The interactive effects of locus of control and situational stress upon performance accuracy and time

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ABSTRACT

The present paper sought to clarify the conceptual relationship between expectancy for personal control, stress, and behavioral reactions to stress. Expectancy for control was assessed as a personality characteristic of internal control; stress was experienced as strong environmental interruptions, disturbances, and unpredictable obstacles encountered during the performance of assigned tasks. Subjects were junior high school aged students who attempted to complete three academic type tasks during one of two levels of stress or a base line, no stress, condition. Analyses of the data included: (a) internal subjects were capable of sustaining task performance under high stress, but external students experienced performance decrements as stress increased; (b) time to complete the mathematics task reflected a facilitating effect of stress for internals but a debilitating effect for externals; (c) performance differences between internal and external students, in the absence of differences in reported anxiety, could be attributed to the stronger reward expectancies possessed by the internal individual. Interpretation of the data suggested an interactive relationship between type of stress (threat to ego vs. threat to instrumental performance) and expectancy for control in the influencing of behavior reactions to stress.

One of the more intriguing yet unresolved questions related to locus of control as a personality determinant of behavior concerns the role of expectancy for control in an individual's reactions to threat and stress. The findings of a substantial set of research studies have converged in suggesting that, relative to the external individual, the internal, who expects to control behavioral consequences, often is more successful in confronting environmental demands. As Phares (1976) has concluded, this ability on the part of the internal individual to master the en-

vironment has stood up as one of the more consistent behavioral correlates of locus of control within the plethora of research published in the last ten years.

However, when a review is conducted of the few studies which have examined internal-external differences in reaction to stress and threat, the interpretation of results is much less clear. Although some segment of this lack of clarity can be attributed to the diversity of methodological approaches, it is presently contended that the research has failed to differentiate a major influence upon internal-external differences: the manner in which stress can threaten an individual. Thus, the type of stress and threat an individual experiences can play a mediating role in the relationship between locus of control and behavioral reactions to stress and threat.

Discussion of the types of stress necessitates a brief presentation of a conceptualization of stress and consequent behavioral reactions. Spielberger's (1972) conceptual schema serves as the basis for this presentation:

> stress → perception of danger → state of anxiety reaction → cognitive reappraisal → coping, avoidance behavior or psychological defenses.

Stress may be either an external stimulus or internal cue that sets off the perception of danger or threat. The perception of threat leads to the emotional reaction of anxiety, situationally based. The unpleasantness of heightened anxiety further leads the individual to select and use some action designed to reduce anxiety. This selection may be preceded by a reappraisal of the stressful stimulus in order to consider appropriate coping strategies. The potential influence of locus of control as a function of type of stress may now be analyzed.

Consider the case in which stress and accompanying perception of danger or threat are elicited by a personal characteristic—for example, an intellectual deficiency, failure, or disability. This type of stress involves threat to the ego or self-concept and the source of the stress is an inadequacy within the individual. Such stress should be more disruptive to the internal individual relative to the external. Specifically, internal locus of control involves the attribution of responsibility to personal qualities in the process of exerting oneself and confronting environmental

demands. To experience information during these activities that suggests a personal inadequacy is highly dissonant with the generalized tendency to view oneself as potentially capable of employing skill or effort successfully. The internal is faced with a challenge to his or her belief in personal effectiveness, stemming from some personal deficiency. Since this deficiency may reside in some quality or characteristic difficult to change, the internal may be forced to rely upon denial or other defensive reactions designed to deal with the anxiety and the source of the stress. Thus, this type of stress can interact with locus of control in a manner to threaten and disrupt the internal more so than the external. The external, to some degree, possesses a "built in" rationalization in being able to attribute an inadequacy to "bad luck" or repeated failure to "powerful others."

In support of the effects of this type of stress and threat, Efran (1963) found that repression of failure correlated with internality. The external, who takes relatively less responsibility for failure and its correlated stress, experienced less of a perception of threat and had his emotional adjustment less disrupted. In the study by Lipp, Kilstoe, and Randall (1967) external disabled individuals displayed lower recognition thresholds for stimuli related to their disability than did internals. The authors interpreted these effects as the tendency of internals to deny a disability. Phares, Ritchie, and Davis (1968) reported that externals recalled more negative information concerning personality problems than internals (less repression), although internals did express a greater willingness to engage in hypothetical remedial action. In summary, the three studies cited exposed individuals to stress and accompanying threat whose source resided in some personal deficiency; internals manifested reactions indicative of greater disruption than did externals. Parenthetically it should be noted that little assessment has been made of the possible long-term negative effects of the use of defensive behaviors by the internal. Denial and repression may alleviate anxiety temporarily but ultimately risk a distorted definition of reality, a characteristic greatly inconsistent with the many positive attributes associated with internality.

Stress may also take the form of unpredicted environmental disruption and competing demands that threaten performance during a task or required activity. The stress and accompanying

threat can reside in some form of an aversive or interfering stimulus that potentially functions to impede the individual (for example, threatened shock or loud noise). Rather than being a threat to self-concept or emotional security this type of stress primarily threatens to impede goal-directed behavior. An index of the disruptive effects of this type of stress is the degree to which an individual can maintain a prior level of instrumental behavior. Lazarus (1966) has argued that one factor of importance to coping with stress of this type is the belief held by an individual concerning control over the situation and the stressful stimulus. In a theoretical review of the literature covering both human and nonhuman research, Lefcourt (1973) notes: "It is possible to conclude, then, that with respect to the response to aversive stimulation, perceived control makes a great difference. . . . The perception of control would seem to be a common predictor of the response to aversive events regardless of species" (p. 424). The empirical research directed toward a test of the relationship between perception of control and reaction to environmental stress has taken differing approaches, resulting in mixed findings. Glass, Singer, and Friedman (1969) and Glass, Reim, and Singer (1971) have found that control or potential control over an aversive condition, as defined by *situational* contingencies, resulted in less disruption upon task performance. Houston (1972) found that subjects in an unavoidable-shock condition (low control) reported more negative affect than subjects in the avoidable-shock condition; no effect for situational control itself was obtained for performance on a digit-reading task. Watson and Baumal (1967) also failed to show a direct relationship between situational control over stress and task performance.

Both Watson and Baumal (1967) and Houston (1972) additionally assessed the role of generalized perception of control, within the personality of the individual, for task performance during stress conditions. Neither study found that internal individuals performed better under stress than externals. Neither study examined task performance, when the environment is *actually* interfering in attempting to disrupt performance, and the effect of personality locus of control upon this disruption. Yet, it is possible to extend Lefcourt's (1973) conclusions to locus of control. i.e., generalized expectancy for control within the personality.

Theoretically it would be expected that, relative to the external, the internal's performance would be more resistant to interference. Why, conceptually, might this be so? Returning to Spielberger's schema, the sense of control generated by the personality of the individual might relate to the stress-performance link in one of several ways. As in the Glass et al. (1969) study, the perception of control might lead directly to a reduction in the perceived danger and attendant anxiety of a situation. In this manner the aversive value of the stress stimulus is directly influenced by the expectancy or perception of control. A sense of control over a stressful stimulus results in that stimulus being interpreted as less threatening. It should be recalled that this research: (a) defined situational control relative to potential stress, making it more possible for the sense of control to be salient prior to the experience of an aversive stimulus; (b) operationalized control as situationally based rather than generalized from the personality. An alternative interpretation of this type of stress has been offered by Phares (1976) who has argued that internals and externals may be equally aroused and made anxious by some aversive stimulus; during the course of an experiment or task the internal's belief in his own capacity to control events begins to assert itself. Therefore, anxiety dissipates at differential rates in internals and externals, due to the cognitive reappraisal made by the internal that the situation is within personal control. It should be noted that either of these possible interactive effects of locus of control and stress result in differences in levels of anxiety and performance for internal and external individuals. A third effect locus of control might have in conjunction with stress is a direct one, an effect upon goal-directed behavior itself. Internal locus of control does define the generalized belief that the contingency between behavior and its rewards or negative consequences is under direct personal influence. Therefore, the internal may be as equally aroused by stress and become as equally anxious as the external. However, due to the greater control over reinforcement contingencies expected by the internal (other things equal, overall reward expectancy is greater for the internal) disruptive, stressful stimuli and related attentional and emotional responses are less capable of influencing the task performance-goal relationship. The more stable reward expectancy of the internal results in more stable behavior. A belief in internal control may act as a "buffer" be-

tween anxiety and the disruptive effects upon goal-directed behavior. It should be noted that this third possible effect results in equal levels of anxiety for internals and externals but differing levels of task performance.

The present study seeks to affirm the following predictions: (a) under neutral performance conditions (no stress) there will be no difference between the performance of internal and external individuals for well-learned tasks. This prediction is based upon the theoretical expectation that a significant amount of situational experience negates the predictive importance of generalized locus of control for behavior (Phares, 1976; Rotter, 1976). The no-stress condition thus serves as a base line against which to assess the interactive effects of stress and locus of control for performance; (b) as stress is experienced during an assigned activity, the internal individual, relative to the external, will be capable of more successful task performance. The previously reviewed literature strongly suggests that a belief in personal control is adaptive when environmental stimuli threaten or actually do impede ongoing behavior. It remains through analyses of both performance and anxiety indicants of stress to infer for what conceptual reasons the internal may be more resistant to disruption. The present paper also attempts to clarify the conceptual relationship between stress, personality locus of control, and performance.

Method

Subjects

Initially 255 seventh and eighth grade students enrolled in Spanish classes at a public junior high school were selected for the experiment and administered the Intellectual Achievement Responsibility Scale (Crandall, Katkovsky, and Crandall, 1965). The scale consists of 34 forced choice items which assess a subject's attribution of academic success and failure to himself (internal control) or to forces outside his control (external control). Low scores on the IAR indicate externality and high scores represent internality.

Subjects were classified as internal if they scored 27–34 and were classified as external if they scored 0–21. These two groups represented approximately the upper and lower 20% of the distribution of scores. This technique was used to assure more reliable and distinct differences in expectancies for control between internal and external groups.

The experimental sessions involved 42 females and 30 males (reflective of the sex ratio of the overall school population) assigned to either the base line, moderate, or high stress treatment. It should be noted that a number of the tested students were utilized in a pilot study designed to refine experimental procedures. Ten males, five internals and five externals, and fourteen females, seven internals and seven externals, were assigned randomly to each of the three treatment conditions. Since subjects were tested during the school day on school property, it was necessary to conduct the experiment in groups of three students. For each experimental condition then, six groups consisted of two females and one male and two groups consisted of two males and one female. Each experimental session consisted of one of these three-member groups.

Several steps were taken to eliminate any extraneous effects of intelligence upon task performance. Three Iowa IQ scores (math, verbal, and nonverbal) were obtained for each student. These particular ability scores were chosen since they reflected the nature of the tasks selected for the experiment. Any student with an IQ score of less than 95 on any of the three Iowa tests was not included in the sample. These students were expected to have considerable difficulty in completing any of the tasks. For the 72 students who actually participated in the study, these indices of scholastic ability were used as a statistical control. This allowed for a more precise measure of performance difference between internals and externals as a function of stress.

Procedure

Experimental tasks. The three subjects who were assigned to each testing session were asked to complete three tasks individually. In order to ensure that the experiment was conducted with no group effect, a number of steps were taken. There was no interaction among the three subjects before they entered the room. All three students were seated so that no subject faced another subject. No talking or questions were permitted.

The subjects were asked to perform the following tasks: (a) fifteen 2×2 digit multiplication problems (math performance); three problems were written on each page to prevent subjects from reworking problems during the task; (b) thirteen words with missing letters accompanied by definitions; subjects were required to supply missing letters to complete each word (verbal performance), spaced out over four pages; (c) a "find the hidden objects" problem in which students were asked to locate and circle a list of hidden objects within a larger picture (perceptual performance).

The order in which the first two tasks were taken was randomly alternated within each group. The picture task was last for all subjects. Two blank pages were inserted between tasks to ensure that students would not begin work until the experimenter gave the signal.

Students were instructed to raise their hands when they completed each task and the experimenter recorded their time. Students were given a maximum of nine minutes to complete each task. The experimenter recorded time using a stopwatch. Since the distributions of time scores were fairly homogeneous, raw time scores measured in seconds were used for analyses. The performance measures were based on the number of correct responses in each of the tasks (math: 0–15; verbal: 0–13; perceptual: 0–20).

At the end of the experiment each student was asked to fill out a twenty-item questionnaire. This questionnaire represented a slight modification of Spielberger's state anxiety measure (1972). Several words were changed to make the scale more comprehensible to seventh and eighth graders. The higher the score the more situational anxiety reflected by the subject (range: 0–60).

Experimental Conditions

Base line (no stress). When the students entered the classroom, the experimenter introduced herself and told each subject where to sit. She gave the directions for each of the tasks and told the students when to begin work. The experimenter sat at her desk and had no other interaction with the students.

Moderate stress. The experimenter entered the room, told subjects where to sit and introduced each of the tasks. She assumed a strict attitude as she told students she would refuse to answer questions and additionally warned them against talking to one another. An unexplained piece of equipment (digital counter) was hooked up to a dry cell battery in front of the room. In addition, a tape recorder was set up (presumably to record the sound level in the room). After students began work on the first task, the experimenter turned on the tape recorder and in sixty seconds an extremely loud noise blared out from it and lasted twenty seconds. The experimenter apologized and turned off the recorder. She explained that she had accidentally put it on "play" instead of "record." During the remainder of the first task the experimenter walked around the room with a clipboard and observed the subjects, making several negative comments to each one. During the second task, the experimenter screamed that she had forgotten to give them special pencils. She handed them different

pencils and instructed them to continue work. The picture for the perceptual task was purposely marred before being duplicated. The experimenter explained the very poor quality saying that the copying machine was not working correctly.

High stress. Subjects entered the room and the experimenter introduced herself and gave them the same instructions as in the moderate stress treatment. There was, in addition, a videotape deck and camera in the room. The experimenter informed the students that she would be taking pictures of their every move as they worked. When the experimenter looked for the task booklets, she pretended that she was unable to find them. She impatiently searched filing cabinet drawers and cast accusing glances at the three students. She asked the teacher about the whereabouts of the booklets. Several pages of each booklet were stapled upside down. The first and second tasks proceeded in a manner identical to the moderate stress treatment. In addition, during the second task subjects were reminded of the presence of the videotape equipment when the experimenter asked each to look up so that she was sure to get their faces recorded on tape. This time, the experimenter stood in front of the students with her clipboard and wrote notes about each one. She spent the rest of her time at the videotape camera. During the last task the experimenter excitedly shouted that she had forgotten to give the students green magic markers. The markers were supplied and the students continued work. The experimenter then tripped over a desk which fell over making a very loud "explosive" noise.

At the conclusion of each session, students were debriefed and asked not to divulge details of the experiment until their teacher had discussed the experiment with the entire class. None of the students had advance information as to the identity of students to be included in the sample.

Data Analyses

The overall statistical design of the experiment consisted of a 2 (sex) × 2 (locus of control) × 3 (stress) analysis of covariance. The dependent variables consisted of the measures of performance accuracy, the measures of time taken to complete each task, and the score on the situational anxiety scale. Each of the three performance and time measures was analyzed utilizing the matching IQ covariate. Due to the number of dependent measures involved in task performance accuracy and time, the level of significance set for testing experimental effects in regard to the task variables was $p < .01$.

Results

The data analyses conducted in the present study allow several firm conclusions: (a) internal subjects are successful in maintaining task performance accuracy under heightened environmental stress relative to a stress-free situation; (b) external subjects experience performance decrements in accuracy as stress increases; (c) the differences between the performance levels of internal and external subjects is greatest, and statistically significant, under the maximum stress conditions; (d) to a somewhat lesser degree, the performance speed of externals is more negatively influenced (increases) as stress increases, relative to internal subjects.

Table 1 presents adjusted performance means and standard deviations for the verbal, math, and perceptual tasks by experimental conditions. Utilized as the covariate for each of these sets of scores was the matching deviation intelligence score of each subject. The significant effects obtained for each variable were as follows. Verbal performance: locus of control, $F(1,61) = 11.21$, $p < .001$; locus of control $\times$ stress, $F(2,61) = 6.15$, $p < .01$. Math performance: locus of control, $F(1,61) = 12.04$, $p < .01$; locus of control $\times$ stress, $F(2,61) = 5.01$, $p < .01$. Perceptual performance: stress, $F(2,61) = 74.42$, $p < .001$.

For the variables of math and verbal performance internals did perform significantly higher than externals. However, the obtained significant interaction between locus of control and stress, to be discussed subsequently, assumes greater statistical meaning: the internals' better performance on these tasks was the result of differences occurring under the high stress condition.

Based upon a reconsideration of the manipulation associated with the perceptual task, as well as the patterning of the data, it is contended that the potential validity of this task, as an additional assessment of the various treatment effects, was negated. The substantial decrease in the quality of the copy of the figures, intended as the manipulation of stress within this task, was so severe under the high stress condition to preclude significant variation between groups of subjects.

Of particular importance to the present study is the significant interaction effect of stress $\times$ locus of control found for the de-

Table 1. Adjusted means and standard deviations for verbal, math and perceptual performance by levels of stress, locus of control, and sex of subjects.

		Base line				Moderate stress				High stress			
		I		E		I		E		I		E	
		M	F	M	F	M	F	M	F	M	F	M	F
Verbal performance													
	M	12.82	12.06	12.46	12.70	12.99	12.36	10.40	10.65	13.68	13.21	9.80	8.68
	SD	3.03	3.05	1.67	1.53	1.25	1.72	2.07	2.81	1.34	.78	1.00	3.98
	M	I: 12.00		E: 12.60		I: 12.62		E: 10.55		I: 13.40		E: 9.15	
Math performance													
	M	8.70	9.00	9.50	8.86	11.83	9.25	9.35	7.04	9.70	11.73	7.40	7.71
	SD	1.30	1.83	2.05	1.35	3.74	3.95	2.24	1.57	.84	1.72	1.34	1.38
	M	I: 8.87		E: 9.12		I: 9.72		E: 8.00		I: 10.88		E: 7.58	
Perceptual performance													
	M	18.45	18.12	18.65	19.64	13.08	12.45	12.86	13.94	9.20	8.64	9.85	9.08
	SD	1.30	1.95	1.00	.95	2.75	3.19	3.16	3.15	1.00	3.35	1.03	1.86
	M	I: 18.25		E: 19.22		I: 12.71		E: 13.49		I: 8.87		E: 9.40	

Note.—M = male; F = female; I = internal personality type; E = external personality type.

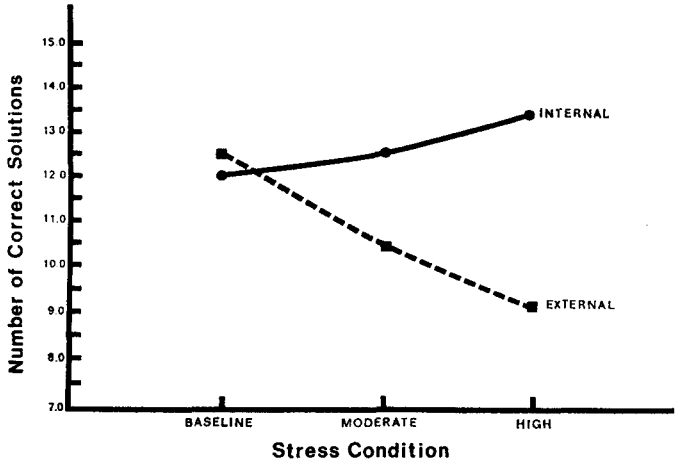

Figure 1. Verbal performance as a function of locus of control (internal-external) and stress condition.

pendent measures of verbal and math performance. A post hoc comparison between mean scores (Tukey Least Significant Difference, Kirk, 1968, p. 87) revealed that for both tasks internal subjects performed better than externals ($p < .01$) under the high stress condition. Additionally, external subjects in the base line condition performed better ($p < .01$) than externals under

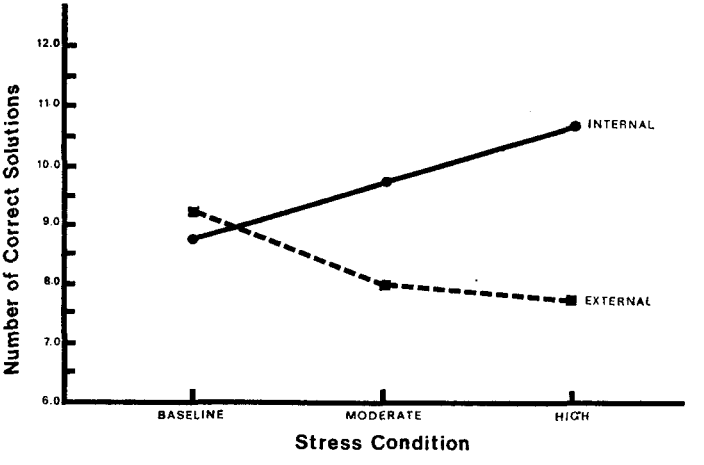

Figure 2. Math performance as a function of locus of control (internal-external) and stress condition.

high stress in the verbal task. Figures 1 and 2 present a graphic depiction of the overall patterning of the means relative to this interaction effect. Both graphs suggest that the performance differences between internals and externals increase as a function of added stress, and reach statistical significance under the maximum level of stress. This difference seems attributable to the decrement in the performance of externals, significantly so in the verbal task, and the increment in the performance of internals, although not statistically significant, as level of stress is increased.

Table 2 presents adjusted performance time means and standard deviations for the verbal, math, and perceptual tasks. Several significant effects were found: Math performance time: locus of control $\times$ stress, $F(2,61) = 4.92$, $p < .01$. Perceptual performance time: stress, $F(2,61) = 22.01$, $p < .01$; Stress $\times$ sex, $F(2,61) = 5.84$, $p < .01$. The latter two effects for perceptual performance time are again interpreted to be a function of the invalid manner in which stress was manipulated for this task. Many subjects in the moderate and high stress conditions required the full nine minutes for the task although they had not fully completed the task.

Comparison of means involved in the interaction between locus of control and stress for the variable of math performance time indicated that the only significant difference was between the higher time for internals in the base line condition relative to the lower time for internals under high stress. The difference in mean times between externals in the moderate and high stress conditions, as well as the difference between internals and externals in the high stress condition, just failed to reach a level of statistical significance. Figure 3 presents a graph of the means relative to this interaction effect. The clearest aspect of this graph seems to be that internals' time to complete the task decreased with added stress, while externals' time increased specifically from the moderate to high stress condition.

An analysis of the subjects' responses to the situational or state anxiety scale indicated only one statistically significant effect, that for stress, $F(2,61) = 3.51$, $p < .05$. The degrees of situational anxiety by levels of stress were as follows: base line, 23.40; moderate stress, 26.72; high stress, 30.18. No systematic differences in reported anxiety, as a function of locus of control or stress $\times$ locus of control were found.

Table 2. Adjusted means and standard deviations for verbal, math, and perceptual performance speed by levels of stress, locus of control, and sex of subjects.

		Base line				Moderate stress				High stress			
		I		E		I		E		I		E	
		M	F	M	F	M	F	M	F	M	F	M	F
Verbal time													
	M	267.40	398.71	405.60	346.29	388.60	389.14	434.80	430.29	299.20	360.71	429.40	359.43
	SD	164.12	140.92	80.35	62.82	102.79	104.27	139.87	97.42	84.65	88.96	117.27	126.77
	M	I: 343.99		E: 371.00		I: 388.83		E: 432.16		I: 335.08		E: 390.06	
Math time													
	M	189.20	254.71	168.20	169.14	151.80	175.71	142.80	127.00	155.80	116.71	227.00	176.28
	SD	63.86	98.71	66.40	48.47	50.97	76.85	50.12	43.61	42.35	38.37	177.07	61.19
	M	I: 227.41		E: 168.74		I: 165.74		E: 133.50		I: 132.99		E: 197.41	
Perceptual time													
	M	531.00	366.43	432.80	369.00	340.00	532.86	540.00	502.57	525.60	535.43	494.80	540.00
	SD	20.13	113.60	81.21	100.67	.00	18.90	.00	99.02	26.90	12.10	101.07	.00
	M	I: 435.00		E: 319.58		I: 535.83		E: 518.16		I: 531.33		E: 431.16	

Note.—M = male; F = female; I = internal personality type; E = external personality type.

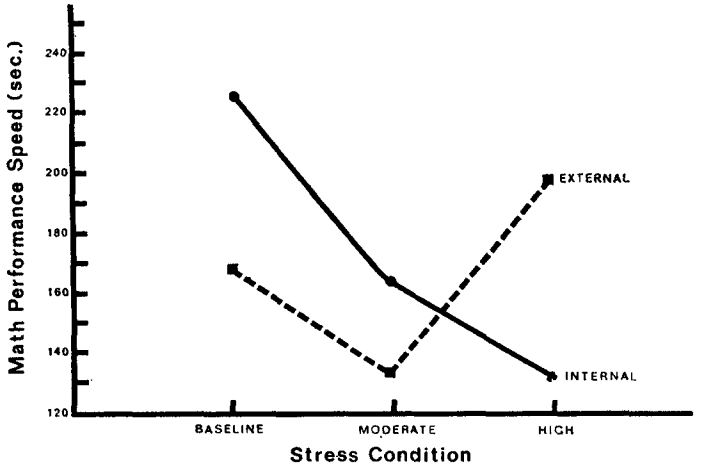

Figure 3. Math performance time as a function of locus of control (internal-external) and stress condition.

Discussion

Existent research has studied the role of personal control in the reaction to stress from several differing conceptual and methodological points of view. It seems important to differentiate, conceptually and methodologically, at least two types of stress, in order to account for the influence of expectancy for control. Stress and resultant threat can reside in a personal inadequacy and potentially disrupt self-concept and emotional security. Stress may also be conveyed through environmental hazards that function to threaten ongoing behavior and goal attainment. The influence of personal control is somewhat different in each case. It is contended that the manner and degree to which stress is disruptive for an individual in a given situation depends upon the conjoint effects of the type of stress encountered and the degree of expected personal control. The assessment of expectancy for control chosen for use in the present study, considered to reflect a generalized (personality) sense of control (Crandall et al., 1965), does also contain a much stronger situational frame of reference than other more generalized measures of locus of control. The intention of the present study was to define locus of control conceptually and operationally as a personality expectancy for control, and as highly salient for academic performance.

During each of the tasks the students encountered levels of stress specifically designed to disrupt goal-related performance. Stress was experienced in the form of strong environmental interruptions, competing demands, and unpredictable obstacles. The degree to which each subject could continue behaving in a goal-directed manner was challenged. Within the no-stress condition, internal and external subjects performed similarly. This is to be expected, given the amount of experience both types of subjects can be presumed to have had with verbal and mathematics tasks under similar instructional settings and the presumed equivalence in overall reward expectancy of the internal and external as a function of this amount of experience (Phares, 1976). As noted in previous research (Phares, 1976; Wolk & DuCette, 1974) performance differences between internal and external subjects are to be expected in the absence of significant amounts of experience with a task, or where the task is ambiguously defined, making prior experience less relevant. The base line condition thus functioned as a specific reference point against which to assess the disruptive effects of stress.

Differing conceptual reasons were considered to support the predictions that expectancy for control could influence the reaction to stress and threat to instrumental activity. The data appear to support one of these interpretations most strongly. At the outset of this discussion, however, it must be admitted that the experimenters were surprised by the absence of an effect of moderate stress upon overall performance. Apparently, for the type of well-learned tasks chosen for the experiment, a very high degree of stress is necessary for any significant effect upon performance level. This is consistent with other research and interpretations (Anderson & Faust, 1973) that have considered the effects of anxiety, as a drive stimulus, upon task performance as a function of level of learning.

Internal subjects in the high stress condition did make significantly fewer mistakes on both the verbal and math tasks than externals. Internals did not report a higher level of state or situational anxiety relative to externals, although on the average subjects reported more situational anxiety in this condition. The stressful stimuli were equally anxiety provoking for both the internal and external subjects. Indeed, it can be argued that neither the internal nor the external should have perceived

more or less control over these stimuli nor reported differing levels of situational anxiety. The stress could not be avoided and was dispersed by agents in the environment independent of the subjects' responses. Potential control over the stress was not possible. Other studies (Houston, 1972) in which avoidance of stress was possible as a function of invested control in the individual subject report that such control, either potential or actual, correlates with a reduction in the aversive value of stressful stimuli.

The present findings suggest the following. When subjects are classified in regard to the expectancy for control over the consequences of personal action, behavior-goal contingencies become important. Goal-directed behavior is strongly guided by the reward expectancy associated with the goal. Environmental stress, manipulated through disturbances, annoying demands, and unpredictable interruptions, would seem to challenge or qualify an individual's expected control over the contingency between behavior and goal. Past experience with similar tasks becomes less predictive of the expectancy for success or failure on a current task in which stressful stimuli are dominant. Rather the generalized belief in internal or external control over the rewards and failures following behavior, a component of overall reward expectancy not influenced by situational stress, leads to the relatively more successful maintenance of performance by the internal subject.

The external subject under high stress is again faced with an environment potent enough to interrupt his attention and concentration to the tasks. Stress leads the external to consider again the relatively more tenuous relationship between behavior and desired goals that characterizes a belief in external control. Stress is represented as goal obstacles that contribute to the breakdown of behavior-reward contingencies, a condition generally expected by external subjects.

Internal locus of control has been found to be correlated with the tendency to "master the environment," usually under less taxing conditions than in the present experiment (Phares, 1976). Expectancy for internal control often leads to the attempt to control, a congruence between expectancy and behavior. The internal's locus of control can continue to guide behavior toward goal outcomes in the face of a challenge from the environment.

Acting upon the expectancy for internal control, a subject can continue to believe in the likelihood of goal attainment. In the present study, expectancy for personal control leads to the maintenance of instrumental behavior under great stress, not because of a reduction in the aversiveness of stress, over which control is not realistically possible, but because of a continuation in the belief that behavior can reach its goal.

A final comment upon the differences between internal and external subjects under high stress concerns the pattern in performance times during the math task. Internal students took significantly less time to complete the task under high stress relative to the base line condition. Overall (Figure 3) the time to complete the task decreased as stress increased for the internal subjects. For the external groups none of the time differences were significant, although the greatest change occurred with an increase in time from moderate to high stress, indicative, again, of the disruption stress had for the external students. On the other hand, as increased stress challenges the internal's belief in control, the internal exerts himself more strongly. Stress seems to motivate this type of subject to perform a well-learned skill, although this added motivation does not evidence itself in an increase in performance accuracy. Although this conclusion is qualified by the lack of similar patterns in the times to complete the verbal task, there is some suggestion that stress can be either debilitating or facilitating to the efficency of task performance as a function of expectancy for control.

As a conclusion to the interpretation and discussion of the findings of this study, several strengths and weaknesses in the methodology should be noted. The use of a natural and familiar setting with tasks meaningful to the subjects, as well as forms of stress quite plausible to this type of setting, would seem to enhance the external validity of the findings. It should also be noted that great care was taken with the operational definitions of stress not to confound an increase in stress with an increase or decrease in the reward value of the task. As an example students were not instructed, "that it is important to do well since we will evaluate you relative to others," or "failure is likely," since such statements, while potentially stressful, also contain information that influences the reward value of task performance

as well. Reward value and reward expectancy are conceptually distinct influences upon performance (Phares, 1976).

The students did possess much learning experience in tasks similar to the math and verbal tasks. It could be reasoned then that the obtained effects of stress upon task performance may have represented "conservative" effects. That is, the reward contingencies underlying performance could be assumed to be strongly developed, and an inordinate degree of stress was necessary to produce disruption. Again, such conditions may actually resemble naturally occurring stress situations, in which well-learned skills would tend to predominate, or at the minimum, be relied upon when stress is encountered.

Several negative aspects of the experiment must also be considered. Although steps were taken to keep extraneous group effects to a minimum, it cannot be determined to what degree being in a small group attenuated the effects of stress. There did not appear to be systematic variation in task performances attributable to specific group membership; however, there may have been a "dampening" of the effect of stress for individual students through proximity to other students. The differences in state or situational anxiety reported by subjects in each of the stress conditions was of a smaller magnitude than might have been expected, given all that the moderate and high stress manipulations contained relative to the base line conditions. Many students did manifest great distress subsequent to the experiment and during the debriefing session. Perhaps this suggests the limits of self-report assessments of a characteristic as anxiety, by subjects such as young adolescents who may not feel comfortable to report feeling "uptight," "worried," or "tense" to an unfamiliar adult.

In summary, considering the strengths and weaknesses of the present study, there is support for the conclusion that type of stress exerts an important influence upon the relationship between expectancy for control and behavioral reactions to stress. It is the internal individual, acting upon his or her expectancy for personal control and the stronger reward expectancies that follow from such a belief, who is more successful in maintaining instrumental behavior. This reaction can be considered positive adaptation to stress, to be contrasted with the less adaptive re-

actions of the internal when stress is experienced in the form of threat to ego integrity. Thus, an understanding of the interactive effects of expectancy for control and stress upon behavior requires a distinction in the type of stress that can be encountered as well as the personal meaning each type of stress has for subjects who bring an internal or external locus of control to the stressful situation.

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