Motivation and Emotion, Vol. 28, No. 2, June 2004 (© 2004)

The Role of Self-Focus, Task Difficulty, Task Self-Relevance, and Evaluation Anxiety in Reaction Time Performance

Georgia Panayiotou[1,3] and Scott R. Vrana[2]

Self-focused attention has been found to facilitate task performance in some instances and inhibit it in others. Among chronically anxious individuals it appears to consistently hinder performance. Less is known about the impact of self-focus on the performance of normal individuals. The present study examines the role of task difficulty, task self-relevance, and presence of evaluation anxiety in the performance effects of self-focus among normal individuals. Participants performed a simple reaction time (RT) and a lexical decision task, in Experiments 1 and 2, respectively, with or without self-focus. Self-focus and evaluation anxiety resulted in faster responding in simple RT, but there was no significant effect of self-focus on performance in the more difficult lexical decision task. Participants' heart rate (HR) was monitored and indicated that orienting was associated with slower RT in both experiments, and less orienting was found during self-focus and evaluation conditions. Results are interpreted in light of several self-focus theories.

KEY WORDS: self-focus; evaluation anxiety; social facilitation; lexical-decision.

Self-focus, the process of directing attention toward attributes of the self, including emotions, self-evaluations, and personal attitudes, has attracted the interest of social and clinical psychologists during the last four decades (Liebling & Shaver, 1973; Nasby, 1985; Woody, 1996; Woody & Rodriguez, 2000), in part because of its association with personality and psychopathological processes (Ingram, 1990). A second impetus of this interest has been the recognition that self-focused attention is implicated in motivation and goal-directed behavior.

[1]University of Cyprus, Nicosia, Cyprus.
[2]Virginia Commonwealth University, Richmond, Virginia.
[3]Address all correspondence to Georgia Panayiotou, Department of Psychology, University of Cyprus, P.O. Box 20537, 1678 Nicosia, Cyprus; e-mail: georgiap@ucy.ac.cy.

0146-7239/04/0600-0171/0

Directing attention toward the self has a number of implications for task performance, which have been described in relevant theories. Duval and Wicklund's self-awareness theory (Duval & Wicklund, 1972) assumes a limited capacity central processor and posits that performance declines under self-focus conditions because attention is focused toward the self and away from task-relevant information (Wicklund & Hormuth, 1981). Self-focus is almost always negatively valent because it involves evaluation of the self, which usually falls short of expected standards. In spite of this, self-aware people are motivated to match their behavior to salient social standards and do well on tasks (Duval, Duval, & Mulilis, 1992). Social facilitation theory deals with the effects of the presence of others on performance, but is relevant to a discussion of self-focus because typical social facilitation manipulations (presence of audience, camera) are the same also used to induce self-focused attention. The theory emphasizes the role of arousal (rather than self-evaluation) in performance changes under these manipulations (Zajonc, 1965). Specifically, performance improves on easy tasks due to an increase in drive that facilitates over-learned responses and declines on difficult tasks, during which drive inhibits responses that require more attention and concentration to a variety of relevant cues (Good, 1973).

Other theories emphasize the role of cognition, linking the relationship between self-focus and performance to success expectancies and the type of material that needs to be processed. Carver (1979) has posited that whether performance is improved or harmed by self-focus depends on the person's perceived ability to meet the required behavioral standards. Along similar lines as Duval and Wicklund, he suggests that self-evaluation is central, but he posits that this evaluation does not always result in negative affect: If one perceives that one has the ability to meet a behavioral goal, one is likely to put forth the effort to succeed (Schmitt, Gilovich, Goore, & Joseph, 1986) but if one perceives oneself as lacking the resources to cope, one may withdraw cognitively or behaviorally. In Carver's theory, expectations of forthcoming failure increase negative affect, which in turn further increases self-focus (Krohne, Pieper, Knoll, & Breimer, 2002). Attention is viewed as flexible, so that it can swiftly shift between the self and the task. Burgio, Merluzzi, and Pryor (1986) demonstrated how this model works in social performance. They examined the effects of high and low expectancy of success and self-focused attention, on the performance of men getting to know a woman over the telephone. Low expectancy men were rated as less skillful and more nervous by judges but only in the self-focus condition (presence of a camera). Behaviorally, they spent less time talking and had shorter conversations.

Baumeister and Showers (1986) concur that an interaction between personal and audience expectancies of success, task difficulty and skill determine whether performance is improved or impaired under conditions of observation (i.e. self-focus). When audience expectations are high but do not correspond to the actor's own predictions, one may choke and fail (Lewis & Linder, 1997). Hull and Levy

(1979), on the other hand, argue that induced self-focused attention only enhances performance of tasks relying on self-relevant information, the encoding of which is facilitated through priming, but does not affect the processing of self-irrelevant material. Geller and Shaver (1976) provided evidence in support of this theory: They found that participants were slower in Stroop responding to self-relevant (trait) words in a self-focus condition, and deduced increased activation of self-relevant thoughts by the self-focus manipulation.

Finally, Hope, Gansler, and Heimberg (1989), working within the domain of social anxiety, suggest that performance decrements might only be observed when participants induced to be self-focused are made vulnerable to self-focus by another variable such as evaluation apprehension. Indeed, the centrality of evaluation anxiety in impairing the performance of self-focused individuals has been demonstrated repeatedly within clinical psychology among individuals who suffer from chronic fear of negative evaluation (social phobics, test anxious, procrastinators etc.) and who tend to become self-focused during tasks (Carver, Peterson, Follansbee, & Scheier, 1983; Ferrari, 2001; Flett, Blankstein, & Boase, 1987; Kurosawa & Harackiewicz, 1995; Rich & Woolever, 1988). These individuals appear to be distracted by self-relevant, negatively valent thoughts, usually pertaining to failure and its consequences, and as an outcome fail to pay attention to significant aspects of the task at hand.

Hence, findings regarding those who suffer from chronic evaluation apprehension show with relative consistency that self-focus is associated with performance decline. What are the effects of self-focus on the performance of those who are *not* chronically anxious, however? This is the very issue addressed in the present study. Among normal individuals, being evaluated or otherwise becoming self-focused does not uniformly impair performance, although in a number of studies such impairment was observed. For instance, Kassin (1984) found that camera presence in combination with evaluation instructions impaired the recall of testimony-related information by mock jurors and Dollinger, Greening, and Lloyd (1987) found that in a condition involving the presence of a mirror, video-camera, and evaluation instructions, participants performed worse on a task entailing choosing a person who might commit theft. In other studies with normal individuals the prospect of evaluation and the presence of self-focus manipulations may be associated with enhanced performance (Ackerman & Woltz, 1995; Ferris & Rowland, 1983; Huguet, Galvaing, Monteil, & Dumas, 1999; Paulus, Annis, & Risner, 1978; Szymanski, Garczynski, & Harkins, 2000) or its effect may depend on task difficulty (Bell, Loomis, & Cervone, 1982; Davidson & Henderson, 2000). Task difficulty is significant for a number of reasons: Easy tasks are (a) more likely to be associated with expectations of success, (b) less demanding of attention, and (c) can be enhanced by arousal because they have a limited number of cues that one needs to process (Easterbrook, 1959). Difficult tasks may be associated with failure expectations, demand greater attention, and be negatively affected by the presence of arousal. On the basis of this reasoning, self-focus need not be associated with increased anxiety and performance failure among those who are not chronically anxious, unless task difficulty reaches a significant level and as a consequence the individual shifts from success to failure expectations.

Up to this point the concepts of evaluation and self-focused attention have been used almost interchangeably and need to be further clarified. The processes of self-focused attention and self-evaluation are closely intertwined. Both Carver's cybernetic model and Duval and Wicklund's self-awareness theory, propose that they are tools used in self-regulation: Attention becomes self-focused so that one can evaluate one's ability to cope with a goal or to compare oneself to social standards. One will automatically evaluate oneself when attention turns to the self (Duval & Wicklund, 1972). Self-evaluation leads to anxiety (becomes negatively valent) when a discrepancy is perceived between one's abilities and task demands, or if one's self-efficacy regarding the specific task is low. Otherwise, self-evaluation may lead to persistence and goal-directed behavior. Hence, self-focus and self-evaluation are inherent aspects of motivation whether this is approach (goal persistence) or avoidance (evaluation anxiety, withdrawal) oriented. Self-focus represents the cognitive processes of directing attention to the self, whereas self-evaluation can include a valence component, depending on the outcome of the assessment of ones ability to cope.

To summarize, among chronically anxious individuals the presence of self-focus, evaluation apprehension, and high task difficulty have been associated with reduced cognitive and other task performance. Much less is known about the impact of self-focus on the performance of normal individuals, and the specific processes underlying it. One may hypothesize that if what self-focus does among the chronically anxious is to bring to the fore failure expectations and negative self-evaluations, the opposite should be true among normal individuals: Because they have no reason to anticipate failure, self-focus should enhance positive performance expectations and performance should improve, unless the task reaches a particularly high level of difficulty. This prediction may be modified by task self-relevance, if Hall and Levy's hypothesis that only self-relevant tasks are affected by self-focus is correct. The present study evaluates these hypotheses in two experiments.

THE PRESENT STUDY

The present study examines self-focus, task self-relevancy, task difficulty, and the presence of evaluation apprehension to test the above hypotheses in a design that precludes as much as possible the confounding of the variables of interest. Specifically, one of the criticisms that can be directed toward similar research conducted in the past is that in most studies it is almost impossible to delineate the effects of self-focus, an attentional process, from evaluation anxiety, an emotional process (see Panayiotou, in press, for a review). In fact, the bulk of our knowledge regarding self-focus comes from studies that involved participants who can be thought of as chronically anxious, where the aim was to test for the interaction between self-focus and their low success expectations (Alden, Teschuk, & Tee, 1992; Brockner, 1979a, 1979b; Sanna & Shotland, 1990). Other studies combined evaluation and self-focus manipulations in the same cells (Dollinger et al., 1987; Kassin, 1984). For instance, Ferris and Rowland (1983) found that the presence of an *evaluative* audience (audience is a self-focus manipulation) improved the quality of performance on a text-editing task compared to an "alone" condition. Even in cases where evaluation was not explicitly induced, the presence of self-focus manipulations, such as monitoring or a camera, without the specific effort to remove evaluative implications may confound a self-focus with an evaluation apprehension manipulation (Burgio et al., 1986). In the case of the present study, participants are placed in evaluative and self-focus conditions randomly and are not selected to be high in anxiety, self-consciousness, low self-esteem, or other individual differences that could potentially cloud the effects of self-focus. Most importantly, evaluation apprehension and self-focused attention are manipulated independently, an approach that was introduced in a previous study in our lab (Panayiotou & Vrana, 1998). This permits for a relatively "pure" manipulation of self-focused attention, without the confounding effects of induced evaluation anxiety. Further, Experiment 2 attempts to manipulate task difficulty in a systematic and measurable way (word frequency) and task self-relevancy is examined within the same design. Thus, the study can potentially verify that the performance of normal individuals is enhanced by self-focus and elucidate the possible cognitive and emotional processes that contribute to this effect.

Reaction time (RT) was used as the performance measure. Specific tasks were selected because they have been used successfully in previous self-focus research (Turner, 1980). The study also introduces an objective measure, heart rate (HR), of both the emotional (evaluation apprehension) and attentional components of performance under self-focus conditions, in order to shed light on the processes underlying the predicted performance improvement. Tonic HR changes index overall autonomic arousal, whereas phasic HR changes during the RT trials can be used as indexes of orienting, attention, and cognitive effort (e.g. Zimmer, Vossel, & Froelich, 1990).

Experiment 1 serves as a pilot study designed to verify the hypothesis that on simple tasks the presence of self-focus enhances the performance of normal individuals. Experiment 2 replicates this design but additionally adds the variables of task difficulty and task self-relevancy in order to show whether the expected improved performance is only limited to easy tasks, or to self-relevant ones. The RT stimuli (adjectives) used in the lexical decision task in Experiment 2 varied in their frequency in the English language. Low frequency words are more difficult to distinguish from nonwords, requiring longer response times (Paap & Johansen, 1994; Waley, 1978). This allowed for a within-participants manipulation of task difficulty. However, task difficulty was additionally examined by comparing RTs across the two experiments, which involved tasks varying in complexity. Heart rate was an important manipulation check of task difficulty. The cognitive effort required by the RT tasks can be indexed through an examination of the HR response during RT trials. More deceleration (orienting) to a stimulus takes place when the task requires greater attention compared to an easy task (Bohlin & Kjellberg, 1979).

Experiment 2 also included two different types of stimuli—trait adjectives and neutral adjectives—in order to look at the effect of stimulus self-relevancy (Hull & Levy, 1979; Turner, 1980). In the present study, Geller and Shaver's design was extended by obtaining ratings from participants of the actual relevance to oneself of the adjectives used (Geller and Shaver, 1976)

EXPERIMENT 1 (PILOT STUDY)

In a 3 Self-focus (camera, mirror, no self-focus) × 2 Evaluation apprehension (evaluation, no evaluation) between-participants design, this study examined the effects of self-focus on simple RT. Improved performance was expected in both the self-focus and evaluation apprehension conditions because of social facilitation and/or increased motivation in the context of this simple task (McCullagh & Landers, 1976; Ross & Pihl, 1988). If the mechanism behind performance improvement involves increased physiological arousal, higher tonic HR rate would accompany improved task performance in the self-focus and evaluation conditions. Increased tonic HR rate should also be accompanied by increased self-report of arousal.

Method

Participants

Participants were 47 (31 male, 16 female) college students who received course credit for their participation. They were assigned randomly to one of the three self-focus conditions and one of two evaluation apprehension conditions. Experimenters were five trained graduate and undergraduate students, three women and two men, who were assigned to participants based solely on scheduling considerations.

Apparatus

Visual stimuli were presented on a computer monitor situated directly in front of the participant at a distance of approximately 1.5 ft. Participants were allowed to adjust their position slightly to comfortably see the monitor. The stimulus was always a string of five X's and looked as follows: XXXXX. This stimulus was presented in the center of the screen in 12-point font for 500 ms at intertrial intervals varying randomly from 5 to 12 s. RT was measured in milliseconds. Participants responded with the thumb of their dominant hand via a button mounted on a hand-held rod. The signal triggered a 5-V relay that was fed into a digital input on the computer. HR was monitored using a photoplethysmograph clipped to the index finger of the nondominant hand. The signal was fed into a digital input on the computer, which recorded interbeat intervals with millisecond resolution.

Self-focused attention was induced using either a video-camera set in the corner of the participant room, and clearly focused on the participant, or a rectangular mirror, on the wall behind the computer monitor so that the participant's reflection would be obvious to him/her during the task.

Procedure

Upon arrival to the lab, participants were seated and instructions read. Participants were asked to respond to the stimulus as quickly and accurately as possible and to keep their thumb on the response button at all times. The HR monitor was then fitted.

Participants in the evaluation condition, a social comparison manipulation (e.g. Mussweiler & Ruter, 2003) were instructed as follows: "... we will be evaluating your performance and at the end of the experiment we will tell you how you did compared to other participants in this experiment." Participants in the no-evaluation condition were told: "During this experiment try to perform as well as you can. However, what we are interested in is your body's physiological response to the task so we will not be evaluating how well you did."

Participants in the camera condition were told that "we will be observing you from the next room as you do the task using this camera" and those in the mirror condition were not given any special instructions regarding the manipulation. Instead, on the mirror, a tag indicated that it would be used in an experiment to be run the next summer (as in Carver & Scheier, 1978). It was assumed that in the no-evaluation condition the inherent evaluation insinuation of the self-focus conditions (observation through a camera, examining one's reflection in the mirror) would be removed by the instructions that reassured that the purpose of the experiment did not revolve around performance. This is the same procedure that was used in Panayiotou and Vrana (1998).

Participants completed the preexperimental questionnaires (see below) alone in the room, instructions were reviewed and the RT task began with the word "READY" appearing on the screen indicating that stimulus presentation was to start, followed by 70 trials of the simple RT task. After task completion the photoplethysmograph was removed and the participant was debriefed. Debriefing included information on what the average RT performance on similar tasks is, and what it was so far in the experiment, but no feedback on the participant's personal performance. Instead, participants were provided with a clear explanation for the need for the evaluation manipulation.

Questionnaires

The preexperimental questionnaires included the Linguistic Implications Form (LIF), the State-Trait Anxiety Inventory - state (STAI, Spielberger, Gorsuch, & Lushene, 1970), and a Likert-type measure of emotional valence, dominance, and arousal (anchors were 0 = *negative*, 7 = *positive*; 0 = *calm/relaxed*, 7 = *excited/aroused*; and 0 = *submissive or controlled by events* and 7 = *dominant or in control of events*). It should be noted that these were given *after* the self-focus and evaluation manipulations were induced but before the RT task began so that they would be uninfluenced to the degree possible by the cognitive demands of the task, but would measure the effects of the manipulations. The LIF (Wegner & Guiliano, 1983) was used as an index for the presence of self-focused attention. It involves 20 statements that the respondent is asked to complete with either a first, second, or third person pronoun. The ratio of first person pronouns to the total number of statements is believed to reflect the participant's degree of self-focus. It was selected because it is a frequently used measure, and because there are few other options available, but with some caution because its ability to assess state self-focus under performance conditions has been questioned (Panayiotou & Vrana, 1998). The STAI measured subjective state anxiety. STAI scores have been found to increase during performance of a motor task in the presence of an audience (Ferreira & Murray, 1983), and hence it was used as a manipulation check for the presence of evaluation apprehension. However, it was not expected that normal individuals should feel anxiety in the self-focus or the evaluation conditions, given that this was an easy task.

Data Reduction and Analysis

To remove outliers, RTs over and below 2.5 standard deviations from the mean for each participant were eliminated. Failures to press the button were counted as missing values. Four participants with 50% of RTs missing (the rest had only 0.9% RTs missing), and one participant with mean RT over 500 ms were eliminated from RT analyses. Analysis of Variance (ANOVA) was conducted on all measures (RT, mean HR, emotion ratings) using self-focus and evaluation condition as between-participants variables, in a 3×2 design. Where no differences between the two self-focus conditions were obtained, the analysis was repeated collapsing across these two conditions in a 2×2 design in order to increase the power of the self-focus comparison.

Cardiac interbeat intervals were converted to beats per minute for 1 and 0.5 s prior to the presentation of each stimulus until 2.5 s after stimulus onset (Graham, 1978). In addition to the ANOVA examining mean heart rate, HR orienting was examined. For this analysis, the 2.5-s period of HR, converted to beats per minute, was divided into 5 half-second intervals during each RT trial in order to see changes in the HR wave during this period (Graham & Clifton, 1966). The 1 s of HR just prior to stimulus onset was used as a baseline for that trial. A 2 (self-focus) $\times$ 2 (evaluation) $\times$ 5 (half-seconds) ANOVA examined the 5 half-second intervals of HR as difference scores from the pretrial baseline. When significant effects of half-seconds were found, a Greenhouse-Geisser corrected p values and epsilon are reported. For each significant interaction obtained, follow-up t tests were used to examine differences between means using a modified Bonferroni procedure (Simes, 1986).

Results

Reaction Time

The overall mean RT was 329.6 ms ($SD = 46.7$). As predicted, RTs were faster in the two self-focus conditions compared to the no self-focus condition $F(2, 36) = 2.38$, $p \leq .1$ ($\eta^2 = .12$) although the effect was marginally significant (means were 361.62, 320.06, and 315.64 ms for no-self-focus, camera, and mirror, respectively). There was also a marginally significant self-focus $\times$ evaluation interaction, $F(2, 36) = 2.45$, $p \leq .1$ ($\eta^2 = .12$), which indicated that the slower RTs associated with no self-focus only occurred in the no-evaluation condition. Cell sizes for this analysis were as follows: no evaluation/no self-focus = 8; no evaluation/mirror = 6; no evaluation/camera = 6; evaluation/no self-focus = 8; evaluation/mirror = 7; evaluation/camera = 7. Because there was no significant difference between the two self-focus conditions, an ANOVA was conducted in which these two conditions were collapsed (i.e. 2 self-focus $\times$ 2 evaluation). Cell sizes increased from 8 to 14. This time, there was a significant effect of self-focus, with faster RTs in the self-focus condition, $F(1, 42) = 4.83$, $p \leq .03$ ($\eta^2 = .10$). The Self-focus $\times$ Evaluation interaction remained marginally significant, $F(1, 42) = 3.70$, $p \leq .06$ ($\eta^2 = .08$), and follow-up t tests indicated that RTs were significantly slower in the no evaluation/no self-focus condition compared to all other cells (see Fig. 1). Although the proportion of missing RTs (the only possible measure of errors in this pilot study) was very low—averaging less than 1%—error rates were compared in an analysis of variance with self-focus (two levels) and evaluation conditions as the between-participants factors. There were no significant differences in total number of error (missing) RTs between the conditions.

Heart Rate

Mean HR was not significantly different for the three self-focus conditions or for the two evaluation conditions. The analysis of the HR wave resulted in

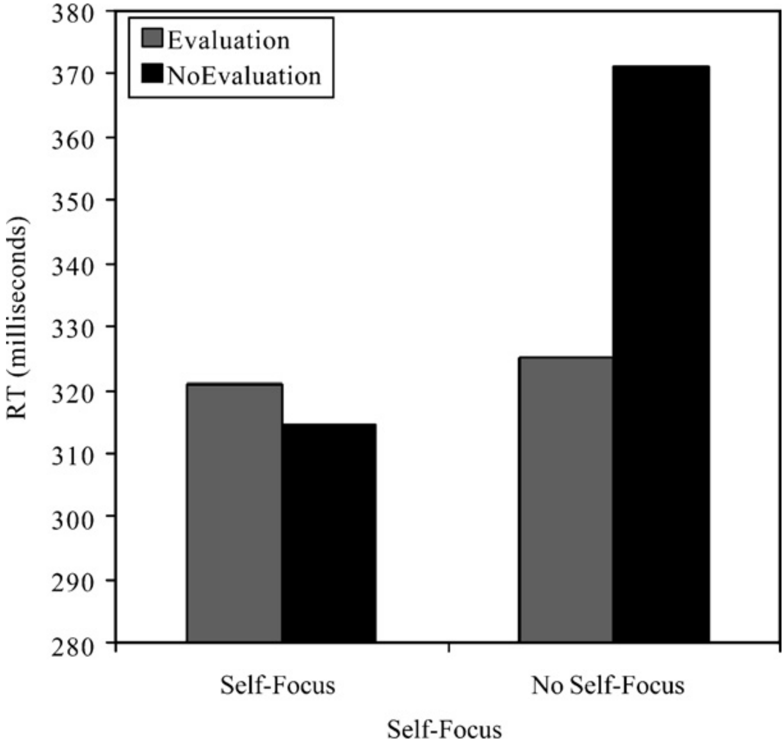

Fig. 1. Interaction effects between self-focus and evaluation anxiety on reaction time in Experiment 1.

an anticipated significant effect of half-seconds, $F(4, 34) = 47.12$, $p < .0001$, ($\eta^2 = .85$), $\in = 0.38$. This is an anticipated effect because HR reflects changes in cognitive processing (Bohlin & Kjellberg, 1979): Heart rate showed an initial deceleration following stimulus onset, followed by some acceleration. A marginal interaction between self-focus (collapsed into two conditions), and evaluation condition, $F(1, 34) = 4.02$, $p < .06$, ($\eta^2 = .11$), indicated that the least acceleration following the RT stimulus took place in the no self-focus, no-evaluation condition. This is the cell that was associated with the slowest RTs, that is the worst performance.

Self-Report Measures

There were no significant effects of self-focus (examined either as two or as three levels) or evaluation condition on the STAI or LIF. Table I shows means and standard deviations of the manipulation checks across conditions. Regarding

Table I. Means and Standard Deviations (in Parentheses) of Scores on the LIF and STAI in the Self-Focus and No Self-Focus and the Evaluation and No-Evaluation conditions

	LIF			STAI		
	Self-focus	No self-focus	Mean	Self-focus	No self-focus	Mean
Experiment 1						
Evaluation	0.53 (0.23)	0.46 (0.12)	**0.49 (0.20)**	37.57 (10.06)	38.11 (4.05)	**37.78 (8.11)**
No evaluation	0.46 (0.18)	0.46 (0.16)	**0.46 (0.17)**	34.77 (7.43)	36.25 (6.52)	**35.33 (6.97)**
Mean	**0.49 (0.21)**	**0.46 (0.13)**		**36.22 (8.84)**	**37.24 (5.26)**	
Experiment 2						
Evaluation	0.53 (0.19)	0.49 (0.19)	**0.51 (.19)**	39.94 (9.95)	39.60 (6.22)	**39.77 (7.90)**
No evaluation	0.47 (0.13)	0.53 (0.22)	**0.50 (.18)**	37.56 (7.27)	34.42 (6.26)	**35.99 (6.75)**
Mean	**0.50 (.16)**	**0.51 (.20)**		**38.75 (8.60)**	**37.01 (6.27)**	

Note. For both experiments self-focus scores represent the average of the mirror and camera conditions. LIF = Linguistic Implications Form (ratio of self-focused to total responses; scale 0–1); STAI = State-Trait Anxiety Inventory (State Form, total anxiety score; scale 20–80). Marginal means are shown in bold type.

self-rated emotion, no significant effects of either self-focus (examined as two levels) or evaluation were observed on valence or arousal ratings.

Discussion

This study was conducted to establish the effects of self-focus and evaluation on the performance of a simple RT task. The main prediction entailed improved performance in the self-focus and evaluation conditions. This hypothesis was verified. There was significant facilitation because of self-focus, and the combination of no evaluation and no self-focus produced the slowest RTs. Self-focus improved performance only in the no-evaluation condition; conversely, evaluation instructions resulted in faster RTs in the no self-focus condition only. A similar effect was obtained by Panayiotou and Vrana (1998), who found that participants performed better on a digit recall task with evaluative instructions but only under no self-focus; Liebling and Shaver (1973) obtained improved prose copying under similar conditions. Apparently having both evaluative instructions and self-focus conditions does not improve performance beyond that caused by each manipulation alone. One possibility is that performance may have reached a ceiling and could not improve further with the addition of both manipulations (the obtained RTs were in the 300 to 350-ms range, which is typical for simple RT paradigms). Phasic HR changes seemed to track performance, as the least acceleration (arousal) was associated with the cell that involved the slowest RTs (no self-focus, no evaluation). Heart rate acceleration is an indication of cognitive effort (Cacioppo & Sandman, 1978). This finding hence indicates that the absence of both self-focus and evaluation may fail to provide the context for optimal motivation, effort, and successful performance. Conversely, the presence of one or both of these conditions, at least when the task is as easy as the one examined here, may enhance motivation and goal-directed behavior.

The manipulation check for self-focus, the LIF did not capture changes in these manipulations in the present study. The reason for this is not clear, but similar difficulties in identifying appropriate manipulation checks for self-focus have been encountered in the past (Panayiotou & Vrana, 1998) and may have to do with the fact that the LIF was developed to track self-focus when the participant was simply exposed to the manipulation and not when he/she was simultaneously performing a task. Regarding the STAI, the absence of significant differences between the evaluation conditions may be explainable by a number of possibilities. Table I shows that the mean was higher in the evaluation condition, indicating that the effect may have been significant with a larger sample size. On the other hand, this null effect may be an accurate depiction of reality, in the sense that normal individuals may not become anxious about being evaluated on their performance, unless they have evidence that the task is difficult, which was not the case here.

In spite of weak findings regarding the self-report measures and the small sample size, this pilot study did help to verify that self-focus and evaluation conditions improve performance among normal individuals in the context of a simple task. Experiment 2 was designed to replicate these findings, with a larger sample, using another RT task that included stimuli that varied in difficulty and self-relevance.

EXPERIMENT 2

Experiment 2 examined the same between-participants variables within a more complex lexical decision task. Word stimuli were either trait or neutral adjectives (i.e. ones that do and do not describe people, see Geller & Shaver, 1976). They were classified as trait and neutral adjectives on an a priori basis and as self-descriptive and non-self-descriptive based on participant ratings, in an extension of Geller and Shaver's design, in order to examine Hull and Levy's prediction that self-focus only facilitates the processing of self-relevant information (here trait and self-descriptive words). Words were also either high or low in frequency in the English language to manipulate task difficulty. High frequency words are responded to faster within a lexical decision task, whereas it was expected that low frequency words would be harder to distinguish from nonwords requiring greater attention and cognitive effort. All variables, except for self-focus and evaluation, were manipulated within participants to increase statistical power.

For Experiment 2 it was predicted that (a) to the degree that Hull & Levy's theory is correct, self-focus would activate self-relevant information and result in faster RTs compared to no self-focus conditions for trait and/or self-descriptive (self-rated) adjectives; (b) self-focus and evaluation anxiety would result in speeded RTs for the easy task (high frequency words) and in slower RTs for the difficult task (low frequency words). This prediction holds only if self-focus and evaluation anxiety influence performance on a stimulus-by-stimulus basis; and (c) reaction time and HR should track task difficulty: RT should be longer, and HR orienting (deceleration) should be greater, for low compared to high frequency words.

Method

Participants

Participants were 99 college students (50 male, 49 female) who received credit for participation and were assigned randomly to the between-participants conditions. The number of participants per cell were as follows: No Self-focus/Evaluation = 13, No Self-focus/No Evaluation = 16, Camera/Evaluation = 16, Camera/No Evaluation = 14, Mirror/Evaluation = 14, Mirror/No Evaluation = 15.

Stimuli

RT stimuli were words or nonwords. The words were adjectives ranging in length from three to seven characters and in frequency in the English language from 385 to 386 occurrences per million based on tables published by Kucera and Francis (1967). Half of the words were trait adjectives (i.e. describe people, e.g. "tall") and the other were neutral (e.g. "oval"). Trait and neutral adjectives were matched for length and frequency. Half the words occurred with low frequency in the English language ($M = 10.7$, range = 6–15 occurrences per million) and half were high frequency ($M = 111.1$, range = 41–385 occurrences per million). An example of a high frequency adjective is "quiet"—with 76 occurrences per million and of a low frequency adjective is "static" with 13 occurrences per million. An equal number of nonwords (72) were included, which were nonsense strings of characters constructed by changing letters of real words that matched the word stimuli in length and frequency. Stimuli were presented one at a time on the computer monitor. Eight different presentation orders were created and participants were randomly assigned to each.

Apparatus

The apparatus was similar to Experiment 1. Two RT buttons (one in each hand) rather than one were employed for this experiment. Heart rate was monitored via EKG to avoid interference of the finger sensor with the button press. Lead I EKG was collected by two 12.55 mm Ag–AgCl electrodes filled with electrode gel and placed on each inner forearm. The signal was filtered by a Coulbourn S75-01 Hi Gain Bioamplifier and fed into a digital input on the computer, which recorded interbeat intervals with millisecond resolution.

Procedure

Procedures were similar to Experiment 1 except that participants were instructed to respond by pressing as quickly as possible one button as soon as they saw a word and the other button (held in the opposite hand) as soon as they saw a nonword. Right or left hand responding to word stimuli was counterbalanced across participants. No distinction was made in the instructions between trait and neutral adjectives or high and low frequency words. Instructions for the evaluation and self-focus conditions were similar to those in Experiment 1 and the same preexperimental questionnaires were administered.

To examine the effects of self-focus and evaluation anxiety on HR at a time when the latter was unaffected by the cognitive activity required by the RT task, tonic HR was collected for a period of 30 s prior to task onset while the experimenter left the participant's room to "check on the equipment." Next, the word "READY" appeared followed by 174 trials of words and nonwords. The first 30 were practice trials and were not used in analyses (but were not distinguished as practice trials to participants). Following physiological monitor removal, the participant was escorted to another room to complete a questionnaire that asked him or her to identify adjectives used in the experiment as descriptive of him/herself. The questionnaire asked for a yes/no response to the question "in your opinion is this word used to describe people," and for the words marked "yes" a 1–7 rating of how much it described the participant, with 1 = *not at all like me* and 7 = *just like me*.

Data Reduction and Analysis

To remove the effects of outliers, RTs over and below 2.5 standard deviations from the mean for each participant were eliminated, as were error RTs (defined as participants either responding incorrectly—word to nonwords or vice versa—or not pressing the button at all). Analyses of Variance (ANOVA) were conducted on RTs using self-focus condition and evaluation condition as between-participants variables, and word frequency (high, low) and word type (trait, neutral) as within-participants variables. Where no significant differences among self-focus conditions were observed, the three self-focus conditions were collapsed into two, as in Experiment 1. A similar ANOVA was conducted with self-descriptiveness based on participant ratings (self-descriptive or nondescriptive) as the within-participants variable. For this analysis, participant ratings 5, 6, and 7 were used to indicate "self-descriptive" and ratings 1, 2 and 3 were used to indicate "nondescriptive" on the 1–7 scale. Only words rated as trait adjectives ("used to describe people" were included in this analysis. An additional ANOVA with the same between-participant variables was conducted with the ratio of error RTs (11% of trials) to total trials as the dependent variable.

Cardiac interbeat intervals were converted to beats per minute for a 30-s baseline prior to task onset. An ANOVA examined mean HR during baseline as a function of the between-participant variables. HR orienting was examined as in Experiment 1. Another ANOVA examined the 5 half- second intervals combining the data for Experiments 1 and 2 to compare the HR wave across the two tasks, that varied on task difficulty. For this analysis, only the first 70 trials of Experiment 2 were included, because Experiment 1 included only 70 trials. When significant effects of half-seconds were found, a Greenhouse-Geisser corrected p value and epsilon are reported. ANOVAs performed on the measures of emotion, the LIF and STAI were similar to those described in Experiment 1.

Results

Reaction Time

There were not significant effects for self-focus or evaluation apprehension on RT. Hence, the two self-focus conditions were collapsed creating a 2×2 between-participants design, which allowed cell size to range from 15 to 31. This design was used for the rest of the RT analyses. Although there was still no significant self-focus effect, $F(1, 95) = 1.29$ ($\eta^2 = .01$), $p = .26$, the means were in the expected direction, with RT during no self-focus being longer ($M = 852.48$, $SD = 203.08$) than during self-focus ($M = 811.94$, $SD = 148.92$).

The main two hypotheses for this experiment were that self-focus would prime the self-relevant information (predicting a Self-focus × Word- type interaction) and that self-focus would facilitate performance of the easy task and interfere with performance of the difficult task (predicting a Self-focus × Word frequency interaction). Neither of these interactions was apparent in the data. There was a significant interaction between word type and evaluation, $F(1, 95) = 4.19$, $p \leq .04$ ($\eta^2 = .04$), but if evaluation should produce effects similar to self-focus, the data were not in the predicted direction; rather, trait adjectives resulted in marginally slower RTs than neutral, in the evaluation condition only.

To explain the later unexpected effect, and the otherwise nonsignificant differences between word types, the impact of the valence of the adjectives was examined: Could it be that self-focus and evaluation interacted not with the trait-adjective versus neutral dimension of the stimuli but with the positive versus negative trait valence dimension instead? For this purpose, all adjectives were rated by eight judges (PhDs in Psychology) on a 1–7 Likert-type scale in terms of their valence (1 = *negative*, 7 = *positive*). Interrater reliability was very high, with correlations between raters ranging from $r = .56$ to $r = .93$. The average rating of the eight judges was used as the valence score of each adjective. Adjectives were then divided into positive and negative based on a median split of these scores. First, an ANOVA with valence as the grouping variable and self-descriptiveness as the dependent variable indicated that positive adjectives were rated as more self-descriptive $(1, 3234) = 1665.77$, $p < .0001$ ($\eta^2 = .34$). Next, an ANOVA was run to examine the effect of valence on RT. This used a Self-focus × Evaluation × Valence × Word type × Word frequency design. Result indicated a marginal interaction between word type, valence, and evaluation, $F(1, 87) = 3.29$, $p < .07$ ($\eta^2 = .004$), which showed that positive trait adjectives in the no-evaluation condition had somewhat slower RTs than in the evaluation condition. This finding helps to clarify the Word type × Evaluation interaction found above, and may indicate than when there were no-evaluation instructions to emphasize the significance of a speeded response, participants may have taken longer to evaluate positive trait adjectives in order to see if they were descriptive of themselves.

The word frequency manipulation had its predicted effect: High frequency words resulted in significantly faster RTs (785.7 ms) compared to low frequency words (860.0 ms), $F(1, 95) = 178.01$, $p \leq .0001$ ($\eta^2 = .65$). When stimuli were grouped into self-descriptive and nondescriptive based on individual ratings, self-descriptive adjectives resulted in faster RTs, $F(1, 93) = 25.71$, $p \leq .0001$ ($\eta^2 = .22$); (*M* self-descriptive = 792.1, *SD* = 163.5; *M* nondescriptive = 824.2, *SD* = 174.2). However, this effect may have been partially confounded with word frequency, because 69% of self-descriptive and 40% of nondescriptive words were high frequency. A follow-up ANOVA was conducted using frequency as an additional within-participants variable to clarify this result. No significant interaction between self-descriptiveness and word frequency was obtained, but the descriptiveness effect was, this time, marginal, $F(1, 93) = 3.31$, $p \leq .08$ (*M* self-descriptive/high frequency = 774.4, self-descriptive/low frequency = 830.6, nondescriptive/high frequency = 776.5, nondescriptive/low frequency = 853.6), suggesting that differences in frequency partially accounted for the strong self-descriptiveness effect in the first analysis.

Errors

The ANOVA examining error RTs revealed a marginal effect of evaluation, $F(1, 94) = 3.74$, $p \leq .06$ ($\eta^2 = .04$), showing that the evaluation condition was associated with a somewhat higher error rate.

Heart Rate

There were no significant effects of self-focus condition or evaluation condition on the 30 s of mean tonic HR prior to the beginning of the RT task. During the RT trial, HR showed more deceleration from baseline for low frequency compared to high frequency words, $F(1, 83) = 5.62$, $p \leq .02$; $\eta^2 = .06$. A Word

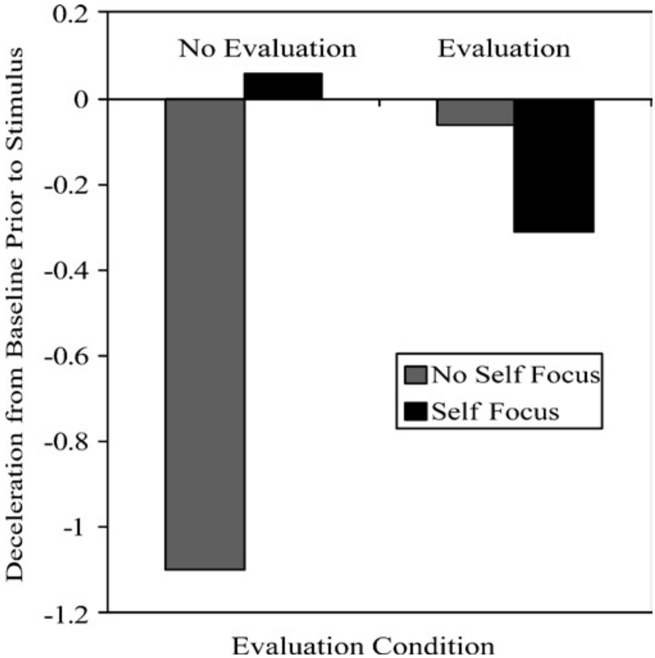

Fig. 2. Interaction effect between self-focus and evaluation on heart rate deceleration during Experiment 2.

Frequency × Time interaction, $F(4, 332) = 4.61$, $p \leq .02$ ($\eta^2 = .05$), $\in = 0.41$, indicated that this difference occurred within 1.5 s following stimulus onset.

A significant Self focus × Evaluation interaction, $F(2, 83) = 3.84$, $p \leq .03$ ($\eta^2 = .08$), showed that participants in the two self-focus conditions had more HR acceleration compared to those in the no self-focus condition, but only in the no-evaluation condition. Because there was no significant difference between the mirror and camera conditions, the ANOVA was rerun collapsing the two self-focus conditions. The Self- focus × Evaluation interaction remained significant, $F(1, 85) = 5.93$, $p < .02$ ($\eta^2 = .07$), (see Fig. 2). A significant Self focus × Evaluation × Time interaction emerged, $F(4, 340) = 3.75$, $p \leq .03$, $\in = 0.49$ ($\eta^2 = .04$), indicating that self-focus led to less deceleration (and more acceleration) than no self-focus in no-evaluation from 0.5 to 2.5 s after stimulus onset.

There was no significant difference between trait and neutral adjectives in HR during the RT task. When the word stimuli were divided into self-descriptive and nondescriptive based on participant ratings, however, nondescriptive adjectives produced marginally greater HR deceleration and less subsequent acceleration compared to self-descriptive adjectives, Self-descriptiveness $F(1, 84) = 2.97$, $p \leq .09$ ($\eta^2 = .03$); Self-descriptiveness × Time, $F(4, 336) = 2.51$, $p \leq .04$ ($\eta^2 = .04$), $\in = 0.56$.

Self-Report Measures

As in Experiment 1, there were no significant effects of self-focus or evaluation conditions on the LIF or on the measures of emotion. Participants in the evaluation condition reported significantly more anxiety than participants in the no-evaluation condition on the STAI, $F(1, 93) = 4.96$, $p \leq .03$ ($\eta^2 = .05$).

Total Sample Analyses

Task Difficulty. The lexical decision task in Experiment 2 was much more difficult than the simple RT task as indicated by the larger overall RTs in Experiment 2 ($M = 857.5$ ms, $SD = 178.5$, $t = 22.09$, $p < .001$) than in Experiment 1 ($M = 329.6$ ms, $SD = 46.77$). Task difficulty was also examined by looking at HR wave differences between the two experiments, using Experiment as a between-participants variable. Heart rate decelerated more for Experiment 2 compared to Experiment 1, $F(1, 129) = 49.90$, $p \leq .0001$, $\eta^2 = .28$ (see Fig. 3). Figure 3 also

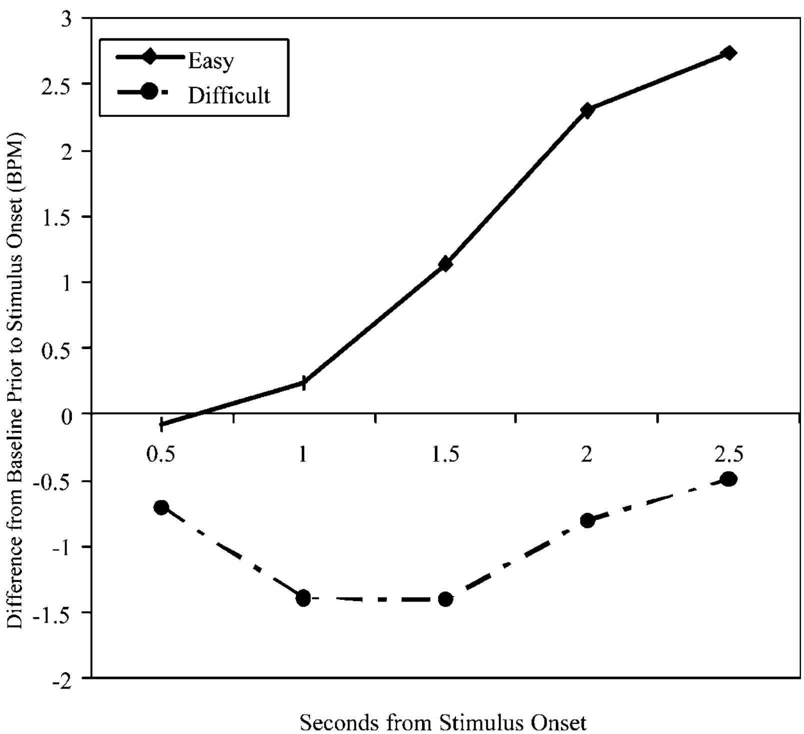

Fig. 3. The heart rate wave during reaction time for Experiment 1 (easy task) and Experiment 2 (difficult task).

shows that, whereas for the easy task there was very little initial deceleration followed by acceleration, for the difficult task there was initial deceleration that did not reach baseline HR levels within the 2.5-s measurement window, Experiment $\times$ Time $F(4, 516) = 19.00$, $p \leq .001$ ($\eta^2 = .13$), $\in = 0.47$. There was no significant interaction between task difficulty and either self-focus or evaluation conditions.

Manipulation Checks. Because the questionnaires used as manipulation checks (LIF, STAI) resulted in nonsignificant differences in Experiment 1 (though means were in the expected directions) between the control conditions and the conditions involving the manipulations, analyses on them were reran using the combined data from Experiments 1 and 2 to correct for the relatively small sample size in the first experiment. Participants scored significantly higher on the STAI if they were in the evaluation compared to the no-evaluation condition, $F(1, 127) = 3.8$, $p \leq .05$. However, participants in the self-focus and no self-focus conditions did not differ significantly on the LIF. Hence, it appears that evaluation apprehension was successfully manipulated, whereas some questions remain regarding self-focus. The fact that self-focus manipulations resulted in predicted effects, at least in the first experiment indicate that the lack of the expected findings on the LIF may have more to do with the manipulation check than with the manipulation itself.

Discussion

In Experiment 2, even though a significant main effect of self-focus was not observed, mean RT was faster in the self-focus compared to the no self-focus condition, indicating that perhaps there was some overall facilitation associated with self-focus, replicating the findings in Experiment 1. The main prediction was that self-focus would result in faster RTs for trait or self-descriptive words (Geller & Shaver, 1976; Green & McKenna, 1996; Higgins, Van Hook, & Dorfman, 1988). Priming should lead to RT response speeding (Posner, 1978), but this did not occur here. Participants did respond faster to words they later self-identified as self-descriptive, though there were no significant interactions with self-focus. Self-descriptive words may have been more familiar to the individual, and familiarity of a word is more important than its frequency in the language in determining speed of reaction (Kreuz, 1987). The follow-up analyses showed that this effect was partly due to the fact that more words rated as self-descriptive were also high in frequency.

RT speeding during self-focus and evaluation was also predicted when the task was easy (high frequency words) but RT slowing when the task was difficult (low frequency words), based on social facilitation theory. However, self-focus and evaluation had little effect on RT in this experiment, in relation to stimulus difficulty.

Although self-focus and evaluation did not influence speed of processing the various word categories, the word categories themselves did affect lexical decision speed in predicted ways. Specifically, high frequency words and self-descriptive words were responded to faster than low frequency words and non-self-descriptive words, respectively. Heart rate appeared to track these differences in cognitive effort, as will be further discussed in the General Discussion.

GENERAL DISCUSSION

This study evaluated the hypothesis that normal individuals perform better under self-focus conditions. This prediction was juxtaposed against the accumulating evidence for performance deterioration among chronically anxious, self-focused individuals. Normal individuals should have success rather than failure expectations regarding their performance, unless the task reaches a high level of difficulty. On the basis of this assumption, improvement of their performance under self-focus conditions (and evaluation conditions if self-focus and self-evaluation are both part of the same self-regulatory process) was predicted. The study evaluated this hypothesis in a design that corrected a limitation of many previous studies in this area: It manipulated self-focus and evaluation apprehension independently, in order to avoid confounding the effects of self-focused attention with those of increased evaluation anxiety. Furthermore, it combined all the variables of interest in the same design, task difficulty, self-relevancy, self-focus and evaluation (Experiment 2) in order to shed light on possible interactions between these factors that affect performance. HR was introduced as an objective measure of arousal and cognitive effort.

Performance facilitation during self-focus was observed in Experiment 1, but the impairment predicted by social facilitation theory and by Easterbrook (1959) during difficult tasks (defined as low frequency words in Experiment 2) did not occur. In fact, some overall facilitation due to self-focus, across stimulus types, was observed in Experiment 2 that did not reach statistical significance. The absence of both task difficulty and self-relevancy interactions with self-focus in Experiment 2 (Fenigstein & Carver, 1978; Higgins et al., 1988; Hull & Levy, 1979) may indicate that processes that take place automatically and hence effortlessly, such as the activation of words within an associative network during the lexical decision task, may not be susceptible to influences by contextual cues such as self-focus and evaluation apprehension, especially when the stimuli to be processed change dynamically within the task: In Experiment 2 stimulus difficulty and stimulus self-relevancy changed on a stimulus-by-stimulus basis, unlike the Stroop task in which words were consistently self-referential or were not (Geller & Shaver, 1976). The increased activation of self-relevant material may become masked when one has to constantly shift between self-relevant and nonrelevant words, and may only become apparent when self-relevancy is altered at the level of the entire task, leading to a corresponding adjustment in the strategic approach of the individual.

Performance facilitation by self-focus could not be attributed in either of the experiments to tonically increased physiological arousal (social facilitation theory), as there was no HR difference between self-focus or evaluation manipulations. However, there was some indication of phasic HR changes tracking self-focus effects on performance, because in Experiment 1 the cell with the worst performance showed the most HR deceleration, whereas in Experiment 2 the most HR acceleration was associated with the self-focused condition that also produced the best performance. Also consistent with this effect, in the second experiment the stimuli responded to more slowly elicited greater HR deceleration from baseline. In addition, greater HR deceleration was observed in the more difficult lexical decision task (Experiment 2), compared to that in Experiment 1. Heart rate deceleration is an indication of orienting to a novel, complex, or significant external stimulus (Graham & Clifton, 1966). In this case, the deceleration probably indicates that participants had to devote more attention to the lexical decision task, and the non-self-descriptive and low frequency adjectives in particular, than to the simple RT or the lexical decisions regarding self-descriptive or high frequency adjectives.

The reduced HR orienting observed in the self-focus and evaluation conditions (Experiment 1) and in the self-focus conditions (Experiment 2) may allude to how participants approached the task: It appears that self-focus (and evaluation in Experiment 1) were perceived as sources of approach motivation, associated with increased arousal or activation as predicted by social facilitation theory. The same arousal might have been experienced as pressure (avoidance motivation) among those who do not expect to succeed, either because of the negative self-evaluations they bring into the situation or because of the high level of difficulty of the task (Baumeister & Showers, 1986; Joiner, Messer, Light, & Littleton, 1998; Kimble & Rezabek, 1992; Lewis & Linder, 1997; Robinson-Staveley & Cooper, 1990) leading to cognitive or behavioral withdrawal as in Carver's cybernetic model (Carver, 1979) . This effect could not be evaluated here because success expectancy was not manipulated (Lewis & Linder, 1997; Sanna & Shotland, 1990) and even the more difficult task of Experiment 2 was apparently relatively easy (e.g., was performed with nearly 90% accuracy, and hence could not be expected to elicit negative success expectancies). Consistent with the view that lexical decision may have also been a relatively easy task is the fact that in Experiment 2 RT was 35 ms *faster* under the self-focus conditions compared to the no self-focus condition, about the same difference as found in Experiment 1.

Overall, the present studies show that our hypothesis that self-focus enhances performance among normal individuals is generally supported by the findings, whereas no evidence is provided in support of performance decline at high levels of task difficulty. It remains for future studies to show exactly how high the level of difficulty needs to be for normal individuals to perceive the presence of self-focus and evaluation conditions as pressure and begin to experience performance failures because of task avoidance motivation.

The absence of differences on the LIF between the self-focus and no self-focus conditions in both experiments may be seen as a limitation of this study, as it can be argued that self-focus was not successfully manipulated. However, the LIF has been found sensitive to self-focus manipulations only when one's sole task is to complete the measure—i.e. when the self is the only salient target of attention. It (and other self-focus measures) have repeatedly failed to indicate self-focus when given in the context of other tasks. In our previous research (Panayiotou & Vrana, 1998) we similarly did not observe LIF differences between self-focus and no self-focus conditions. In the present study, it was given prior to RT task initiation, but after instructions. The effort made to keep the LIF uninfluenced by the cognitive demands of the task may have failed in that participants may have been preoccupied with the upcoming task rather than with the self. This does not mean that the self-focus conditions were ineffective, but that the measure was not sensitive to self-focus in such a complex situation. A more appropriate measure may be to ask participants to what extent they thought about themselves and their performance, as is done by the Focus of Attention Questionnaire (Woody, Chambless, & Glass, 1996).

In sum, this study is in partial support of the hypothesis that self-focused attention enhances performance among normal individuals. Both experiments, to a level of statistical significance in the first study and to a similar but not statistically significant level in Experiment 2, concur that self-focus enhances RT performance, at least when the task is not extremely difficult. The unique contribution of the study is that it was able to examine the effects of self-focus without the confounding effects of evaluation apprehension by manipulating these two processes separately. This is a clear advantage compared to previous efforts to examine the performance effects of self-focus. The study further shows that self-focus and evaluation manipulations have similar effects on task performance (Experiment 1) and performance-related HR measures. This, and other evidence (Panayiotou & Vrana, 1998; Strack, Blaney, Ganellen, & Coyne, 1985) suggest that evaluation apprehension and self-focused attention are part of the same sequence of events involved in self-regulation as described in Carver's model (Carver, 1979) that helps in the performance of easy tasks, but may hinder performance of difficult tasks depending on one's success expectations (Panayiotou, in press).

One limitation of the study is that sample sizes were relatively small. This was partially compensated for by collapsing the two self-focus conditions into one. Furthermore, the attempt to manipulate task difficulty and word self-relevancy on a stimulus-by-stimulus basis may not have allowed self-focus to affect these task dimensions. This should provide an impetus for future research to develop equivalent tasks that only vary in the above two dimensions, in order to examine their interactions with self-focus. One additional direction for future research is to directly assess success expectancies and how these relate to effort and motivation or withdrawal from a task during self-focus conditions by examining the thought content of participants during task performance. This may prove crucial to anyone attempting to build models that explain how specific circumstances, such as the presence of self-focus, lead to either impaired performance among those who are socially anxious or improved performance among normal individuals.

REFERENCES

Ackerman, P. L., & Woltz, D. J. (1995). Determinants of learning and performance in an associative memory/substitution task: Task constraints, individual differences, volition, and motivation. *Journal of Educational Psychology*, *86,* 487–515.

Alden, L. E., Teschuk, M., & Tee, K. (1992). Public self-awareness and withdrawal from social interactions. *Cognitive Therapy and Research*, *16,* 249–267.

Baumeister, R. F., & Showers, C. J. (1986). A review of paradoxical performance effects: Choking under pressure in sports and mental tests. *European Journal of Social Psychology*, *16,* 361–383.

Bell, P. A., Loomis, R. J., & Cervone, J. C. (1982). Effects of heat, social facilitation, sex differences, and task difficulty on reaction time. *Human-Factors*, *24,* 19–24.

Bohlin, G., & Kjellberg, A. (1979). Orienting activity in two-stimulus paradigms as reflected in heart rate. In H. Kimmel, G. van Olst, & J. Orlebeke (Eds.), *The orienting response in humans* (pp. 169–197). New York: Erlbaum.

Brockner, J. (1979a). The effects of self-esteem, success failure, and self-consciousness on task performance. *Journal of Personality and Social Psychology*, *37,* 1732–1741.

Brockner, J. (1979b). Self-esteem, self-consciousness, and task performance: Replications, extensions and possible explanations. *Journal of Personality and Social Psychology*, *37,* 447–461.

Burgio, K. L., Merluzzi, T. V., & Pryor, J. B. (1986). Effects of performance expectancy and self-focused attention on social interaction. *Journal of Personality and Social Psychology*, *50,* 1216–1221.

Cacioppo, J. T., & Sandman, C. A. (1978). Physiological differentiation of sensory and cognitive tasks as a function of warning, processing demands, and reported unpleasantness. *Biological Psychology*, *11,* 510–519.

Carver, C. S. (1979). A cybernetic model of self-attention processes. *Journal of Personality and Social Psychology*, *37,* 1251–1280.

Carver, C. S., Peterson, L. M., Follansbee, D. J., & Scheier, M. F. (1983). Effects of self-directed attention on performance and persistence among persons high and low in test anxiety. *Cognitive Therapy and Research*, *7,* 333–353.

Carver, C. S., & Scheier, M. F. (1978). Self-focusing effects of dispositional self-consciousness, mirror presence, and audience presence. *Journal of Personality and Social Psychology*, *36,* 324–332.

Davidson, R., & Henderson, R. (2000). Electronic performance monitoring: A laboratory investigation of the influence of monitoring and difficulty on task performance, mood state, and self-reported stress levels. *Journal of Applied Social Psychology*, *30,* 906–920.

Dollinger, S. J., Greening, L., & Lloyd, K. (1987). The "mirror" and the "mask": Self-focused attention, evaluation anxiety, and the recognition of psychological implications. *Bulletin of the Psychonomic Society*, *25,* 167–170.

Duval, S., Duval, V. H., & Mulilis, J. P. (1992). Effects of self-focus, discrepancy between self and standard, and outcome expectancy favorability on the tendency to match self to standard or to withdraw. *Journal of Personality and Social Psychology*, *62,* 340–348.

Duval, S., & Wicklund, R. A. (1972). *A theory of objective self-awareness*. New York: Academic Press.
Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, *66,* 183–201.
Eysenck, M. W. (1991). Anxiety and attention. In R. Schwarzer & R. Wicklund (Eds.), *Anxiety and self-focused attention* (pp. 125–131). London: Harwood Academic.
Fenigstein, A., & Carver, C. S. (1978). Self-focusing effects of heartbeat feedback. *Journal of Personality and Social Psychology*, *36,* 1241–1250.
Ferrari, J. R. (2001). Procrastination as self-regulation failure of performance: Effects of cognitive load, self-awareness, and time limits on "working best under pressure." *European Journal of Personality*, *5,* 391–406.
Ferreira, R., & Murray, J. (1983). Spielberger's State-Trait Anxiety Inventory: Measuring anxiety with and without an audience during performance on a stabilometer. *Perceptual-and-Motor-Skills*, *57,* 15–18.
Ferris, G. R., & Rowland, K. M. (1983). Social facilitation effects on behavioral and perceptual task performance measures: Implications for work behavior. *Group and Organization Studies*, *8,* 421–438.
Flett, G. L., Blankstein, K. R., & Boase, P. (1987). Self-focused attention in test anxiety and depression. *Journal of Social Behavior and Personality*, *2,* 259–266.
Geller, V., & Shaver, P. (1976). Cognitive consequences of self-awareness. *Journal of Experimental Social Psychology*, *12,* 99–108.
Good, K. J. (1973). Social facilitation: Effects of performance anticipation, evaluation, and response competition on free associations. *Journal of Personality and Social Psychology*, *28,* 270–275.
Graham, F. K. (1978). Constraints on measuring heart rate and period sequentially through real and cardiac time. *Psychophysiology*, *15,* 492–495.
Graham, F. K., & Clifton, R. K. (1966). Heart rate change as a component of the orienting response. *Psychological Bulletin*, *65,* 305–320.
Green, M. W., & McKenna, F. P. (1996). Self-focused attention and the processing of threat-related information. *European Journal of Social Psychology*, *26,* 1007–1010.
Higgins, E. T., Van Hook, E., & Dorfman, D. (1988). Do self-attributes form a cognitive structure? *Social Cognition*, *6,* 177–206.
Hope, D. A., Gansler, D. A., & Heimberg, R. G. (1989). Attentional focus and causal attributions in social phobia: Implications from social psychology. *Clinical Psychology Review*, *9,* 49–60.
Huguet, P., Galvaing, M. P., Monteil, J. M., & Dumas, F. (1999). Social presence effects in the Stroop Task: Further evidence for an attentional view of social facilitation. *Journal of Personality and Social Psychology*, *77,* 1011–1025.
Hull, J. G., & Levy, A. S. (1979). The organizational functions of the self: An alternative to the Duval and Wicklund Model of self-awareness. *Journal of Personality and Social Psychology*, *37,* 756–768.
Ingram, R. E. (1990). Self-focused attention in clinical disorders: Review and a conceptual model. *Psychological Bulletin*, *107,* 156–176.
Joiner, R., Messer, D., Light, P., & Littleton, K. (1998). The effects of gender, expectations of success and social comparison on children's performance on a computer-based task. *Educational Psychology*, *18,* 319–326.
Kassin, S. M. (1984). TV cameras, public self-consciousness, and mock juror performance. *Journal of Experimental Social Psychology*, *20,* 336–349.
Kimble, C. E., & Rezabek, J. S. (1992). Playing games before an audience: Social facilitation or choking. *Social Behavior and Personality*, *20,* 115–120.
Kucera, H., & Francis, W. N. (1967). *Computational analysis of present-day American English*. Providence, RI: Brown University Press.
Kurosawa, K., & Harackiewicz, J. M. (1995). Test anxiety, self-awareness, and cognitive interference: A process analysis. *Journal of Personality*, *63,* 931–951.
Kreuz, R. J. (1987). The subjective familiarity of English homophones. *Memory and Cognition*, *15,* 154–168.

Krohne, H. W., Pieper, M., Knoll, N., & Breimer, N. (2002). The cognitive regulation of emotions: The role of success versus failure experience and coping dispositions. *Cognition and Emotion*, *16,* 217–243.

Lewis, B. P., & Linder, D. E. (1997). Thinking about choking? Attentional processes and paradoxical performance. *Personality and Social Psychology Bulletin*, *23,* 937–944.

Liebling, B. A., & Shaver, P. (1973). Evaluation, self-awareness, and task performance. *Journal of Experimental Social Psychology*, *9,* 297–306.

McCullagh, P. D., & Landers, D. M. (1976). Size of audience and social facilitation. *Perceptual and Motor Skills*, *42,* 1067–1070.

Mussweiler, T., & Ruter, K. (2003). What friends are for! The use of routine standards in social comparison. *Journal of Personality and Social Psychology*, *85,* 467–481.

Nasby, W. (1985). Private self-consciousness articulation of the self-schema, and recognition memory of trait adjectives. *Journal of Personality and Social Psychology*, *49,* 704–709.

Paap, K. R., & Johansen, L. S. (1994). The case of the vanishing frequency effect: A retest of the verification model. *Journal of Experimental Psychology Human Perception and Performance*, *20,* 1129–1157

Panayiotou, G. (in press). Performance effects of self-focused attention among evaluatively anxious and normal individuals: A review of the literature. *Psychology: The Journal of the Hellenic Psychological Society.*

Panayiotou, G., & Vrana, S. R. (1998). Effect of self-focus attention on the startle reflex, heart rate and memory performance among socially anxious and nonanxious individuals. *Psychophysiology*, *35,* 1–9.

Paulus, P. B., Annis, A. B., & Risner, H. T. (1978). An analysis of the mirror-induced objectively self-awareness effect. *Bulletin of the Psychonomic Society*, *12,* 8–10.

Posner, M. I. (1978). *Chronometric explorations of mind*. Hillsdale, NJ: Erlbaum.

Rich, A. R., & Woolever, D. K. (1988). Expectancy and self-focused attention: Experimental support for the self-regulation model of test anxiety. *Journal of Social and Clinical Psychology*, *7,* 246–259.

Robinson-Staveley, K., & Cooper, J. (1990). Mere presence, gender, and reactions to computers: Studying human–computer interaction in the social context. *Journal of Experimental Social Psychology*, *26,* 168–183.

Ross, D. F., & Pihl, R. O. (1988). Alcohol, self-focus, and complex reaction-time performance. *Journal of Studies on Alcohol*, *49,* 115–125.

Sanna, L. J., & Shotland, R. L. (1990).Valence of anticipated evaluation and social facilitation. *Journal of Experimental Social Psychology*, *26,* 82–92.

Schmitt, B. H., Gilovich, T., Goore, N., & Joseph, L. (1986). Mere presence and social facilitation: One more time. *Journal of Experimental Social Psychology*, *22,* 242–248.

Simes, R. J. (1986). An improved Bonferroni procedure for multiple test of significance. *Biometrica*, *73,* 751–754.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. D. (1970). *STAI: Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Strack, S., Blaney, P. H., Ganellen, R. J., & Coyne, J. C. (1985). Pessimistic self-preoccupation, performance deficits and depression. *Journal of Personality and Social Psychology*, *49,* 1076–1085.

Szymanski, K., Garczynski, J., & Harkins, S. (2000). The contribution of the potential for evaluation to coaction effects. *Group Processes and Intergroup Relations*, *3,* 269–283.

Turner, R. G. (1980). Self-consciousness and memory of trait terms. *Personality and Social Psychology Bulletin*, *6,* 273–277.

Waley, C. P. (1978). Word-nonword classification time. *Journal of Verbal Learning and Verbal Behavior*, *17,* 143–154.

Wegner, D. M., & Guiliano, T. (1983). On sending artifact in research of artifact: Reply to McDonald, Harris, and Maher. *Journal of Personality and Social Psychology*, *44,* 290–293.

Wicklund, R. A., & Hormuth, S. E. (1981). On the functions of the self: A reply to Hull and Levy. *Journal of Personality and Social Psychology*, *40,* 1029–1037.

Woody, S. R. (1996). Effects of focus of attention on anxiety levels and social performance of individuals with social phobia. *Journal of Abnormal Psychology*, *105,* 61–69.

Woody, S. R., Chambless, C. R., & Glass, C. R. (1996). Self-focused attention in the treatment of social phobia. *Behavior Research and Therapy*, *35,* 117–129.

Woody, S. R., & Rodriguez, B. F. (2000). Self-focused attention and social anxiety in social phobics and normal controls. *Cognitive Therapy and Research*, *24,* 473–488.

Zajonc, R. B. (1965). Social facilitation. *Science*, *149,* 269–274.

Zimmer, H., Vossel, G., & Froelich, W. D. (1990). Individual differences in resting heart rate and spontaneous electrodermal activity as predictors of attentional processes: Effects on anticipatory heart rate deceleration and task performance. *International Journal of Psychophysiology*, *8,* 249–259.