \( p < .01 \), but no difference was evident between −2 days and −1 hour (Figure 1). The effect of self-focused attention was found to be due to significantly higher scores at −1 hour
Figure 1 — Mean anxiety score (±SD) as a function of time-to-event.

Figure 2 — Mean Private Self-Consciousness (PSC) score (±SD) as a function of time-to-event.

compared with +2 days, p < .01. No other between-session differences were found to be significant (see Figure 2).

Polynomial Regression Analysis

The regression analyses identified a significant quadratic trend (inverted-U) between cognitive anxiety and PSC, $F(1, 60) = 3.32, p = .04$, accounting for 10% of the variance, but no other significant trend was evident. The relationship be-
tween somatic anxiety and PSC was defined by a significant positive linear trend, \( F(1, 61) = 4.95, p = .03 \), accounting for 8% of the variance, without evidence of any other trend.

**Discussion**

The results of this study supported the prediction that stress would induce self-focused attention. The hockey players' self-focus levels were relatively high before the stressful semi-final match but decreased dramatically afterward, suggesting a significant effect of psychological stress on self-focused attention. Although the study is quasi-experimental in design, due to the practical difficulties associated with installing a control group in a field setting, anxiety scores confirm the effect of stress by showing a similar drop from a higher level after the competition.

The changing patterns of both cognitive and somatic anxiety across the three time-to-event periods were consistent with the findings of Parfitt and Hardy (1993) and Parfitt et al. (1995). Somatic anxiety, which represents perceived physiological activation, appears to have a more straightforward relationship with self-focused attention; the higher the somatic anxiety, the higher the self-focused attention. This relationship is consistent with the findings of Wegner and Giuliano (1980, 1983) that a higher level of physical arousal, evoked by physical activities, led to a higher level of self-focused attention.

Cognitive anxiety, on the other hand, seems to have a more complicated relationship with self-focused attention. There is a little empirical evidence to account for this inverted-U relationship. A possible explanation, however, can be drawn from a combination of McGrath's (1970) process model of stress and Carver and Scheier's (1981) self-regulation model of self-focused attention. According to McGrath's model, an individual will feel more stressed when the environmental demand is perceived as more intimidating and the individual evaluates his or her own response capabilities as less than able to meet the demand.

The self-regulation model argues that self-focused attention is mediated by the process of comparing between one's current state and a set goal or standard. An attempt will be made to regulate one's state if there is a discrepancy and this self-regulation process involves a high level of self-focused attention. If the gap is perceived as too wide to bridge, the individual is likely to abandon attempts at regulation. It is possible, therefore, that an impending stressful event induces a process in which the demand of the event is compared to one's own response capabilities, which requires a high level of self-focused attention. However, when the stress is perceived as too demanding (cognitive anxiety is getting too high), the self-regulation process will be avoided and the self-focused attention will consequently abate.

Although this study suggests that anxiety might contribute to changes in self-focus, some limitations are worth noting. First, the data in this study are correlational rather than causal; no causal relationship between anxiety and self-focus can be confirmed. Second, despite the significant relationships found between the anxiety and self-focus scores, the associations were only of medium strength (Kirk, 1995). Only 10% and 8% of the variance in self-focus was accounted for by cognitive and somatic anxiety, respectively, which means a large amount of variance was attributable to unknown factors.
STUDY 2

Although Baumeister (1984) and Masters (1992; Masters et al., 1993) disagree as to who is most affected by increases in self-focus, they concur that performance degradation under stress may be due to an increase in the use of conscious control when anxious. Both use a more specific definition of self-focused attention than that used by Fenigstein et al. (1975). They take self-focused attention to refer specifically to conscious monitoring and control of the performance process, rather than a general tendency to be self-aware. Accordingly, in this study we attempted to manipulate levels of attention to the process of performance while individuals practiced a basketball skill, and then put them under psychological stress.

Attention to the performance processes was induced by instructing the performer, during practice, to focus on the execution of the movements and the mechanical components of the task (Baumeister, 1984). In addition, a mirror was present, in which performers could see their movements during practice. It has been shown that the presence of a mirror directs individuals’ attention to themselves (Carey, 1995; Carver & Scheier, 1978; Carver et al., 1983; Duval & Wicklund, 1973; Scheier & Carver, 1977; Wicklund & Duval, 1971), which should encourage attention to performance processes. The level of attention to performance processes was measured by the amount of explicit knowledge acquired during practice, which, as indicated by Masters (1992; Masters et al., 1993), is a salient factor in performance degradation under stress. Psychological stress was evoked by a combination of monetary incentive and evaluation apprehension (Baumeister, 1984; Hardy et al., 1996; Masters, 1992; Masters et al., 1993). It was hypothesized that stress would impair the performance more seriously when the skill had been practiced under a high level of attentional focus on the performance process as opposed to a low level.

Method

Participants

Forty university students (12 M, 28 F) were assigned to either a Self-focus or a Control group. A stratified random sampling procedure was used to ensure that each group consisted of 6 males and 14 females. Ages ranged from 18 to 22 years, and the participants were all novices to basketball, having never received any form of instruction and never played more than once a month. Ethical approval of the study was obtained and all participants gave informed consent.

Task and Apparatus

The participants’ task was to shoot basketballs (set shots) from the standard free-throw distance in basketball (4.6 m) to a standard-size ring (45 cm in diameter) attached to a wall at a height of 3.05 meters. A backboard with an inner rectangle was outlined with gaffer tape on the wall. All measures of the apparatus were in accordance with the English Basketball Association regulations. The participants’ performance was measured by scoring each shot using a system identical to that adopted by Hardy and Parfitt (1991). This was 5 for a clean basket, 4 for rim-and-in, 3 for backboard-and-in, 2 for rim-and-out, 1 for backboard-and-out, and 0 for a complete miss.
Design

There were two distinct phases in the study, a practice phase followed by a test phase. The practice phase consisted of 10 blocks of 10 trials during which the participants practiced the set shot either while focusing on their performance processes (Self-focus group) or in a control condition (Control group). Each block of trials was broken by a 1-min rest interval. No technical instructions on how to take a set shot were given to either group, but both groups practiced their shots in different conditions. Following the practice phase, all participants performed 1 block of 10 shots in a stress condition (test phase).

Procedure

All participants were asked to complete the Reinvestment Scale (Masters et al., 1993). They were then presented with instructions explaining the task and advising them that they could earn 10 pence for every shot that scored.

Separate instructions were also provided in each condition. To induce maximum attention to performance processes in the Self-focus condition, participants were specifically instructed to "be aware of what you are doing" and "pay close attention to the mechanics of your shooting processes." A mirror (40 x 100 cm) in which the participants could view themselves (whole body) was placed on the wall under the basket. Furthermore, during the 1-min rest intervals, participants had to write down as much as they could recall of their shooting processes during this phase.

In contrast to the Self-focused condition, the Control group were asked simply to "try your best and score as well as you can." No mirror was present, and during the 1-min rest intervals the participants were asked to carry out a concentration exercise (the Grid Exercise; Harris & Harris, 1984). This exercise restricted their opportunity to rehearse their shooting processes during the intervals. In both conditions the CSAI-2 was administered after the instructions were given, to assess both cognitive and somatic anxiety.

After the last trial block in the learning phase was completed, a verbal protocol questionnaire was administered to assess the amount of explicit knowledge each participant had acquired. Participants were asked to write down any rules or knowledge they had used or became aware of using during the time they were shooting the ball. These written verbal protocols were then blind-scored by independent raters, summing the number of explicit rules related to technical and mechanical aspects of the shot. This gave an indication of the degree of attention focused on performance processes in each condition.

In the test phase, all participants were instructed that the money they had already earned could increase by 10 pence for every successful shot, but would decrease by 20 pence for every shot that was missed. In addition, they were told that their shooting technique was to be recorded on video camera for evaluation by basketball experts.

A camera operator with video equipment was then brought into the laboratory. The camera was set up at an angle of 30 degrees to the performer as he or she faced the basket. The CSAI-2 was then administered a second time, prior to beginning the test phase. No mirror was present in this phase.
Results

Manipulation Checks

Reinvestment Score. An independent-samples t-test showed no significant differences between the two groups in reinvestment score, $t(38) = -3.4$, $p = .72$. This indicates that individuals in both groups had a similar predisposition to reinvest their explicitly acquired knowledge. Mean scores for the Self-focus and Control groups were 9.15 ($SD = 2.72$) and 9.50 ($SD = 3.48$), respectively.

Attentional Focus Manipulation. Two independent raters counted the number of technical rules written down by the participants in the verbal protocols. Computation of a Pearson product-moment correlation coefficient showed satisfactory intrarater reliability ($r = .95$, $p < .001$). The scores of the two raters were averaged to give verbal protocol scores.

The Self-focus group reported a higher number of rules ($M = 5.15$, $SD = 1.62$) than the Control group ($M = 2.47$, $SD = 1.34$). An independent-samples t-test confirmed this prediction, revealing a significant between-group difference, $t(38) = 5.68$, $p < .001$.

Stress Intervention. The effect of the stress intervention was measured by the CSAI-2 (the self-confidence subscale was presented but its scores were not used in this study). Cronbach’s alpha coefficients indicated adequate internal consistencies for this sample in both the Cognitive Anxiety subscale pre- and poststress ($r = .83$ and $.88$, respectively) and the Somatic Anxiety subscale pre- and poststress ($r = .75$ and .77, respectively).

<table>
<thead>
<tr>
<th>Group</th>
<th>Cognitive anxiety</th>
<th>Somatic anxiety</th>
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<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Self-focus</td>
<td>16.40</td>
<td>19.60</td>
</tr>
<tr>
<td></td>
<td>$\pm 3.98$</td>
<td>$\pm 6.31$</td>
</tr>
<tr>
<td>Control</td>
<td>14.80</td>
<td>17.10</td>
</tr>
<tr>
<td></td>
<td>$\pm 2.93$</td>
<td>$\pm 4.70$</td>
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It was predicted that participants in both groups would exhibit higher anxiety poststress than prestress. A $2 \times 2$ (Group x Stress) repeated-measures MANOVA was conducted on the cognitive and somatic anxiety scores (see Table 1). F-values were obtained using the Wilks’ $\lambda$ statistic. The results revealed significant main effects of both Stress, $F(2, 37) = 8.83$, $p < .01$, and Group, $F(2, 37) = 5.83$, $p < .01$, but no interaction, $F(2, 37) = .44$, $p = .65$, was apparent. Univariate analyses on the Stress main effect indicated that both cognitive anxiety, $F(1, 38) = 17.87$, $p < .001$, $f = .66$, and somatic anxiety, $F(1, 38) = 7.70$, $p < .01$, $f = .43$, had significant
contributions to the changes of variances. For the Group main effect, univariate analyses showed that the changes of variance were contributed by somatic anxiety, $F(1, 38) = 11.48, p < .01, f^2 = .53$, but not cognitive anxiety, $F(1, 38) = 2.42, p = .13$. These results suggest that the stress intervention effectively increased the participants' anxiety and that those in the Self-focus group had generally higher levels of somatic anxiety than those in the Control group.

**Performance**

**Practice Phase.** A 2 x 10 (Group x Block) repeated-measures ANOVA was conducted to examine the performance scores in both groups over the 10 blocks of practice trials. The ANOVA revealed a highly significant main effect for Block, $F(9, 342) = 14.56, p < .001, f = .78$, but neither a Group effect, $F(1, 38) = .39, p = .54$, nor an interaction, $F(9, 342) = 1.14, p = .33$, was found. These results indicate that learning occurred over the 10 blocks of trials and that both groups showed a similar pattern of learning (see Figure 3).

![Figure 3 — Mean performance score during the learning (Blocks 1–10) and test phases.](image)

**Pre- and Poststress Intervention.** The mean performance score of the last two learning blocks taken together (prestress) and the test block (poststress) were compared (see Table 2). A 2 x 2 (Group x Stress) repeated-measures ANOVA revealed a significant Group x Stress interaction, $F(1, 38) = 6.03, p < .05, f^2 = .35$, but no main effect of Stress, $F(1, 38) = 3.11, p = .09$, or Group, $F(1, 38) = .43, p = .51$. Subsequent simple main-effects analysis indicated no group differences prestress, $F(1, 76) = .64, p > .05$, but a significant group difference poststress, $F(1, 76) = 3.60, p < .05$. This difference was due to a significant performance decrement in the Self-focus group poststress, $F(1, 19) = 8.93, p < .01$, but no performance change in the Control group, $F(1, 19) = .24, p = .63$. 
Table 2  Mean (±SD) Performance Scores Pre- and Poststress Intervention

<table>
<thead>
<tr>
<th>Group</th>
<th>Stress intervention</th>
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<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Self-focus</td>
<td>30.48 ±6.32</td>
<td>26.20 ±6.75</td>
</tr>
<tr>
<td>Control</td>
<td>29.00 ±3.74</td>
<td>29.70 ±6.05</td>
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Regression Analysis. The finding that the Self-focus group had higher somatic anxiety than the Control group in the stress phase makes it unclear as to the contributions from self-focus and somatic anxiety to the variance of performance in the stress phase. A stepwise regression analysis was therefore conducted, using the number of technical rules reported (to represent self-focus on the performance process) and somatic anxiety as independent variables and performance score in the stress phase as the dependent variable. This analysis showed the number of technical rules to be the best predictor of performance, \( \beta = -0.33, R^2 \text{ change} = .11, t = -2.12, p < .05 \), with somatic anxiety excluded from the regression equation, \( \beta = -0.19, R^2 \text{ change} = .03, t = -1.23, p = .22 \). The negative slope in the regression equation suggests that the more technical rules the participants had, the worse was their performance under stress.

Discussion

The purpose of this study was to examine the prediction that the performance of a given task is more likely to break down under psychological stress if the task has been practiced under a high level of attention to the details of performance. The results of the study provided support for this prediction, with individuals who practiced basketball set-shots with attention to their own performance achieving equivalent performance levels in unstressed conditions but degraded performance under stress. These findings suggest that the negative effect of stress on performance is likely to be magnified if a skill is acquired under self-focused attention.

The success of the attentional focus and stress interventions was critical in this study. Carver and Scheier (1978) have suggested that self-focused attention may be enhanced by any stimuli which reminds the individual of him/herself. The use of the mirror, performance-relevant instructions, and written reports in this study were all intended to remind the participants of their performance processes. The finding that the Self-focus group acquired more technical rules than the Control group can be taken as validation of the attention focus manipulation. This finding is consistent with the suggestion by Hull and Levy (1979) that self-focused attention will enhance the accessibility of self-relevant information.

The increased CSAI-2 scores after the stress intervention suggest that the combination of financial incentives and evaluation apprehension did indeed evoke stress, concordant with previous studies (Baumeister, 1984; Hardy et al., 1996; Masters, 1992; Masters et al., 1993). It is worth noting, however, that the Self-focus group generally had a higher level of somatic anxiety than the Control group.
throughout the experiment. This may be due to the nature of the somatic anxiety subscale of the CSAI-2, which assesses the physiological activation as perceived by the individual (Martens et al., 1990). The manipulation of attentional focus on the performance process may well have augmented sensitivity to the physiological characteristics.

Although this finding was taken as an indication of the success of the attentional focus manipulation, it raised a concern that the degraded performance of the Self-focus group under stress was due to high levels of somatic anxiety rather than to self-focus. Regression analysis, however, proved this concern groundless and confirmed that the self-focus effect was the most robust predictor of performance under stress.

The findings here favor Masters' reinvestment hypothesis (Masters, 1992; Masters et al., 1993) by showing that the number of technical rules acquired by the individual was a salient predictor of performance under stress. The harmful effects of stress seem to be mediated by the amount of explicit knowledge held about the mechanics of the skill. The key to the hypothesis is that stress affects performance through a process in which anxiety induces a conscious reinvestment of explicit knowledge to control the execution of the skill and, paradoxically, disrupts the automaticity of performance. Accordingly, the more explicit knowledge the performer has to control performance, the more likely the performance is to fail.

GENERAL DISCUSSION

Researchers have suggested that self-focused attention plays a mediating role in performance degradation under stress (Baumeister, 1984; Carver & Scheier, 1981; Masters, 1992). However, the assumption that stress will evoke self-focus has received only anecdotal support. In addition, the underlying mechanisms through which self-focus affects performance are not clear. The two studies reported here attempted to provide a general picture of the relationship between psychological stress, self-focused attention, and performance.

The finding, in Study 1, of two different patterns of relationship between self-focused attention and anxiety (i.e., a positive linear relationship with somatic anxiety and an inverted-U relationship with cognitive anxiety) is intriguing. Several researchers have demonstrated this cognitive/somatic dissociation with performance (Burton, 1988; Gould et al., 1987; Parfitt & Hardy, 1993; Parfitt et al., 1995). It seems likely that different anxiety components may impact differentially on self-focused attention. For example, as somatic anxiety increases, it is likely that physiological information becomes more and more salient to the individual, necessitating or generating greater and greater self-awareness.

It is likely that cognitive anxiety has a more salient effect on the allocation of attentional resources than somatic anxiety (Eysenck, 1992; Eysenck & Calvo, 1992). Self-attention may increase in line with cognitive anxiety until the performer becomes so cognitively anxious that the facility for self-attention is reduced by distraction (Deffenbacher, 1980), competing resource demands, or a reduction in processing capacity (e.g., Humphreys & Revelle, 1984). More studies are needed to shed light on this multidimensional relationship.

Learning under self-focused attention appears to lead to more vulnerable performance under psychological stress. The more the individual pays attention to
the process of execution (reinvestment), the more likely it is that the skill will fail under stress. It is unlikely, however, that this process of reinvestment underlies all performance effects. The multiprocess nature of performance production and attention makes it very likely that multiple processes, including both distraction theories (Carver & Scheier, 1981) and conscious-processing theories (Baumeister, 1984; Masters, 1992), underlie performance effects. It does seem, though, that the theory of reinvestment provides a more complete explanation of the effects of self-focus on performance under pressure than Baumeister’s (1984) acclimatization hypothesis. Although the acclimatization hypothesis implies that conscious control interrupts the automaticity of execution, it does not explain the mechanisms underlying this conscious control process. The reinvestment hypothesis, on the other hand, points out the important role of explicit knowledge and indicates that the reinvestment of explicit knowledge underlies the conscious control process and disrupts performance.

The reinvestment hypothesis is also functional in that it provides a practical solution to performance breakdown under stress. Since the presence of explicit knowledge makes the performer vulnerable to skill failure through reinvestment, it seems logical to acquire the skill with as little explicit knowledge as possible. Research in implicit motor learning (Hardy et al., 1996; Liao & Masters, 2001; MacMahon & Masters, in press; Masters, 1992; Maxwell et al., 2000; Maxwell, Masters, Kerr, & Weedon, 2001) has established a number of techniques that can be used to prevent acquisition of explicit knowledge during motor learning, although the efficacy of these techniques in more technical (cultural as opposed to ontological) skills remains to be shown.

The studies reported here pose a challenge to traditional modes of instruction in sport and physical education. Pupils are often told to focus on the mechanics of the movement in order to “get the idea” of the skill. It is possible that “the idea” they get will, ironically, undermine their performance when the pressure is on. The present studies also support the concern of Hardy and colleagues (1996) on the use of process-oriented goals in skill learning. Process goals involve consciously attending to specific components of a movement during performance. Although several researchers (e.g., Kingston & Hardy, 1994; Orlick & Partington, 1988) have suggested that athletes should set process goals to maintain concentration, focusing on the process is probably a bad idea if the skill is to be performed under high anxiety conditions.

References


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**Author Note**

Data for these studies was collected while the authors were at the School of Sport & Exercise Sciences, University of Birmingham, UK.

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