Personality and Individual Differences 45 (2008) 515–520

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

The effects of negative reflection for defensive pessimists: Dissipation or harnessing of threat?

Mark D. Seery [a,*], Tessa V. West [b], Max Weisbuch [c], Jim Blascovich [d]

[a] Department of Psychology, University at Buffalo, The State University of New York, Park Hall, Buffalo, NY 14260-4110, United States
[b] New York University, United States
[c] Tufts University, United States
[d] University of California, Santa Barbara, United States

ARTICLE INFO

Article history:
Received 1 April 2008
Received in revised form 2 June 2008
Accepted 6 June 2008
Available online 14 July 2008

Keywords:
Defensive pessimism
Challenge and threat
Motivational states
Performance
Strategy
Cardiovascular reactivity

ABSTRACT

Previous research has demonstrated that defensive pessimists perform best when allowed to think about negative outcomes prior to performance. Two competing hypotheses could account for this phenomenon: negative states dissipate or are harnessed. Existing findings have not directly tested defensive pessimists' experience *during* performance, which is critical for resolving the issue. To this end, cardiovascular markers of challenge/threat motivational states were assessed while defensive pessimists and controls completed a test. Before the test, participants were randomly assigned to one of three imagery conditions (positive, negative, or relaxation). Unlike control participants, defensive pessimists exhibited the greatest threat—a negative state—in the negative imagery condition and utilized a more conservative test-taking strategy, thus supporting the harnessing hypothesis. The implications for understanding the relationships between defensive pessimism, motivation, and performance are discussed.

1. Introduction

1.1. Defensive pessimism

Self-reflection plays a complex and sometimes paradoxical role in task performance. For example, worrying about an upcoming exam may be effective for some students, but ineffective or even counterproductive for others. Norem and Cantor (1986) theorized that *defensive pessimists* have acquired a strategy of focusing on potential negative outcomes for upcoming tasks, performing best when given the opportunity to consider worst-case scenarios and low-probability negative outcomes (Norem & Illingworth, 1993).

Research supports the hypothesis that defensive pessimists perform best after thinking about negative outcomes (Norem & Illingworth, 1993; Showers, 1992; Spencer & Norem, 1996). For example, Spencer and Norem (1996) randomly assigned defensive pessimists and optimists to one of three guided imagery conditions prior to a dart-throwing task. Participants were instructed either to imagine possible negative outcomes (negative imagery condition), a flawless performance (positive imagery condition), or irrelevant but relaxed situations (e.g., lying on a beach; relaxation condition). Defensive pessimists achieved the highest dart score in the negative imagery condition.

Two competing possibilities have emerged to explain such performance differences: (1) the *dissipation hypothesis* and (2) the *harnessing hypothesis* (see Norem, 2001). According to the dissipation hypothesis, defensive pessimists' ruminations dissipate negative affective states at the initiation of performance. By imagining the worst-case scenarios, defensive pessimists may then find that the actual performance is, by comparison, not as onerous. Their initial worry, anxiety, and general negative affect then dissipate once performance begins. Because negative affect during performance can be disruptive (Brown & Marshall, 2001; Elliot & McGregor, 1999; Smith, Arnkoff, & Wright, 1990), this dissipation helps defensive pessimists avoid distraction and thus facilitates higher quality of performance.

In contrast, the harnessing hypothesis suggests that defensive pessimists experience especially high levels of negative affect after negative reflection. According to this hypothesis, negative affect facilitates preparatory effort and helps defensive pessimists focus on optimal strategies and behavioral choices during performance. This hypothesis is consistent with prior work on the pragmatic utility of negative affective states (e.g., Parrott, 2002; Tamir, 2005). Tamir (2005), for example, found that neurotic individuals indicate preferences for worry in cognitively demanding situations, and perform especially well when instructed to write about a worrisome event prior to task performance. Defensive pessimists may similarly thrive on anxiety. Indeed, negatively focused defensive pessimists tend to report more anxiety than others during test

* Corresponding author. Tel.: +1 716 645 0239; fax: +1 716 645 3801.
E-mail address: mdseery@buffalo.edu (M.D. Seery).

0191-8869/$ - see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.paid.2008.06.004

preparation *and* in retrospect (Cantor & Norem, 1989; Showers, 1992), suggesting that their anxiety fails to dissipate.

1.2. Biopsychosocial model of challenge and threat

Novel insight into these competing hypotheses can be gleaned by measuring defensive pessimists' physiological responses. Unlike self-reports, physiological responses do not depend on participants' conscious attention and can thus be assessed *during* performance of a task, making it possible to directly test the hypotheses. The biopsychosocial model of challenge and threat (Blascovich, 2008; Blascovich & Tomaka, 1996) provides a theoretically based framework for such assessment. In the context of motivated performance situations—characterized by active striving to reach a self-relevant goal—the model holds that cardiovascular responses reliably index the motivational states of challenge and threat. *Challenge* results from evaluating personal resources as meeting or exceeding situational demands, whereas *threat* results from evaluating situational demands as exceeding personal resources. Challenge and threat represent the endpoints of a single continuous bipolar dimension, such that relative differences between groups (e.g., greater vs. lesser threat) are meaningful.

The work of Dienstbier (1989) provides the basis for physiological markers of challenge/threat. Dienstbier argued that the body mobilizes energy in preparation for performance via activation of the sympathetic-adrenomedullary (SAM) and hypothalamo–pituitary–adrenocortical (HPA or PAC) axes. Whereas SAM activation allows for a fast spike of energy mobilization, HPA activation yields a prolonged response. According to Dienstbier, "toughened" individuals exhibit a fast onset and offset of SAM activation in response to most stressors. Toughness and SAM activation—relative to lack of toughness and HPA activation—are in turn associated with favorable outcomes, including better task performance, lower anxiety, and improved immune function.

Patterns of four cardiovascular responses that are sensitive to SAM and HPA activation have been validated as markers of challenge/threat (for reviews, see Blascovich & Seery, 2007; Blascovich & Tomaka, 1996) and have been successfully employed in dozens of studies examining the motivational underpinnings of various psychological processes, including religious belief systems (Weisbuch-Remington, Mendes, Seery, & Blascovich, 2005), stereotype threat (Vick, Seery, Blascovich, & Weisbuch, 2008), and self-esteem (Seery, Blascovich, Weisbuch, & Vick, 2004). These patterns incorporate heart rate (HR); ventricular contractility (VC), an index of the contractile force of the left ventricle; cardiac output (CO), a measure of the amount of blood pumped from the heart in liters per minute; and total peripheral resistance (TPR), a measure of the net constriction versus dilation of the arteries. During challenge, SAM activation causes increases in HR and VC from resting baseline, as well as dilation of the peripheral arteries (decrease in TPR), which accommodates an increase in blood flow (increase in CO). During threat, SAM activation also results in increases in HR and VC, but HPA activation inhibits the effects of SAM activation on vasodilation and blood flow, yielding an increase in TPR and no change or a decrease in CO. Thus, both challenge and threat are marked by increases in HR and VC, but challenge is marked by relatively higher CO and lower TPR than threat.

1.3. Defensive pessimism, challenge/threat, and performance

Both the dissipation and harnessing hypotheses emphasize the influence of negative reflection on anxiety, worry, and general negative affect for defensive pessimists. Although anxiety is not synonymous with threat, a motivated performance situation that engenders anxiety is likely to be one in which evaluated demands outweigh resources, yielding threat. Thus, the cardiovascular markers of challenge/threat are particularly well suited for differentiating the two hypotheses during performance. According to the dissipation hypothesis, thinking about possible negative outcomes reduces anxiety for defensive pessimists, which should result in cardiovascular responses consistent with lower threat (greater challenge), relative to control conditions. In contrast, according to the harnessing hypothesis, negative reflection increases defensive pessimists' anxiety, which should result in greater threat.

Consistent with prior research (e.g., Spencer & Norem, 1996), the current study provided no opportunity for tangible task preparation (e.g., studying), thereby isolating the proximal impact of negative reflection on performance. Assessing performance itself is more nuanced than it may first appear, especially with the timed performance tasks used in previous research (Norem & Illingworth, 1993; Spencer & Norem, 1996) and here. On such tasks, the number of correctly answered items should be a function of both (1) the individual's ability to perform components of the task (influenced by factors such as distraction and task difficulty), and (2) the strategy the individual uses to manage the speed/accuracy trade-off (e.g., deciding how much time to devote to each of multiple items or attempts). Favoring speed over accuracy should result in a higher number of mistakes or guesses (depending on the nature of the task) than favoring accuracy over speed. Both strategies could potentially lead to equivalently high total scores, so considering the number of correct answers or hits relative to the number of total attempts should provide more insight into the individual's strategy than will the number of correct answers alone.

Both the dissipation and harnessing hypotheses predict that defensive pessimists perform better after negative reflection, but via different mechanisms. The dissipation hypothesis suggests that lower anxiety after negative reflection should remove a potential distraction during performance, thereby enhancing *ability* to perform individual elements of the task. In contrast, with no opportunity to better prepare for an upcoming task, the harnessing hypothesis suggests that greater anxiety enhances task *strategy* (i.e., effectively managing the speed/accuracy trade-off). This could occur, for example, by motivating defensive pessimists to invest more time and care into each attempt, thereby maximizing accuracy. In the context of a performance with no time limit, this type of strategy should be largely irrelevant, but when a time constraint is introduced to the task, strategy should potentially contribute to overall task performance.

With regard to predictions for challenge/threat, Blascovich, Seery, Mugridge, Norris, and Weisbuch (2004) demonstrated that challenge predicted better baseball and softball batting performance outside the laboratory, relative to threat. This dimension of athletic performance is not subject to a time limit, which suggests the observed association between challenge and performance should reflect enhanced task ability rather than task strategy. This leaves open the possibility that threat could predict enhanced task strategy in the proper contexts. This is also consistent with the conceptualization of threat as reflecting elements of a vigilance response (e.g., Hunter, 2001), which could help to enhance certain task strategies.

Hence, defensive pessimists may exhibit greater threat after negative reflection (relative to other conditions) and enhanced task strategy rather than task ability, a scenario consistent with the harnessing hypothesis. Conversely, defensive pessimists could exhibit greater challenge after negative reflection and enhanced task ability, a scenario consistent with the dissipation hypothesis. According to both hypotheses, these patterns of results should hold only for defensive pessimists, not others. In addition, both hypotheses suggest that challenge/threat could mediate the effects of negative reflection on performance.

To pit the hypotheses against one another, we implemented a 2 (defensive pessimists vs. controls) × 3 (positive vs. negative vs. relaxation imagery condition) between-subjects design. The positive imagery condition was included to replicate the design of Spencer and Norem (1996), but consistent with their approach, our primary comparisons of interest were between the negative and relaxation conditions. Dependent variables consisted of cardiovascular markers of challenge/threat and task performance measures sensitive to ability versus strategy.

2. Method

2.1. Participants

Potential participants ($N = 677$) completed Norem and Cantor (1986) Academic Defensive Pessimism Scale (ADPS) as part of a battery of measures administered during a prescreening session. From this pool, 58 undergraduates (27 defensive pessimists, 31 controls; 35 women, 23 men) were selected (see below) to participate in the experiment in exchange for course credit.

2.2. Academic defensive pessimism scale

Norem and Cantor (1986) ADPS yielded defensive pessimism scores based on agreement with 9 items using 7-point, Likert-type response scales (e.g. "I go into academic situations expecting the worst, even though I know I will probably do OK," and "I often think about what it will be like if I do very poorly in an academic situation."). As in previous studies (e.g., Norem, 2001; Norem & Illingworth, 1993; Spencer & Norem, 1996; Yamawaki, Tschanz, & Feick, 2004), a tertiary split of the ADPS scale scores was created. Based on Spencer and Norem (1996) strategy, we excluded individuals who fell in the middle third of the distribution, because such individuals have been found to be heterogeneous (for a more comprehensive explanation, see Spencer & Norem, 1996). Those who scored in the bottom third of the distribution of defensive pessimism items (i.e., endorsed these items the most) were considered defensive pessimists, and those in the top third were considered controls (i.e., those who did not endorse a defensive pessimist strategy). The scale was acceptably reliable ($\alpha = .76$). The items designed to measure optimism were not acceptably reliable, and therefore were not used (for a similar strategy, see Yamawaki et al., 2004). Our controls were thus not defensive pessimists, but not necessarily optimists.

As in previous research (e.g., Norem & Cantor, 1986), we only selected individuals who scored a 5 or higher (on a 7-point scale) on an item that assessed past academic success. We thus excluded "realistic" pessimists (i.e., those whose negative expectations were justified by poor performance in the academic domain).

2.3. Imagery manipulation

We randomly assigned participants to one of three imagery conditions (based on the stimulus audiotapes from Spencer & Norem, 1996). In all conditions, participants were presented four short scenarios and asked to "briefly discuss what the experience would be like and what would happen" in writing. The negative imagery condition was designed so that participants would imagine and elaborate on worst-case scenarios (e.g., "You freeze up and are unable to think of a response for any of the questions."). In contrast, the positive imagery condition was designed so that participants would imagine and elaborate on favorable scenarios (e.g., "You remain calm throughout the experiment, and are able to think of a response for every question."). Finally, the relaxation condition instructed participants to think of relaxing events unrelated to the task (e.g., "You settle down in a comfortable chair to read your favorite book.").

2.4. Remote associates test (RAT)

The performance task involved a version of the RAT adopted from McFarlin and Blascovich (1984). Participants were instructed to generate a single word that linked three other words (e.g., "ball" was the correct response to "base, snow, dance"). The RAT version used here was described as a "test of reasoning ability" and consisted of 12 items presented serially on a computer. Participants had 15 s to answer each item aloud, although a response was not required. After 15 s, the program automatically advanced to the next item. If participants answered in less than 15 s, they could manually (via the keyboard) advance to the next item. Consistent with other insight problems, correct answers on the RAT seem obvious once they are discovered (Bowden, Jung-Beeman, Fleck, & Kounios, 2005). This is particularly important in the present context because not only does the RAT allow assessment of performance quality (i.e., number of items answered correctly), it also provides insight into test-taking strategy. Given that test-takers know when they have answered an item correctly, incorrect attempts represent guesses. Thus, the percentage of attempts answered correctly reveals test-takers' likelihood of guessing during the time-limited task.

2.5. Physiological measurement

Cardiac and hemodynamic measures were recorded noninvasively using equipment meeting commercial and hospital safety standards and following guidelines established by the Society for Psychological Research (e.g., Sherwood et al., 1990). Detailed descriptions of these measures and the method used in applying them can be found in previously published challenge/threat studies (e.g., Seery et al., 2004).

2.6. Procedure

Participants completed the study individually. After the experimenter applied physiological recording sensors, participants sat in an upholstered chair with a tray and closed manila envelope (containing the imagery manipulation questionnaire) across their laps. A 5-min baseline recording period began once the experimenter left the room, during which time physiological responses were recorded.

Next, participants heard audiotaped instructions explaining the rules of the RAT, along with two sample items. Immediately following these instructions, participants were instructed to open the manila envelope and provide written responses to the four scenarios that constituted the imagery manipulation. Next, participants were given 3 min to complete the RAT, during which time physiological responses were recorded. After the completion of the test, the experimenter removed sensors from participants and debriefed them.

3. Results

3.1. Performance

Participants attempted a mean of 9.15 items ($SD = 1.59$) out of 12 and answered a mean of 8.21 ($SD = 1.66$) correctly. Separate 2 (defensive pessimism vs. control) by 3 (positive vs. negative vs. relaxation imagery condition) ANOVAs failed to yield significant interactions for attempts, $F(2, 52) = 2.37$, $p = .10$, or correct answers, $F(2, 52) = 1.98$, $p = .15$. However, a significant interaction

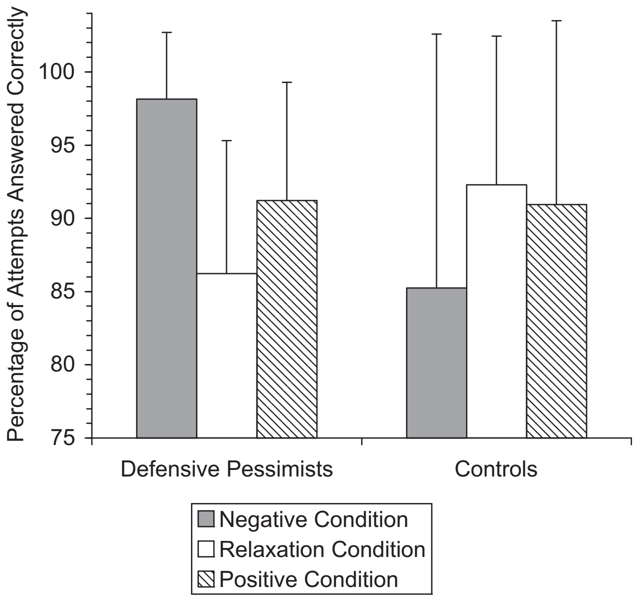

Fig. 1. Percentage of attempted items answered correctly as a function of defensive pessimism and imagery condition. Error bars represent standard deviations.

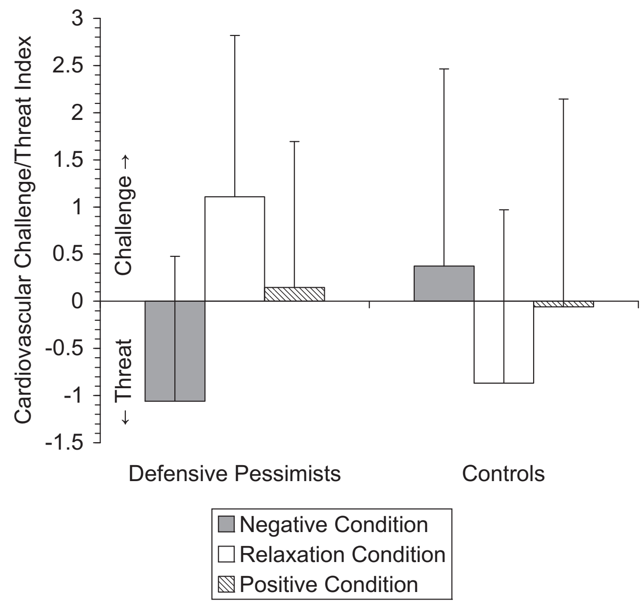

Fig. 2. Cardiovascular challenge/threat index score as a function of defensive pessimism and imagery condition. Higher values are consistent with greater relative challenge and lower values are consistent with greater relative threat. Error bars represent standard deviations.

did emerge for the percentage of attempted items answered correctly ($M = 90.03$, $SD = 11.68$), $F(2, 52) = 3.17$, $p < .05$ (see Fig. 1), an indication of guessing strategy. No main effects for percentage correct were significant. A planned contrast revealed that defensive pessimists answered a higher percentage of attempted items correctly in the negative imagery condition than in the relaxation condition, $F(1, 52) = 4.02$, $p = .05$, $d = 1.04$. The same comparison was in the opposite direction and nonsignificant for controls, $F(1, 52) = 2.25$, $p = .14$, $d = 0.61$. Defensive pessimists in the positive condition did not differ significantly from either of the other two conditions, $F\text{s} < 1.42$.

As an alternative measure of guessing behavior, a dichotomous variable was calculated that represented whether or not participants guessed *at all* during the task (guessing: percentage correct <100%). In this and subsequent regression analyses, two dummy-coded variables corresponded to imagery condition, with the relaxation condition as the reference group. When condition was used to predict the dichotomous guessing variable in a logistic regression among defensive pessimists, participants in the negative condition were significantly less likely to have guessed on at least one test item (16.67% guessed at least once) than those in the relaxation condition (80.00% guessed at least once), $z = -2.22$, $p < .05$, odds ratio = 0.05.

3.2. Challenge/threat

Cardiovascular reactivity values were calculated by taking the value from the last minute of the baseline period and subtracting it from the value obtained during the first task minute (see Llabre, Spitzer, Saab, Ironson, & Schneiderman, 1991, for a psychometric justification for the use of change scores in psychophysiology). Univariate outliers (values more than three standard deviation units from the grand mean) were winsorized by changing the deviant raw score to a value one unit larger or smaller than the next most extreme score.

Increases in HR and VC are common to both challenge and threat. Therefore, *t* tests were conducted to confirm that participants' HR and VC increased significantly from baseline. Testing sample means of HR ($M = 6.35$, $SD = 6.49$) and VC reactivity ($M = 5.45$, $SD = 6.96$) against zero revealed significant increases, $t(57) = 7.44$, $p < .001$, and $t(57) = 5.96$, $p < .001$, respectively.

Because CO and TPR are best viewed as two related measures of underlying SAM versus HPA activation, we calculated a single index ($M = 0$, $SD = 1.90$) by converting each participant's CO and TPR reactivity values ($r = -.81$) into z-scores and summing them. As in prior research (Blascovich et al., 2004), we assigned CO a weight of +1 and TPR a weight of −1, such that a larger value corresponded to greater challenge. An ANOVA yielded only a significant interaction between defensive pessimism and imagery condition, $F(1,52) = 4.00$, $p < .05$ (see Fig. 2). A planned contrast revealed that defensive pessimists exhibited cardiovascular changes consistent with greater threat in the negative imagery condition than in the relaxation condition, $F(1, 52) = 5.19$, $p < .05$, $d = 1.18$. The same comparison was in the opposite direction and nonsignificant for controls, $F(1, 52) = 2.73$, $p = .10$, $d = 0.67$.

3.3. Mediational analysis

Mediational analysis tested whether challenge/threat accounted for the observed performance (% correct) differences among defensive pessimists in the negative versus relaxation imagery conditions. Consistent with the four steps of mediation outlined by Baron and Kenny (1986), we found that for defensive pessimists, (1) the direct effect of imagery condition (negative vs. relaxation) on the challenge/threat index was significant, $\beta = -.52$, $p < .05$, and (2) and the total effect of imagery condition on percentage correct was also significant, $\beta = .57$, $p < .01$. Consistent with partial mediation, (3) the total effect of the challenge/threat index on percentage correct (i.e, the effect of the challenge/threat index controlling for the effect of imagery condition) was significant, $\beta = -.45$, $p < .05$, such that greater threat was associated with higher percentage of attempted items answered correctly, (4) whereas imagery condition no longer significantly predicted percentage correct, $\beta = .33$, $p = .11$. To test the significance of the indirect effect (equivalent to the decrease in magnitude of the effect of imagery condition on percentage correct between steps 2 and 4), we calculated confidence intervals with a bootstrap method. This provides a more powerful alternative to the Sobel test when mediation is tested with small sample sizes (Shrout & Bolger, 2002). The test of the indirect effect was statistically significant, $\beta = .24$, $p < .05$ (95% bias-corrected CI: .030, .608), indicating that controlling for the challenge/threat index significantly decreased the effect of imagery condition on percentage correct.

4. Discussion

The results of this study supported the harnessing hypothesis over the dissipation hypothesis. After imagining possible negative outcomes—relative to a relaxation condition—defensive pessimists exhibited cardiovascular responses consistent with greater threat rather than greater challenge. This suggests that their worry and anxiety likely increased rather than decreased as a result of the negative imagery. Furthermore, defensive pessimists were less likely to guess after negative imagery than relaxation imagery, with no other performance effects reaching significance. This is more consistent with an effect on task strategy than on ability to perform the task. Cohen's *d*s for planned contrasts were above 0.8, corresponding to large effect sizes (Cohen, 1988). Finally, the cardiovascular markers of threat partially mediated the relationship between imagery condition and performance behavior. This correlational analysis does not demonstrate causation, but it is consistent with the harnessing hypothesis's argument that the experience of anxiety and threat motivates defensive pessimists to adopt specific performance strategies. Importantly, these findings only emerged for defensive pessimists, not controls.

Several aspects of the current investigation add novel insight to the existing body of research. Applying cardiovascular methods made it possible to assess defensive pessimists' responses *during* performance, rather than only before and after. The nature of the task highlighted the effects of negative reflection on task strategies, rather than only on performance outcome (e.g., total score). As was true in Norem and Illingworth (1993) arithmetic task and Spencer and Norem (1996) dart-throwing task, the task was time-limited, and participants had no opportunity to prepare for the task before it began, eliminating any such influence on the quality of task performance. However, because RAT items are insight problems in which the correct answer seems obvious when it is discovered, the task in this study was particularly well-suited for assessing guessing behavior.

The current findings suggest that negative reflection induces defensive pessimists to perform tasks in a particular manner. The real-world performance success of defensive pessimists may partially be due to negative reflection motivating task preparation, such as studying for an upcoming exam. However, when preparation isn't possible, such as when caught by surprise by a pop quiz or exam questions that cover unexpected material, it seems unlikely that a single task strategy would always be optimal. A conservative strategy that favors accuracy over speed (e.g., minimizing guessing and providing answers only when relatively confident in them) may sometimes but not always lead to superior performance outcomes, which should depend on the specifics of the task.

Future research could address this issue by presenting defensive pessimists with different types of tasks that are designed to be well versus poorly suited for various points along the continuum of speed/accuracy trade-off. This could help establish precisely how and when negative reflection enhances performance for defensive pessimists. The level of trade-off that results in optimal performance may differ within the range of tasks used in this study and previous research: creative generation of conceptual relationships (the current study), arithmetic calculations (Norem & Illingworth, 1993), and dart throws (Spencer & Norem, 1996).

Other tasks and domains may also be characterized in terms of trade-offs relevant for performance. For example, optimal performance in a foot race may require a comparable trade-off between pushing oneself early in the race versus saving energy for a burst at the finish. Indeed, Wilson, Raglin, and Pritchard (2002) found that despite reporting higher anxiety than others, college athletes who were defensive pessimists performed well in track and field competition. In the future, testing a variety of tasks that require different forms of strategic trade-offs could further delineate the relationship between defensive pessimism and performance.

A final implication of the current results involves the relationship between defensive pessimism and health. Imagining worst-case scenarios and low probability negative outcomes—the very strategy that defensive pessimists often rely on in the face of an impending performance—may entail unanticipated long-term costs. Threat is marked by an increase in HPA activation, which can have deleterious health consequences (Blascovich, 2008; Dienstbier, 1989). If negative reflection leads to threat across situations for defensive pessimists, mental and physical health problems could develop over time. Hence, the study of defensive pessimism has particularly weighty ramifications: not only is defensive pessimism relevant for the quality of task performance in important domains, it also may affect health itself.

References

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.

Blascovich, J. (2008). Challenge and threat. In A. J. Elliot (Ed.), Handbook of approach and avoidance motivation. Mahwah, NJ: Lawrence Erlbaum Associates, in press.

Blascovich, J. (2008). Challenge, threat, and health. In J. Y. Shah & W. L. Gardner (Eds.), *Handbook of motivation science* (pp. 481–493). New York: Guilford.

Blascovich, J., & Seery, M. D. (2007). Visceral and somatic indexes of social psychological constructs: History, principles, propositions, and case studies. In A. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (pp. 19–38). New York: Guilford.

Blascovich, J., Seery, M. D., Mugridge, C. A., Norris, R. K., & Weisbuch, M. D. (2004). Predicting athletic performance from cardiovascular indexes of challenge and threat. *Journal of Experimental Social Psychology*, 683–688.

Blascovich, J., & Tomaka, J. (1996). The biopsychosocial model of arousal regulation. *Advances in Experimental Social Psychology, 28*, 1–51.

Bowden, E. M., Jung-Beeman, M., Fleck, J., & Kounios, J. (2005). New approaches to demystifying insight. *Trends in Cognitive Sciences, 9*, 322–328.

Brown, J. D., & Marshall, M. A. (2001). Great expectations: Optimism and pessimism in achievement settings. In E. C. Chang (Ed.). *Optimism and pessimism: Implications for theory, research, and practice* (pp. 239–255). Washington, DC: American Psychological Association.

Cantor, N., & Norem, J. K. (1989). Defensive pessimism and stress and coping. *Social Cognition, 7*, 92–112.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Dienstbier, R. A. (1989). Arousal and physiological toughness: Implications for mental and physical health. *Psychological Review, 96*, 84–100.

Elliot, A. J., & McGregor, H. A. (1999). Test anxiety and the hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 76*, 628–644.

Hunter, S. B. (2001). Performance under pressure: The impact of challenge and threat states on information processing. Unpublished doctoral dissertation, University of California, Santa Barbara.

Llabre, M. M., Spitzer, S. B., Saab, P. G., Ironson, G. H., & Schneiderman, N. (1991). The reliability and specificity of delta versus residualized change as measures of cardiovascular reactivity to behavioral challenges. *Psychophysiology, 28*, 701–711.

McFarlin, D. B., & Blascovich, J. (1984). On the remote associates test (RAT) as an alternative to illusory performance feedback: A methodological note. *Basic and Applied Social Psychology, 5*, 223–229.

Norem, J. K. (2001). Defensive pessimism, optimism, and pessimism. In E. C. Chang (Ed.). *Optimism and pessimism: Implications for theory, research, and practice* (pp. 77–100). Washington, DC: American Psychological Association.

Norem, J. K., & Cantor, N. (1986). Anticipatory and post hoc cushioning strategies: Optimism and defensive pessimism in "risky" situations. *Cognitive Therapy and Research, 10*, 347–362.

Norem, J. K., & Illingworth, K. S. S. (1993). Strategy dependent effects of reflecting on self and tasks: Some implications of optimism and defensive pessimism. *Journal of Personality and Social Psychology, 65*, 822–835.

Parrott, W. G. (2002). The functional utility of negative emotions. In L. Feldman-Barret & P. Salovey (Eds.), *The wisdom in feeling: Psychological processes in emotional intelligence* (pp. 341–359). New York: Guilford Press.

Seery, M. D., Blascovich, J., Weisbuch, M., & Vick, S. B. (2004). The relationship between self-esteem level, self-esteem stability, and cardiovascular reactions to performance feedback. *Journal of Personality and Social Psychology, 87*, 133–145.

Sherwood, A., Allen, M. T., Fahrenberg, J., Kelsey, R. M., Lovallo, W. R., & van Dooren, L. J. P. (1990). Methodological guidelines for impedance cardiography. *Psychophysiology, 27*, 1–23.

Showers, C. (1992). The motivational and emotional consequences of considering positive or negative possibilities for an upcoming event. *Journal of Personality and Social Psychology, 63*, 474–484.

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7*, 422–445.

Smith, R. J., Arnkoff, D. B., & Wright, T. L. (1990). Test anxiety and academic competence: A comparison of alternative models. *Journal of Counseling Psychology, 37*, 313–321.

Spencer, S. M., & Norem, J. K. (1996). Reflection and distraction: Defensive pessimism, strategic optimism, and performance. *Personality and Social Psychology Bulletin, 22*, 354–365.

Tamir, M. (2005). Don't worry be happy? Neuroticism, trait-consistent affect regulation, and performance. *Journal of Personality and Social Psychology, 89*, 449–461.

Vick, S. B., Seery, M. D., Blascovich, J., & Weisbuch, M. (2008). The effect of gender stereotype activation on challenge and threat motivational states. *Journal of Experimental Social Psychology, 44*, 624–630.

Weisbuch-Remington, M., Mendes, W. B., Seery, M. D., & Blascovich, J. (2005). The nonconscious influence of religious symbols in motivated performance situations. *Personality and Social Psychology Bulletin, 31*, 1203–1216.

Wilson, G. S., Raglin, J. S., & Pritchard, M. E. (2002). Optimism, pessimism, and precompetition anxiety in college athletes. *Personality and Individual Differences, 32*, 893–902.

Yamawaki, N., Tschanz, B. T., & Feick, D. L. (2004). Defensive pessimism, self-esteem instability, and goal strivings. *Cognition and Emotion, 18*, 233–249.