Journal of Personality and Social Psychology
1976, Vol. 34, No. 6, 1049–1056

Locus of Control and the Generality of Learned Helplessness in Humans

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To examine the effects of learned helplessness on tasks used to assess the aftereffects of stress, internal and external subjects were pretreated with contingent or noncontingent nonnoxious reinforcement using a yoking procedure to control for amount of trials and reinforcement. Both internal and external noncontingent subjects performed more poorly on subsequent tasks requiring a problem-solving strategy. However, only externals showed helplessness effects on non-problem-solving tasks.

Recent research has demonstrated that organisms which experience inescapable noxious stimulation show impaired performance on subsequent instrumental tasks. This phenomenon, described by Seligman (1975) as "learned helplessness," has been observed with humans (e.g., Hiroto, 1974; Krantz, Glass, & Snyder, 1974) as well as with infrahumans (e.g., Overmier & Seligman, 1967; Seligman & Maier, 1967). Seligman has proposed that learned helplessness occurs because the organism learns that its reinforcements are independent of its responses (i.e., that it lacks control over its outcomes), and this learning undermines the motivation to initiate further instrumental responses.

Closely related to the work on learned helplessness is Glass and Singer's (1972) research on the effects of noise on poststimulation performance. These authors reported that subjects exposed to uncontrollable noise that is unrelated to the ongoing task do more poorly on poststimulation tasks than subjects who perceive that they can terminate the noise at will. These effects were observed on poststimulation tasks as diverse as proofreading, a tolerance for frustration test, and the Stroop Color–Word task. Seligman (1975) interpreted these results as an example of learned helplessness. He argued that subjects unable to control the noise learn that their reinforcements are independent of their responses, which results in motivational decrements manifested in poorer performance on poststimulation tasks. Such an interpretation requires two assumptions that are not supported by existing literature: (a) Learned helplessness can be induced when performance on the experimental task (task performed during noise exposure) is not instrumental in escaping or avoiding the aversive stimulus, and (b) helplessness will generalize to a wide range of cognitive tasks including ones that do *not require a directed problem-solving strategy*. (Test tasks used in previous studies require subjects to initiate responses in a trial-and-error fashion; cf. Wortman & Brehm, 1975, p. 299.) The first purpose of this study is to examine this last assumption. Specifically, we have tried to determine whether task impairment on the Glass and Singer aftereffects tasks can be replicated when a more standard learned helplessness pretreatment is used.

Also related to the work on learned helplessness is the social learning construct, internal–external control of reinforcement (Lefcourt, 1966; Rotter, 1966). Internal–external locus of control refers to the degree to which an individual feels that his reinforcements are contingent upon his actions. Those who feel they control their reinforcements are labeled *internals*, whereas those who perceive their out-

The research reported in this article was supported by grants from the National Science Foundation (SOC 75-09224) and the University of Oregon Bio-Medical Fund.

The authors are indebted to Belinda Butler, Joy Reich, and Linda Nathan for serving as experimenters; to Andy Burger, Chris Wiper and Anne Lezak for helping in a pilot study; to Ray Klein, Gil Osgood, Al Murphy, Paul Farrar, and Nick Garshnek for technical assistance; and to Robyn Dawes for comments on an earlier draft.

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comes to be independent of their responses are labeled *externals*. The relationship between this personality factor and learned helplessness has been studied by Hiroto (1974), who reported that externals display greater helplessness effects than internals. Hiroto, however, included in his study only those subjects with extreme scores on the locus of control scale—at least one standard deviation from the mean. To determine whether people with internal–external scores that are less extreme are similarly affected by a helplessness manipulation, the present study used a less select group of subjects.

A third purpose of the present research is to examine Seligman's (1975) suggestion that learned helplessness should occur not only when an organism experiences uncontrollable noxious stimulation, as in the studies cited earlier, but also in situations in which the individual lacks control over nonnoxious contingencies. Evidence relevant to this hypothesis is supplied by two recent studies. Both Hiroto and Seligman (1975) and Roth and Kubal (1975) reported that subjects receiving noncontingent reinforcement on a concept-formation problem showed deficiencies on a subsequent problem-solving task. Although these studies support the suggestion that learned helplessness is induced by noncontingency rather than by some property of noxious stimulation, generalization of their results is limited by a subtle confound. In both studies, subjects in the noncontingent group were on random 50% reinforcement schedules. However, subjects in the contingent groups received substantially greater percentages of reinforcement. (The exact percentage for any subject depended on the number of trials required to learn the discrimination.) Thus, in manipulating whether the reinforcement is administered contingently or noncontingently, these studies have also varied the subject's actual success or failure. Recent work on learned helplessness induced by noxious contingencies has avoided this problem by yoking contingent and noncontingent subjects, with each member of a yoked pair receiving the identical number of reinforcements (cf. Hiroto & Seligman, 1975). In line with this, the present study manipulated contingency of nonnoxious reinforcement without varying the percentage of reinforcements received by the contingent and noncontingent groups. A yoking procedure similar to the one described above is used to accomplish this purpose.

The present study, then, is an attempt to induce learned helplessness by pretreating subjects with noncontingent nonnoxious reinforcement by means of a yoking procedure that does not confound contingency with percentage of reinforcement. To determine the degree to which a helplessness pretreatment on an instrumental task will generalize to other tasks, two of Glass and Singer's (1972) aftereffects tasks, a problem-solving task, and a task not requiring a problem-solving strategy were used during the test phase. Finally, subjects' scores on a locus of control scale were used to determine the effects of this individual difference on susceptibility to the learned helplessness pretreatment.

Method

Subjects

Subjects were 22 female and 20 male undergraduate students who received extra credit in an undergraduate psychology course for participating in the study.

Locus of Control

An abbreviated version of Rotter's (1966) Internal–External Locus of Control (I–E) Scale was administered to a large class of undergraduate psychology students. Political and ideological items were eliminated from Rotter's original scale on the basis of a factor analysis performed by Mirels (1970). Thirteen items with the highest loadings for a factor designated as control over personal events were chosen for the modified scale, along with six buffer items. Test administration was conducted by experimenters other than those associated with the experimental task and in a context unrelated to the experiment. The locus of control tests were scored in the external direction, resulting in a bell-shaped distribution ranging from 0 to 13. A median split excluding subjects who fell within 1 point of the median (excluding less than 10% of the sample) produced two experimental groups. Subjects falling below the median were labeled *internals* and those above the median were labeled *externals*.

Pretreatment: Contingent Versus Noncontingent Reinforcement

A computerized concept-formation task served as the vehicle for the experimental manipulations. The concept-formation task was based on the spatial relationships between pairs of designs. Subjects were presented with a repeating series of 32 different slides based on stimulus materials developed by Postman (1954) and described by Roth and Bootzin (1974). Each slide contained a stimulus figure and two possible response figures. One of the response figures was related to the stimulus figure in a manner that conformed to a specific principle: A line from the left design in the figure was transferred to the right design in the figure.

At the outset of the experiment, each subject was told by Experimenter A that the task was a test of spatial reasoning ability. The format of the slides was described to the subject, and an explanation of the concept formation task was given. In brief, each subject was told that one set of figures was arranged according to a particular rule or principle. His task was to choose the set of figures that he believed conformed to the appropriate principle. He was told that he would receive feedback after each trial informing him of whether his choice was correct or incorrect. The same principle applied to all of the slides presented, and his objective was to discover the appropriate rule in as few trials as possible. The experimenter then showed the subject a sample task with a similar format and demonstrated the process of systematically testing hypotheses. The experimental task itself was executed in the presence of a second experimenter (B) as soon as the first experimenter ascertained that the subject clearly understood the nature of a concept-formation problem.

The stimulus slides were projected on a 12-inch (30.5 cm) display screen directly in front of the seated subject. Each slide was exposed for 4 sec, after which a "please respond" message appeared on an oscilloscope located directly above the projection screen. The subject was permitted to take as long as he wished to choose either the right or left set of figures by pushing one of two corresponding response keys placed on the table in front of him. After the subject pressed one of the keys, a "right" or "wrong" message appeared on the scope. Immediately after the feedback message, the word *ready* appeared. When the subject was ready to proceed, he pressed either of the response keys, which activated the presentation of the next slide. The subject was free to take as much time as he wished before proceeding to the next slide. He was told to continue judging slides until he was notified to stop, even if he believed he had discovered the correct principle.

After each 20 trials, the experimenter showed the subject (in all conditions) one of eight hints. The hints were graduated so that the first one simply reiterated the instruction and the final ones described the solution to the problem. The hints were placed beside the subject, who was free to refer back to them whenever he wished. The hints were used to ensure that all subjects receiving contingent reinforcement would learn the discrimination within the 200 trials that were allowed. Postexperimental interviews suggest that subjects who received noncontingent reinforcement (and thus noninformative hints) were not suspicious about the hints but that they assumed instead that the problem was a difficult one.

Depending upon the subject's assignment to one of the experimental conditions, his performance on the concept-formation task was reinforced contingently or noncontingently. An equal number of internals and externals were (otherwise randomly) assigned to both the contingent and noncontingent feedback conditions. Experimenter A, who explained the task to the subject and later administered the aftereffects tasks, was unaware of the subject's assignment to the experimental conditions or whether the subject was in the group of internals or externals.

In the contingent feedback condition, the subject was told he was right whenever he chose the set of figures in which a line had moved from the left design to the right one. The alternative choice resulted in a wrong message. The task was terminated when the subject reached a criterion of 10 consecutive correct choices. For each subject in the contingent feedback condition, data on the number of correct responses and the number of trials to criterion were saved in a computer file. Each subject in the noncontingent feedback condition was yoked to a subject in the contingent group. The yoked subject received the same number of correct responses and total trials as the contingent subject. For the noncontingent subject, however, the reinforced responses were distributed randomly over the total number of trials.

Test Phase Task Assessment—Aftereffects Tasks

At the termination of the concept-formation task, the subject was taken to another room where two test tasks (Glass & Singer, 1972, aftereffects tasks) were administered by Experimenter A. In the first test task, an adaptation of the Stroop Color-Word test (Jensen & Rohwer, 1966; Stroop, 1935), the subject was required to read (or name) several lists of stimulus material as quickly and as accurately as possible. Subjects were timed separately on each of three separate pages of material. Each page was printed in paragraph form and contained each of four stimuli appearing in random order approximately 42 times each. The first sheet contained the color names red, orange, green, and blue. The second sheet contained color patches of the same four colors. Finally, the third sheet contained the Stroop task, in which the name of each of the four colors is printed in one of the other three colors, and the subject is required to name the colors that the words are printed in rather than reading the words themselves. The experimenter recorded the number of errors the subject made on each of the three readings in addition to the time required for each. The Stroop task was chosen as an example of a task not requiring a problem-solving strategy.

The second test task was a measure of tolerance for frustration adapted from Feather (1961). Four sets of line diagrams were placed in front of the subject. The diagrams were printed on 5 × 7 inch (12.7 × 17.8 cm) cards, and each of the four piles contained multiple copies of the same diagram or puzzle. The subject's task was to trace over all of the lines of the diagram without tracing any line twice and without lifting the pencil from the figure. The piles were placed in a specific order such that the subject would work first on an insoluble puzzle, second on a soluble one, third on another insoluble puzzle, and finally on another soluble one. A subject could take as many trials on a given diagram as he wished, but he was limited to a maximum of 40 sec per card. The subject could choose to continue working on the same diagram or move on to the next pile at any time, but he could not return to a previous pile after proceeding to another. The cards were placed face down until the subject began working on the pile. If the subject successfully completed the task for one diagram, he was to proceed to the next pile immediately. The number of cards attempted on each of the four diagrams and the amount of time spent on each one was recorded. The more time (also, the more cards) a subject spent on the insoluble puzzles (Cards 1 and 3), the greater his tolerance for frustration. This task is considered a problem-solving task.

Finally, each subject was asked to complete a short questionnaire designed to assess his reactions to the concept-formation task. On 7-point scales, subjects indicated how difficult, how stressful, and how frustrating they felt the problem had been. Subjects also used 7-point scales to evaluate their effort on the task, their degree of success on the task, and the degree to which they felt success on the task was under their own control. Subjects were debriefed following completion of the questionnaire.

Results

Performance on Concept-Formation Task

Since the procedure required that one half the subjects in the noncontingent condition be yoked to internal-contingent subjects and the other half to external-contingent subjects, it was necessary to determine whether the internal- and external-contingent subjects performed differently on the concept-formation task. A comparison of internal and external subjects in the contingent condition revealed no differences in number of trials to reach criterion (for internals, $M = 91.80$, for externals, $M = 88.36$, $t = .15$, *ns*) and no differences in the proportion of successful trials (for internals, $M = .57$, for externals, $M = .58$, $t = .26$, *ns*). Thus, subjects in the noncontingent condition who were yoked with internals received virtually the same number of trials and proportion of successes as did subjects who had been yoked with externals.

Manipulation Check

To determine whether the experimental manipulation achieved the desired effect, an analysis of covariance was carried out on measures of perceived control, perceived success, perceived difficulty, stressfulness, frustration, and effort.[1]

An analysis of ratings of perceived control indicated that subjects in the random condition felt significantly less control than subjects in the contingent condition, for contingency, $F(1, 41) = 9.96$, $p < .005$; there were no effects due to locus of control or to the interaction between contingency and locus of control.

Since one purpose of the yoking procedure was to control for the proportion of successes, and to vary only the contingency of the reinforcement, it was important to determine whether perceived success varied between the two conditions. Analyses of covariance of perceived success ratings revealed no significant main effects or interactions.

An analysis of perceived difficulty ratings indicated only that subjects in the noncontingent condition perceived the task as more difficult than did subjects in the contingent condition ($p < .02$). Despite differences in perceived difficulty, subjects did not report expending significantly more effort in the noncontingent than contingent condition. Nor did subjects in the noncontingent condition rate the stressfulness or frustration of the task as greater than did contingent subjects.

Thus, the checks on the manipulation indicate the experimental manipulation successfully influenced perceived control without influencing feelings of perceived success.

The Stroop Test

Data on error rates from the Stroop test showed no significant differences, so only data on the speed of completion are presented here. Three different measures were obtained for the Stroop test: (a) number of seconds to read words alone; (b) number of seconds to name color patches; and (c) number of seconds to name the color in which a word is printed (where the color in which the word is printed is different from the color described lexically by the word).

There were no significant differences among groups in the speed with which they read the words alone. However, significant differences

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[1] In all analyses of variance, number of trials and proportion of successful trials were used as covariates to separate variance due to differences between yoked pairs from variance due to experimental treatments. Although this procedure accounts for some residual variance, there were no differences between the contingent and noncontingent groups (who were yoked) or the internal and external groups on either of the covariates.

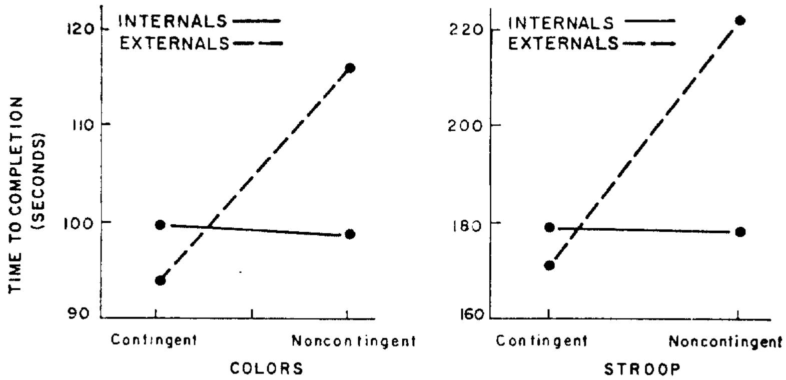

FIGURE 1 Performance on color naming and Stroop as a function of contingent versus noncontingent feedback on a prior concept-formation task.

emerged in both reading the color patches and in the Stroop task itself. It is apparent from Figure 1 that performance on the color patches and the Stroop task is comparable, and in both cases there was a significant interaction between contingency and locus of control. The performance of internals and externals was similar under contingent conditions, but the performance of the externals in the noncontingent conditions was significantly impaired. A main effect for contingency seems to be due to the strong effect of noncontingency on the externals (see Table 1).

TABLE 1
ANALYSIS OF COVARIANCE FOR COLORS AND STROOP TASK

Source	*SS*	*df*	*MS*	*F*
	Colors			
Total	10,866.95	41	265.05	
Contingency (A)	1,040.17	1	1,040.17	4.81*
Internal-External (B)	235.61	1	235.61	1.09
A × B	1,278.16	1	1,278.16	5.91**
No. trials	241.99	1	241.99	1.12
Proportion correct	583.16	1	583.16	2.70
Residual	7,786.86	36	216.30	
	Stroop			
Total	62,194.35	41	1,516.94	
A	6,324.25	1	6,324.25	5.10*
B	2,706.71	1	2,706.71	2.18
A × B	7,293.35	1	7,293.35	5.88*
No. trials	1,019.87	1	1,019.87	.82
Proportion correct	1,640.44	1	1,640.44	1.32
Residual	44,636.13	36	1,239.89	

* $p < .05$.
** $p < .02$.

Frustration-Tolerance Task

Insoluble cards. Data from the insoluble cards (1 and 3) were combined and are presented in Figure 2. As Figure 2 indicates, there is a strong main effect due to the experimental manipulations, with subjects in the contingent condition persisting at the insoluble task longer than subjects in the noncontingent condition, for the contingency main effect, $F(1, 41) = 6.85$, $p < .02$; see Table 2. There were no interactions or effects due to locus of control.

Soluble cards. Although it was not our intention to analyze the data from the soluble cards, some interesting differences emerged for these cards as well. Figure 2 indicates that for the soluble card (2), subjects in the noncontingent condition took longer to solve the problem than subjects in the contingent condition.[2] Also there is the hint of a main effect for locus of control, with externals spending the greatest amount of time, for the interaction, $F(1, 41) = 3.79$, $p < .06$.

DISCUSSION

Both internals and externals showed the expected helplessness effects on the puzzle-solving tasks. These results are consistent with those of previous work in the area (e.g., Hiroto & Seligman, 1975; Roth & Kubal, 1975)

[2] Data from the other soluble card (4) are not included here because the amount of time spent on the last card is not independent of the time spent on the previous cards. However, the data are consistent with those presented in Figure 2.

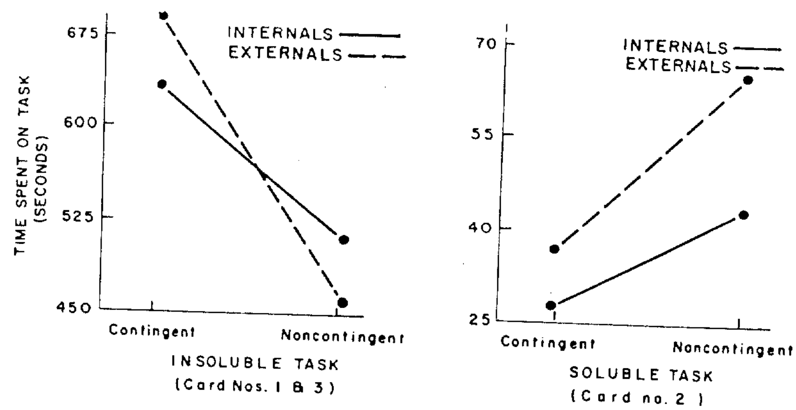

FIGURE 2. Persistence at soluble and insoluble tasks as a function of contingent versus noncontingent feedback on a prior concept-formation task.

and suggest that pretreating subjects with noncontingent nonnoxious reinforcement can induce subsequent deficits on problem-solving tasks. The strength of the helplessness pretreatment is suggested by its impact on soluble as well as insoluble puzzles. Moreover, even though the Stroop task was administered first, and thus intervened between the pretreatment and the puzzle task, both internals and externals showed deficits in puzzle performance.

Unlike the puzzles, the effects of the helplessness pretreatment on the Stroop—a non-problem-solving task—are mediated by individual differences in locus of control. Although both internals and externals show helplessness effects on the puzzles, only externals show deficits on the Stroop task.

Why does locus of control mediate response in the problem-solving task but not on the non-problem-solving task? There are two alternative explanations. First, externals may be more affected by the helplessness pretreatment than internals. This interpretation is consistent with the finding that externals spend more time than internals on the soluble problem-solving task. There are, however, no differences between internals and externals on the insoluble problem-solving task or the self-reports of control. A second explanation suggests that because of the consistency of the noncontingent pretreatment and their generalized expectancy, helplessness for externals generalizes to a wider range of tasks. Thus externals may be more susceptible to a noncontingent event in the sense that expectancies created by that event will be more general. In effect, the event may reinforce externals' generalized expectancy while creating only a task-specific (limited to problem-solving tasks) expectancy for internals.

Although it is striking that externals pretreated with noncontingent reinforcement performed more poorly on the Stroop (a non-problem-solving task that nevertheless is quite difficult), it is even more surprising that the experimental treatment affected the speed with which subjects could name the colored patches. Such an effect on such a low-effort task indi-

TABLE 2

ANALYSIS OF COVARIANCE FOR INSOLUBLE AND SOLUBLE TASKS

Source	*SS*	*df*	*MS*	*F*
Insoluble task				
Total	2,146,629.00	41	52,356.81	
Contingency (A)	335,308.00	1	335,308.00	6.85*
Internal–External (B)	285.35	1	285.35	.00
A × B	26,368.09	1	26,368.09	.54
No. trials	13,933.95	1	13,933.95	.28
Proportion correct	228.83	1	228.93	.01
Residual	1,763,355.00	36	48,982.08	
Soluble task				
Total	29,890.99	41	729.05	
A	5,366.27	1	5,366.27	9.18***
B	2,216.77	1	2,216.77	3.79*
A × B	285.34	1	285.34	.49
No. trials	777.71	1	777.71	1.33
Proportion correct	10.74	1	10.74	.02
Residual	21,055.25	36	584.87	

* $p < .06$.
** $p < .02$.
*** $p < .01$.

cates the generality of the learned helplessness pretreatment for external subjects. It is puzzling, however, that similar effects were not found for the reading of the names of the colors. This may indicate that there is a threshold of difficulty, or effort, below which the effect does not occur. Data indicating that naming color patches requires considerably more effort than reading color names (Fraisse, 1969) is consistent with this interpretation.

In a recent article, Hiroto (1974) reported that externals performed more poorly on problem-solving tasks than internals, regardless of whether their pretreatments consist of contingent or noncontingent reinforcement. He found no interaction between the contingency pretreatment and I–E scores. This suggests that externals entered his experiment in a helpless state (at least relative to internals) and that the contingency treatment did not further affect this state. This interpretation is further supported by the data Hiroto collected on the pretreatment tasks, which indicated that externals were slower to escape and avoid than internals, externals required more trials to reach avoidance criterion, and externals made fewer avoidance responses during pretreatment. The results of the present experiment do not support this interpretation. Internals and externals in the contingent reinforcement group required the same number of trials to criterion on the pretreatment task, and there were no main effects for locus of control on any of the test phase tasks.

The discrepancy between the results of the present study and Hiroto's study (Hiroto, 1974) may be attributable to the different means of assigning subjects to the internal and external conditions. In the present experiment only those subjects falling within one point of the median I–E score (less than 10% of the sample) were excluded. Hiroto, however, only used subjects scoring at least one standard deviation above or below the median. The selection of only those with extreme scores might explain the chronic helplessness effect that he found. It is also important to note that the pretreatment task in Hiroto's study was an aversive escape-avoidance task as compared with nonaversive contingencies involved in the present experiment. This suggests a second possible explanation for the discrepant results, that externals faced with aversive stimuli give up immediately, whether the aversive contingencies are controllable or not, but do not give up immediately when the contingencies are nonaversive.

Finally, equating contingent and noncontingent groups on number of trials and number of reinforcements allows us to determine whether perceived failure is a necessary cause of learned helplessness. Data from the Roth and Kubal (1975) study (in which contingency and amount of reinforcement were confounded) indicates that contingent subjects perceived that they were more successful than their noncontingent counterparts. However, in the present study, responses on the postexperimental questionnaire indicate that the experimental manipulation influenced perceived control without influencing feelings of perceived success: Noncontingent subjects reported that they were just as successful as contingent subjects. These results suggest that the helplessness effect is a result of the subject learning that he cannot control his reinforcements, not an affective response to failure. A study in which contingency and success are manipulated independently could provide further clarification of this point.

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(Received August 11, 1975)

Erratum to Keating and Brock

In the article, "The Effects of Prior Reward and Punishment on Subsequent Reward and Punishment: Guilt Versus Consistency" by John P. Keating and Timothy C. Brock (*Journal of Personality and Social Psychology*, 1976, Vol. 34, No. 3, pp. 327–333), two errors appeared in the left-hand column of page 331. The equation in line 24 reads:

$$F(1, 44) = 2.04, p < .05.$$

It should be changed to read:

$$F(1, 44) = 2.04.$$

The equation in lines 31 and 32 reads:

$$F(1, 44) = .18, p = .02.$$

It should be changed to read:

$$F(1, 44) = .18.$$