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Stress, Anxiety, and Cognitive Interference: Reactions to Tests

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The nature of test anxiety and its relationships to performance and cognitive interference are analyzed from the standpoint of attentional processes. A new instrument to assess dimensions of reactions to tests is presented, and its psychometric properties are described. The scales of the Reactions to Tests questionnaire (Worry, Tension, Test-Irrelevant Thinking, Bodily Symptoms) were compared with regard to intellective performance and cognitive interference. The results were consistent with the idea that the problem of anxiety is, to a significant extent, a problem of intrusive thoughts that interfere with task-focused thinking. In the last of the three studies reported, it was shown that self-preoccupying intrusive thinking can be reduced by means of a task-focusing experimental condition. The studies suggest that the Reactions to Tests questionnaire may be useful in defining anxiety more sharply and improving understanding of how it relates to performance.

Despite a large and growing literature, the concepts of stress and anxiety remain very diverse and, often, in conflict. Researchers differ widely about such matters as basic definitions, mechanisms, and outcomes. Stress, for example, has been defined as a stimulus, a response, and a hypothetical state. An important reason for this diversity and conflict is a failure to specify the contexts in which stress and anxiety are presumed to occur. It seems reasonable that whether stress or anxiety occurs depends on the personal salience of a given situation for an individual. Personal salience, in turn, is a product of those personality variables that shape perceptions of self and world.

Test anxiety is a widely studied personality variable, in part because it provides a measure of the personal salience of one important, definable class of threatening situations, those in which people are evaluated. Research on test anxiety has proven to be a convenient vehicle for investigating a variety of general problems (Sarason, 1980). This article begins with an overview of available evidence concerning the relationship of test anxiety to performance, the mechanisms that cause this relationship, and the dimensions of test anxiety. Reactions to Tests, a new measure that builds on available knowledge, is then presented. This instrument, which yields information on multiple dimensions of evaluative situations, is designed to improve the assessment of test anxiety. It may provide a basis for clarifying some theoretical issues concerning stress–anxiety relationships.

From a cognitive perspective, stress can be understood in terms of a call for action, a person's awareness of the need to do something about a given state of affairs (Sarason & Sarason, 1981). Calls for action occur in response to situational challenges and threats that lead to either task-relevant or task-irrelevant cognitions. Task-relevant cognitions are likely when a situation or task has been self-selected as a challenge (for example, this would be the case with a mountain climber who seeks adventure). When the call for action is imposed on the individual by either situational demands and constraints or introjected preoccupations (for example, a student's feeling that getting less than an A represents failure), task-irrelevant cognitions are more likely to come to the fore. Lazarus (1982) has recently interpreted challenges and threats from a cognitive perspective. Meichenbaum and Butler (1980) have suggested cognitive restructuring as a method by which the threats perceived by anxious individuals might be converted into challenges over which they see themselves as

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having some personal control. The most adaptive response to stress is task-oriented thinking, which directs the individual's attention to the task at hand. The task-oriented person is able to set aside unproductive worries and preoccupations. The self-preoccupied person, on the other hand, becomes absorbed in the implications and consequences of failure to meet situational challenges. Anxious people worry about possible difficulties they may be called upon to confront. The anxious person's negative self-appraisals are not only unpleasant to experience, but also have undesirable effects on performance because they are self-preoccupying and detract from task concentration.

The situations to which a person reacts with anxiety may be either actual or perceived. Many anxious people describe themselves as being tense and feeling that something terrible will happen, even though they cannot specify the cause of their reaction. Whether the situation is real or imagined, the anxious person's self-preoccupation interferes with an orderly, task-oriented approach to situational requirements. It seems clear that an understanding of the effects of stress and the prediction of behavior must take into account the individual's perceptions of both the nature of the situation and his or her ability to meet it (Magnusson, 1981; Magnusson & Stattin, 1982).

Role of Cognitive Interference in Test Performance

Experimental studies of test anxiety have provided evidence that cognitive interference is an important factor in lowering the performance of highly test-anxious people. An experiment by Sarason and Stoops (1978) illustrates the type of relationship that has been uncovered. Subjects who differed in their scores on the Test Anxiety Scale (TAS; Sarason, 1978) performed in experiments in which they worked on a series of tasks presented as measures of intelligence. The dependent measures were their performance, estimates of how long they had worked on the tasks, and postexperimental reports of task-irrelevant thoughts they may have had during performance. These thoughts were assessed using the Cognitive Interference Questionnaire (CIQ; Sarason, 1978). Consistent with many other findings in the literature, the performance of high TAS scorers was deleteriously affected by these achievement-orienting instructions. High TAS scorers also overestimated the period of time during which they worked on test materials. Most important for this discussion was the greater amount of cognitive interference shown by the highly anxious subjects.

The evidence obtained from the CIQ is of particular interest from the standpoint of what people informally report thinking about while working on a task. Under testlike conditions, high TAS scorers, more so than low and middle scorers, report being preoccupied with how poorly they are doing, how other people are doing, and what the examiner will think about them (Sarason, 1978). Under neutral conditions, groups that differ in amount of test anxiety show little or no differences in performance or cognitive interference. Thus, highly test-anxious subjects in situations that pose testlike challenges perform at relatively low levels and experience relatively high levels of task-irrelevant thoughts. In nontest situations, groups with different test-anxiety levels show either small or no differences in performance and cognitive interference.

This type of evidence has led Wine (1971, 1982) to an attentional interpretation of test anxiety, according to which people at high and low levels of test anxiety differ in the types of thoughts to which their attention is directed in the face of an evaluative stressor. Consistent with this interpretation are the results of Ganzer's (1968) experiment, which showed that, while performing on an intellective task, subjects with high test anxiety make many more irrelevant comments than do subjects with low test anxiety. A high percentage of these comments are self-deprecatory. Other researchers have found that persons with high test anxiety are more likely than those with low test anxiety to blame themselves for their performance level (Doris & Sarason, 1955), feel less confident in making perceptual judgments (Meunier & Rule, 1967), and set lower levels of aspiration for themselves (Trapp & Kausler, 1958). These empirical findings have resulted in a variety of productive research issues, including anxiety's effects on cue utilization (Geen, 1976), its developmental antecedents (Dusek, 1980), and clinical and educational

interventions that influence its intensity and consequences (Denney, 1980; Meichenbaum, 1977).

Components of Test Anxiety

Anxiety is usually defined as a complex state that includes cognitive, emotional, behavioral, and bodily reactions. As Wine (1982) has pointed out, it is not immediately obvious how to identify the active or most active ingredients in this complex. She has suggested that test anxiety might fruitfully be reconceptualized primarily in terms of cognitive and attentional processes aroused in evaluational settings.

One heuristic distinction that has been pursued is that between worry and emotionality (Deffenbacher, 1977, 1978; Kaplan, McCordick, & Twitchell, 1979; Liebert & Morris, 1967; Morris, Davis, & Hutchings, 1981). *Worry* refers to the cognitive side of anxiety (preoccupations, concerns); *emotionality* refers largely to a person's awareness of bodily arousal and tension. In their reviews of the literature on the worry–emotionality distinction, Deffenbacher (1980) and Tryon (1980) showed that although worry and emotionality are correlated, worry is related to performance decrements in the presence of an evaluational stressor, and emotionality is not. Deffenbacher & Deitz's (1978) research in a naturalistic setting, together with laboratory evidence (e.g., Marlett & Watson, 1968; Sarason & Stoops, 1978), suggests that cognitive interference may be the key factor in lowering the performance of highly test-anxious people.

Worry and emotionality, like anxiety, are concepts. They may or may not be unitary. Wine (1982) has argued that a concept as complex as anxiety may obscure important processes, have too much excess meaning, and, therefore, be misleading. An approach that would reduce these problems is one that deals more explicitly with the scope of phenomena that may pertain to traditional definitions of test anxiety. As indicated by work related to the worry–emotionality distinction, an additional useful step would be to define more reliably the reactions people have when placed in evaluational situations. The studies described in this article concern a new instrument, Reactions to Tests, designed to assess multiple components of a person's reactions to tests, correlate those components with intellective performance and cognitive interference, and attempt experimentally to influence these relationships.

Study 1

In the first study, a pool of items dealing with personal reactions to tests was constructed. Some items were based on items in the TAS (Sarason, 1978), and many new items were written. On the basis of pilot work that weeded out items that were ambiguous, poorly phrased, or otherwise posed problems for subjects, 91 items were selected for further study.

Method

Subjects. The subjects were 390 introductory psychology students. The 91 items were group administered, and subjects were instructed to circle the alternative that best reflected how they react to tests. The alternatives were as follows: 1—not at all typical of me, 2—only somewhat typical of me, 3—quite typical of me, and 4—very typical of me.

The subjects also filled out the 37-item TAS (Sarason, 1978).

Procedure. Following the recommendations of Nunnally (1978) for conducting factor analyses on large sets of variables, we performed a principal components factor analysis with orthogonal varimax rotation on the 91 items.

Results

The first factor, tentatively labeled Tension, had 18 items with loadings of at least .45 and accounted for 18.1% of the common variance. The second factor, Worry, had 11 high-loading items and accounted for 11.5% of the common variance. The third factor, Test-Irrelevant Thinking, had 10 high-loading items and accounting for 11% of the common variance. Scores for these three factors were created by summing items with loadings greater than .45. Several factors dealt with Bodily Symptoms. Each of them accounted for less than 4% of the variance and had only one or two items with high loadings. The items with high loadings on these factors (totaling 14.1% of the common variance) were organized into a composite scale (12 items) of bodily reactions to evaluative situations. Table 1 gives examples of items on the four scales derived from this factor analysis. Table 2 presents the intercor-

Table 1
Illustrative Items From Four Scales Derived From the Factor Analysis

Tension
1. I feel distressed and uneasy before tests.
2. I feel jittery before tests.
3. I find myself becoming anxious the day of a test.
Worry
1. Before taking a test, I worry about failure.
2. During tests, I wonder how the other people are doing.
3. Before tests, I feel troubled about what is going to happen.
Test-Irrelevant Thinking
1. During tests, I think about recent past events.
2. Irrelevant bits of information pop into my head during a test.
3. During tests, I find myself thinking of things unrelated to the material being tested.
Bodily Reactions
1. I get a headache during an important test.
2. My stomach gets upset before tests.
3. My heart beats faster when the test begins.

relations between the scores for the four factors and the TAS.

Discussion

If tests are considered evaluative situations to which persons respond both overtly and covertly, assessment tools more complex than those typically employed in research on test anxiety are needed. The findings of this study indicate the existence of four discriminable components of test anxiety. Distinctions between the first and fourth components, tension and bodily reactions, have typically not been made in research based on the concepts of worry and emotionality. For example, the Morris, Davis, and Hutchings (1981) Emotionality scale includes items that refer to both general tension level ("I feel panicky") and specific body reactions ("I am so tense that my stomach is upset"). The latter type of item seems less ambiguous than the former. People who describe their reactions to tests in terms of general tension may or may not differ in their psychological reactions from those who emphasize their worries. Are the phrases *I am tense* and *I am worried* simply different semantically, or do they refer to different phenomenological and physical experiences?

Although the measures of reactions to tests were intercorrelated, they might differ in their usefulness in various types of research settings, for example, those in which either the subject's performance or physiological reactivity is of central interest.

Study 2

A new instrument, Reactions to Tests (RTT), was constructed on the basis of the Study 1 findings. It consists of four 10-item scales, each with a possible score range of 10–40. The scales, each made up of the 10 items that had highest loadings on the factors described in Study 1, are (a) Tension, (b) Worry, (c) Test-Irrelevant Thinking, and (d) Bodily Symptoms. Study 2 was conducted to obtain information about the scales' psychometric properties and to determine their relationships to cognitive interference.

In addition to the RTT, the subjects were administered the CIQ (Sarason, 1978). *Cognitive interference* can be defined as intrusive thoughts that keep the individual from directing full attention to the task at hand.

Previous research had found that highly test-anxious college students report high levels of cognitive interference when performing under achievement-orienting conditions (Sarason & Stoops, 1978). Higher levels of both anxiety and cognitive interference have also been associated with decreased accuracy of perception in eyewitness accounts of complex incidents (Siegel & Loftus, 1978). Of the two measures, the cognitive interference score was more highly related to performance deficit. The intrusive thoughts of high scorers on test-anxiety instruments largely involve worrying, and this worrying seems to interfere with task-relevant thinking and cause lower performance. In Study 2 it was possible to determine the re-

Table 2
Intercorrelations Between Scores for Four Factors and the Test Anxiety Scale (TAS)

Factor	1	2	3	4	5
1. Tension	—	.66	.28	.69	.04
2. Worry		—	.51	.40	.72
3. Test-Irrelevant Thinking			—	.24	.36
4. Bodily Reactions				—	.60
5. TAS					—

Note. $N = 390$.

lationship of each RTT scale to cognitive interference.

Method

Subjects. The subjects were 385 introductory psychology students: 241 females and 144 males.

Procedure. The subjects were tested in groups of 15–20 students. First the RTT and the TAS were administered. Then subjects were given a difficult version of the Digit Symbol Test for a 6-min period. Immediately after this, the subjects responded to the CIQ. Research by Sarason and Palola (1960) had shown that highly test-anxious subjects perform at a lower level on this task under achievement-orienting conditions than do other subjects. Instructions similar to those used by Sarason and Palola were used.

Results

For both males and females, the correlations among the four RTT scores and the TAS closely resembled those of Study 1 (see Table 2). The alpha coefficients for the 10-item scales ranged from .68 to .81. For all 40 items, alpha equaled .78. Table 3 provides information from the entire Study 2 sample for RTT total score and scale means, standard deviations, and ranges.

High and low scorers on the RTT and its subscales and the TAS were compared with regard to their Digit Symbol Test performance and CIQ scores. For each measure, 20 high and 20 low scorers were compared. These subjects were drawn from the upper and lower 15% of each selection variable. Subjects who differed in TAS score, RTT total score, and RTT Worry scale score showed significant differences in performance on each measure: For the two TAS groups, $F(1, 39) = 4.53$, $p < .05$, for Digit Symbol Test performance, and $F(1, 39) = 4.41$, $p < .05$, for CIQ scores. High TAS scores were associated with poor Digit Symbol Test performance (high-TAS $M = 125.40$; low-TAS $M = 168.75$) and high levels of cognitive interference (high-TAS $M = 33.45$; low-TAS $M = 20.45$). For the RTT total score, $F(1, 39) = 4.89$, $p < .05$, for the Digit Symbol Test, and $F(1, 39) = 4.77$, $p < .05$, for CIQ scores. The direction of the results was similar to that of the TAS findings. The high and low RTT digit symbol means were 135.11 and 164.54; the comparable CIQ means were 32.98 and 20.14. The Worry scale was related to performance and cognitive interference in the same way as the TAS and RTT total score were. For the Worry scale, $F(1, 39) = 7.94$, $p < .01$, and $F(1, 39) = 8.13$, $p < .01$, respectively. For the Digit Symbol Test, the means for high and low Worry scale scorers were 121.04 and 170.53, respectively. The comparable CIQ means were 33.68 and 19.84. The other RTT scales were unrelated to performance and were related to the CIQ at significance levels ranging from $p < .10$ to $p < .06$.

Table 3
Means, Standard Deviations, and Ranges for Reactions to Tests (RTT) Total Score and Four Scales

Measure	*M*	*SD*	Range
Males ($N = 144$)			
RTT total score	74.04	17.99	43–135
Tension scale	22.39	6.58	10–39
Worry scale	19.51	5.93	11–36
Test-Irrelevant Thinking scale	17.19	6.40	10–39
Bodily Symptoms scale	14.95	4.12	10–27
Females ($N = 241$)			
RTT total score	80.37	21.13	42–141
Tension scale	25.17	7.58	10–40
Worry scale	21.30	6.72	10–37
Test-Irrelevant Thinking scale	17.83	7.01	10–40
Bodily Symptoms scale	16.08	5.70	10–39

Table 4 presents the correlations between scores on the RTT and its scales and the TAS with scores on the CIQ for males and females. For each sex, the Worry scale showed the highest correlation with cognitive interference. To assess the significance of the difference between nonindependent *r*s, a series of *t* tests were computed (Edwards, 1960). For males, the correlation between the CIQ and the Worry scale was greater ($p < .01$) than each of the CIQ correlations involving the other RTT scales. The same result was obtained for females.

Discussion

If test anxiety is conceptualized in terms of worrisome, self-preoccupying thoughts that interfere with task performance, the Worry scale should be negatively related to performance and positively related to cognitive interference. This is what was found. Although

Table 4
Correlations of Reactions to Tests (RTT) Total Score and Its Scales and Text Anxiety Scale (TAS) With Cognitive Interference Questionnaire (CIQ) Scores for Males and Females

Test	CIQ scores	
	Males (N = 144)	Females (N = 241)
RTT		
Total	.47	.44
Tension scale	.31	.29
Worry scale	.54	.51
Test-Irrelevant Thinking scale	.33	.30
Bodily Symptoms scale	.27	.26
TAS	.44	.38

all of the RTT scales were positively correlated with reports of cognitive interference, the correlation involving the Worry scale was significantly higher than correlations involving the other RTT scales. Perhaps a similar prediction could have been made for the Test-Irrelevant Thinking scale. However, the higher correlations of the Worry scale with the CIQ suggest that, in an evaluative situation, cognitive interference and lowered performance are most likely to be related to thoughts that reflect fears of failure and comparison with others rather than thoughts that are merely irrelevant to the situation.

These results are consistent with growing evidence that test-anxiety measures that deal with the thoughts people have while being evaluated are more consistently related to performance than are test-anxiety measures that deal with emotional reactions in the same situations. This is not too surprising, because, by definition, worry over performance is specific to evaluation situations, whereas tension and emotionality are not. High tension combined with high worry might be quite debilitating. High tension in the absence of worry might have neutral or even facilitative effects by increasing motivation. This is particularly likely if the person has overlearned appropriate responses (e.g., athletic skills or a foreign language vocabulary list), and the situation then confronted is low in uniqueness and calls for only those responses to be executed as practiced. Perhaps challenges are characterized by emotional tension, whereas threats are characterized by emotional tension plus worry.

Study 3

There is evidence that preperformance instructions that deemphasize the evaluative component of performance (e.g., reassurance) have a facilitative effect on highly test-anxious subjects (Sarason, 1958, 1972, 1973). Whereas reassuring preperformance instructions help subjects with high test anxiety, they seem to lower the performance of those with low test anxiety (Sarason, 1958, 1978).

There is also evidence that under evaluation conditions, subjects high in test anxiety show increases in cognitive interference as assessed by the CIQ (Sarason & Stoops, 1978). If self-preoccupying worry produces poor performance because of cognitive interference, any technique that aids the subject's attention to the task at hand should have a facilitative effect. Another alternative, suggested by Wine (1971, 1982), is the possibility of developing instructional or training aids that would help worry-prone people to attend more completely to assigned tasks.

Study 3 was carried out in an effort to compare groups that differ in the tendency to worry about tests after they have received either (a) instructions directing them to attend completely to the task on which they will perform or (b) a reassuring communication prior to performing the task.

Method

Subjects. The subjects were introductory psychology students. Prior to and independent of the experiment, they had been administered the RTT. From the group of 612 students who responded to the RTT, 180 were selected for participation in the experiment. The sample included both males and females with scores in the upper, middle, and lower thirds of the Worry scale distribution.

Procedure. The task used in the experiment consisted of a series of difficult anagrams, on which subjects worked for 18 min. Previous research had shown that high test-anxiety scorers perform poorly on this task when they are tested under achievement-orienting conditions (Sarason, 1961). There is also evidence that under these conditions, subjects high in test anxiety show increases in cognitive interference as assessed by the CIQ (Sarason & Stoops, 1978).

In the present experiment, after working on the anagrams task, the subjects responded to the CIQ. They were told that performance on the anagrams task was a measure of the ability to do college-level work. After this communication (similar to those used by Sarason, 1961, and Sarason & Stoops, 1978), one third of the subjects were given an attention-directing condition, one third were given reassurance, and a control group received no additional communication.

The experiment was conducted using group administrations to 15–20 subjects. Instructions for the anagrams task were contained in the test booklet. The attention-directing and reassuring communications were given by the experimenter after the subjects had read the task instructions, which included the achievement-orienting message. Subjects under the reassurance condition were told not to be overly concerned about their performance on the anagrams. The experimenter made such comments as "Don't worry" and "You will do just fine." Subjects under the attention-directing condition were told to absorb themselves as much as possible in the anagrams task and to avoid thinking about other things. The experimenter said, "Concentrate all your attention on the problems," "Think only about the anagrams," and "Don't let yourself get distracted from the task."

Results

The experiment followed a 3 × 3 × 2 analysis of variance (ANOVA) design with 10 male or female subjects per group. There were three levels of scorers on the Worry scale (high, middle, and low) and three conditions (two experimental and one control). These groups consisted of equal numbers of males and females.

An ANOVA of anagram performance scores yielded a significant effect for conditions, $F(2, 162) = 3.41$, $p < .05$. The group that received attention-directing instructions had a mean of 5.79 correct anagram solutions. The comparable reassurance and control condition means were 4.88 and 5.14, respectively. The only other significant effect was for the interaction between scores on the Worry scale and conditions, $F(4, 162) = 3.84$, $p < .025$. As Table 5 shows, the three groups of Worry scale scorers performed comparably under the attention-directing condition. However, the high Worry scale scorers performed at a significantly higher level (Newman-Keuls test, $p < .05$) under the attention-directing condition than they did under the control condition. In the control group, the high Worry scale scorers' performance was significantly lower (Newman-Keuls test, $p < .05$) than that of the middle and low Worry scale scorers. Reassurance tended to have a facilitative effect for high Worry scale scorers and a detrimental effect for low and middle Worry scale scorers.

Table 5
Performance Means for Worry × Conditions Interaction (Number of Correct Solutions)

	Worry		
Condition	High	Middle	Low
Attention-directing	5.92	5.67	5.77
Reassurance	5.45	4.78	4.41
Control	3.62	5.82	5.98

Table 6
Cognitive Interference Questionnaire Means for Worry × Conditions Interaction

	Worry		
Condition	High	Middle	Low
Attention-directing	22.30	22.78	20.31
Reassurance	24.48	23.52	22.19
Control	33.62	21.44	19.61

There were two significant effects in the CIQ analysis. The worry main effect, $F(2, 162) = 3.25$, $p < .05$, was due to the tendency of high Worry scale scorers to report more cognitive interference than the middle and low scoring groups, with means of 26.78, 22.58, and 20.70, respectively. The Worry × Conditions effect, $F(4, 162) = 4.71$, $p < .01$, was primarily due to the CIQ mean for high Worry scale scorers in the control group (33.62). Table 6 presents the means for this interaction.

Discussion

The findings in Study 3 show that reassuring instructions have different effects for subjects who score high, middle, and low on the Worry scale. This is consistent with previous work in which the TAS, rather than the Worry scale of the RTT, was the individual difference measure on the basis of which subjects were selected (Sarason, 1958, 1978). The detrimental effect of reassurance on people who are not worriers may be due to these subjects' taking the reassuring communication at its face value; that is, they take the task too lightly and lower their motivational level.

The attention-directing condition seems to have all of the advantages that reassurance has for high Worry scale scorers with none of the disadvantages. The performance levels of all groups that received the attention-directing instructions were high. Furthermore, cognitive interference under the same condition was consistently low. The relatively poor performance and high cognitive interference of the high Worry scale scorers under the control

condition are similar to previous findings concerning highly test-anxious subjects.

We reanalyzed the performance and CIQ scores in terms of other RTT scales. This was done to provide information about the possible interactions of tension, test-irrelevant thinking, and bodily reactions with the experimental conditions. None of these additional analyses revealed statistically significant results. However, the general trend of the scores for test-irrelevant thinking resembled that for worry.

This experiment, together with earlier work (Sarason, 1978; Wine, 1982), supports an attention-directing interpretation of anxiety and worry and suggests that simply reminding subjects to be task-oriented can have a salutary effect on their performance and intrusive thoughts. The attention-directing instructions seemed to provide subjects with an applicable coping strategy. It seems desirable in future research to study various categories of intrusive thoughts (e.g., worry, anger) as a joint function of personality characteristics, situational demands, and coping strategies that are provided.

General Discussion

If stress is viewed in a cognitive perspective as a call for action instigated by appraisals of properties of situations and personal dispositions, then anxiety can be viewed as self-preoccupation over the inability to respond adequately to the call. The test-anxious person experiences self-preoccupying worry, insecurity, and self-doubt in evaluative situations. These internal distractors lessen attention to the task at hand and contribute to relatively poor performance. The results of the present studies suggest that, at least in evaluation situations, anxiety is, to a significant extent, a problem of intrusive, interfering thoughts that diminish attention to and efficient execution of the task at hand. Under neutral conditions, high and low test-anxious subjects perform comparably. When an evaluative component is introduced, a flag indicating danger goes up for those who are prone to test anxiety. For them, the situation becomes personally salient and threatening.

The findings of Study 3, together with other recent evidence, show that it is possible to influence these thoughts experimentally. Instructions that emphasize the evaluative nature of the task have been shown to increase the interfering thoughts of highly test-anxious subjects (Sarason, 1978). People who are prone to worry in evaluative situations benefit simply from their attention being called to the importance of maintaining a task focus. Cognitive modeling geared to task orientation and other training procedures also seems to be effective (Meichenbaum, 1972, 1977; Meichenbaum & Butler, 1980; Sarason, 1973). Thus, experimental manipulations can either increase or decrease the self-preoccupation of test-anxious subjects. The amount of self-preoccupation, in turn, influences performance level. This interpretation is consistent with Geen's (1976, 1980) analysis of test anxiety as one influence in a person's ability to use the range of cues available in a given situation. Worry over evaluation leads to task-irrelevant cognitions that interfere with attention to the range of cues in the situation. The wider the range of relevant cues, the greater the debilitating effects of cognitive interference.

Might the concept of test anxiety be defined primarily or exclusively in terms of interfering worry and self-deprecation? Such a definition would be consistent with what is known about the relationships between test anxiety, self-preoccupation, and performance. However, it would not be consistent with the widely held view that physiological arousal is a necessary component of anxiety in general. According to this view, the anxious response involves hypermobilization of physiological resources to cope with stress. In their literature review, Holroyd and Appel (1980) concluded that (a) no relationship has been demonstrated between test anxiety and tonic physiological activity and (b) the cognitive aspects of test anxiety may be its most active ingredients.

Yet it is important not to be too quick to cast out the emotional component of evaluation anxiety. One topic that needs clarification is the meaning of the RTT Tension scale, which accounts for more of the variance than does any other single factor. Its items clearly refer to feeling tense and emotionally upset. However, it is not clear what message people are sending when they indicate that these items refer to themselves. Are people who attribute such characteristics to themselves providing information about their state of mind, bodily self-perceptions, or both?

Cognitive and behavioral assessments are often found not to be highly correlated with measurements of bodily processes. That physiological arousal is not peculiar to anxiety becomes all too evident when one notes the autonomic correlates people manifest who are experiencing high levels of anger. Studies are needed to relate various combinations of cognitive and physiological response patterns to observable behavior. For example, what are the similarities and differences between people who are worried and do not show high levels of autonomic functioning and those who do? The RTT instrument might be useful in selecting subjects for such comparisons. Its four scales might contribute to more fine-grained analyses of the components of test anxiety.

Worrying behavior, one component of anxiety, was demonstrated in Study 2 to be the major component in decreasing performance efficiency in evaluative situations. As a further illustration of the efficacy of this approach, another study based on this finding (Study 3) demonstrated that, as predicted, task-orienting instructions that serve to reduce time spent worrying are more effective in reducing the detrimental effect of anxiety on behavior than are instructions that emphasize reassurance.

Reassurance, calming statements geared to reduce the general feeling of upset that people experience in threatening situations, is often used in everyday life as a means of reducing the effects of anxiety. However, telling the parents of a child who is dying of cancer or someone who is unemployed not to worry may, if anything, be counterproductive because it simply demonstrates for the troubled individual the need outsiders have to deny or not deal with what he or she is really going through. Not only is reassurance a more limited way of improving the performance of highly anxious persons than the task-directed approach is, but it also has the unfortunate effect of decreasing the performance level of individuals with low anxiety. This finding, from Study 3, illustrates some of the benefits of rephrasing the definition of anxiety so that the components can be studied separately in relation to the behavior observed.

The studies reported here are consistent with growing evidence that simultaneous attention to both the characteristics of stress-arousing situations and personality attributes is needed to account for the wide variability among people in how they confront and deal with challenges that arise in their lives.

The concept of anxiety has been researched extensively, but many of the findings have been conflicting. One factor responsible for much of this confusion has been a broad, all-enveloping definition of anxiety—both what it is and precisely how it affects performance. The cognitive approach to anxiety, the information-processing view that anxiety arises from a self-assessment of personal deficit in meeting situational demands, has helped in the process of clarification. However, the relationship between how anxiety is experienced and how this experience affects performance is still unclear.

This article is concerned with one step to remedy that lack of clarity. The construction of a multifactor instrument may make it possible to define anxiety more sharply and improve the understanding of how it relates to performance. A few examples of applications of the RTT instruments have been provided.

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