

## **Analysis of Self-Efficacy Theory of Behavioral Change<sup>1</sup>**

**Albert Bandura<sup>2</sup> and Nancy E. Adams**

*Stanford University*

*This article reports the findings of two experimental tests of self-efficacy theory of behavioral change. The first study investigated the hypothesis that systematic desensitization effects changes in avoidance behavior by creating and strengthening expectations of personal efficacy. Thorough extinction of anxiety arousal to visualized threats by desensitization treatment produced differential increases in self-efficacy. In accord with prediction, microanalysis of congruence between self-efficacy and performance showed self-efficacy to be a highly accurate predictor of degree of behavioral change following complete desensitization. The findings also lend support to the view that perceived self-efficacy mediates anxiety arousal. The second experiment investigated the process of efficacy and behavioral change during the course of treatment by participant modeling. Self-efficacy proved to be a superior predictor of amount of behavioral improvement phobics gained from partial mastery of threats at different phases of treatment.*

According to social learning theory (Bandura, 1977a), changes in defensive behavior produced by different methods of treatment derive from a common cognitive mechanism. It is postulated that psychological procedures, whatever their format, serve as ways of creating and strengthening expectations of personal effectiveness. Perceived self-efficacy affects people's

<sup>1</sup>This research was supported by Public Health Research Grant M-5162 from the National Institute of Mental Health. The authors are indebted to Laura Macht for her able assistance in administering the assessment procedures, and to Earl Neilson for his contributions to the preliminary work in this project. We are grateful to Paul McReynolds, Robert Peterson, and Duane Varble for arranging the research facilities at the University of Nevada, Reno.

<sup>2</sup>Address all correspondence to Albert Bandura, Department of Psychology, Stanford University, Stanford, California 94305.

choice of activities and behavioral settings, how much effort they expend, and how long they will persist in the face of obstacles and aversive experiences. The stronger the perceived self-efficacy, the more active the coping efforts. Those who persist in subjectively threatening activities will eventually eliminate their inhibitions through corrective experience, whereas those who avoid what they fear, or who cease their coping efforts prematurely, will retain their self-debilitating expectations and defensive behavior.

In this social learning analysis, expectations of personal efficacy stem from four main sources of information. Performance accomplishments provide the most influential efficacy information because it is based on personal mastery experiences. The other sources of efficacy information include the vicarious experiences of observing others succeed through their efforts, verbal persuasion that one possesses the capabilities to cope successfully, and states of physiological arousal from which people judge their level of anxiety and vulnerability to stress.

Empirical tests of this theory (Bandura, Adams, & Beyer, 1977), confirm that different treatment approaches alter expectations of personal efficacy, and the more dependable the source of efficacy information, the greater are the changes in self-efficacy. Thus, treatments based on performance accomplishments through the aid of participant modeling produce higher, stronger, and more generalized expectations of personal efficacy than do vicarious experiences alone. Results of a microanalysis of the congruence between self-efficacy and performance reveal that behavioral changes correspond closely to level of self-efficacy whether instated enactively or vicariously.

As a further test of the generality of this theory, an experiment was conducted of efficacy expectations instated by systematic desensitization, which is aimed at eliminating emotional arousal. Social learning theory and the dual-process theory of anxiety, on which the desensitization approach is based, posit different explanatory mechanisms for the changes produced by this mode of treatment.

The standard desensitization approach is based on the assumption that anxiety activates defensive behavior (Wolpe, 1974). According to this view, association of neutral events with aversive stimulation creates an anxiety drive that motivates defensive behavior. The defensive behavior, in turn, is reinforced by reducing the anxiety aroused by conditioned aversive stimuli. Hence, to eliminate defensive responding it is considered necessary to eradicate its underlying anxiety. Treatment strategies are therefore keyed to reduction of emotional arousal. Aversive stimuli are presented at graduated levels in conjunction with relaxation until anxiety reactions to the threats are eliminated.

Although desensitization produces behavioral changes, the principal assumption that defensive behavior is controlled by anxiety arousal is disputed by several lines of evidence (Bandura, 1977b; Bolles, 1972; Herrnstein, 1969; Rescorla & Solomon, 1967). Autonomic arousal, which constitutes the principal index of anxiety, is not necessary for defensive learning. Maintenance of avoidance behavior is even less dependent upon autonomic feedback. Social learning theory regards anxiety and defensive behavior as *coeffects* rather than as causally linked (Bandura, 1977b). Aversive experiences, of either a personal or a vicarious sort, create expectations of injurious consequences that can activate both fear and defensive behavior. Being *coeffects*, there is no fixed relationship between autonomic arousal and actions.

Dual-process theory predicts that thorough extinction of anxiety should eliminate avoidance behavior. In the desensitization treatment, however, anxiety reactions are typically eliminated to visualized representations of feared situations. One would expect some transfer loss of extinction effects from symbolic to real-life threats, as is indeed the case (Agras, 1967; Barlow, Leitenberg, Agras, & Wincze, 1969). It is not uncommon for people to perform less than they have been desensitized to in imagery. Therefore, extinction of anxiety to visualized threats might be expected to produce substantial, though less than complete, reductions in avoidance behavior. However, since anxiety arousal to visualized threats is completely eliminated in all subjects, dual-process theory provides no basis for predicting the substantial variability in behavior commonly displayed by subjects who have all been equally desensitized.

Stressful situations generally elicit emotional arousal that, depending on the circumstances, might have informative value concerning personal competency. Therefore, emotional arousal is a constituent source of information that can affect perceived self-efficacy in coping with stressful situations (Bandura, 1977a). Because high levels of arousal usually debilitate performance, individuals are more likely to expect to function effectively when they are not beset by aversive arousal than if they are tense and viscerally agitated. Treatment approaches that focus on physiological arousal as the major factor requiring modification further reinforce the expectation that anxiety arousal governs behavioral functioning. Clients are taught how to manage their physiological arousal, they learn to discriminate small variations in their level of arousal, and most of the treatment strategies are designed to eradicate physiological arousal to subjective threats. By the structuring explanations and therapeutic practices, arousal is thus given considerable salience.

From the perspective of social learning theory, reducing physiological arousal improves performance by raising efficacy expectations rather than

by eliminating a drive that instigates the defensive behavior. This cognitive mediating mechanism of change places greater emphasis on the informative than on the automatic energizing function of physiological arousal. Most arousal is activated by thought, and cognitive appraisal of arousal states to a large extent determines the level and direction of motivational inducements to action (Bandura, 1977b; Weiner, 1972). Because arousal is only one of several sources of efficacy information, and not necessarily the most dependable one, extinguishing anxiety arousal is rarely a sufficient condition for eliminating avoidance behavior.

To test the theory that desensitization changes behavior through its intervening effects on efficacy expectations, severe phobics were administered the standard desensitization treatment until their anxiety reactions were completely extinguished to imaginal representations of the most aversive scenes. Their approach behavior and efficacy expectations were measured before and after completion of desensitization treatment. The perceived self-efficacy of phobics reflects the direct and mediated experiences they have had with what they fear, as well as appraisals of their physiological arousal to the threats. Because subjects have met with different types and amounts of efficacy-generating experiences, it was hypothesized that eliminating emotional arousal alone would enhance self-efficacy but the levels attained would vary. It was further predicted that the higher and stronger the efficacy expectations instated by the desensitization treatment, the greater would be the reductions in avoidance behavior.

## METHOD

### *Subjects*

Subjects whose social, recreational, and vocational activities were adversely affected by chronic snake phobias were recruited through advertisements placed in a newspaper serving a metropolitan area and its suburban communities. All but one of the subjects who participated in the desensitization study were females. They ranged in age from 19 to 57 years with a mean age of 31 years.

### *Pretreatment Measures*

A multifaceted assessment procedure was used to provide the data required for a microanalysis of changes in expectations of personal effectiveness and avoidance behavior.

*Behavioral Avoidance.* The test of avoidance behavior consisted of a series of 29 performance tasks requiring increasingly more threatening interactions with a red-tailed boa constrictor. The hierarchical set of tasks required subjects to approach a glass cage containing the snake, to look down at it, to touch and hold the snake with gloved and bare hands, to let it loose in the room and return it to the cage, to hold it within 12 cm of their faces, and finally to tolerate the snake crawling in their laps while they held their hands passively at their sides.

A female tester administered all the assessment procedures. Prior to measuring phobic behavior, subjects were given factual information about the characteristics and habits of snakes to eliminate moderately fearful subjects who might be emboldened by factual information alone. Those who could not enter the room containing the snake received a score of zero; subjects who did enter were asked to perform the various tasks in the graded series. To control for any possible influence of expressive cues from the tester, she stood behind the subject and read aloud the tasks to be performed.

The avoidance score was the number of snake-interaction tasks the subject performed successfully. Those who could lift the snake inside the cage with a gloved hand were considered insufficiently fearful and were not included in the experiment. To maximize the generality of the findings, all people who were sufficiently phobic on the behavior test were selected for study.

*Fear Arousal Accompanying Approach Responses.* In addition to the measurement of performance capabilities, the degree of fear aroused by each approach response was assessed. During the behavioral test, subjects rated orally, on a 10-interval scale, the intensity of fear they experienced when each snake approach task was described to them, and again while they were performing the corresponding behavior. These fear ratings for all the approach tasks actually completed were averaged to provide the index of fear arousal.

*Efficacy Expectations.* In the pretest phase efficacy expectations were measured after the test of behavioral avoidance so that subjects would have some understanding of what types of performances were required. Separate measures were obtained of the magnitude, strength, and generality of expectations.

Subjects were provided with the list of performance tasks included in the behavioral test and instructed to designate those they expected to perform as of then. For each task so designated, they rated the strength of their expectations on a 100-point probability scale, ranging in 10-unit intervals, from high uncertainty through intermediate values of certainty to complete certitude. The *level* of self-efficacy was the number of performance tasks

subjects designated they expected to perform with a probability value above 10, which was the lowest point on the scale signifying virtual impossibility. *Strength* of self-efficacy was computed by summing the magnitude of expectancy scores across tasks and dividing the sum by the total number of performance tasks. To provide an index of the *generality* of self-efficacy, subjects rated the level and strength of their expectations in coping successfully with an unfamiliar snake as well as with a boa constrictor similar to the one used in treatment.

Efficacy expectations were measured after the behavioral pretest, prior to the posttest that was administered within a week after treatment was concluded, and after completing the behavioral posttest. These expectations were recorded privately and remained so during the behavior tests to minimize any motivational inducements to improve performance that could arise had the expectations been communicated publicly to the examiner.

*Situational Generalization of Fear and Self-Efficacy.* Situational generalization of the effects of desensitization was assessed in terms of subjects' anticipatory fear of snake encounters under different natural conditions and their self-efficacy in coping with them.

Fear of snake encounters in natural situations was measured on six scales portraying diverse encounters with snakes, including visiting a reptile exhibit, watching a film on the habits of snakes, suddenly confronting snakes on hikes or in a garage, visiting a household containing pet snakes, and handling them. Subjects were instructed to rate each item on a 7-interval scale of fearfulness. The mean of the six ratings constituted the level of anticipatory fear arousal over encounters with snakes.

Subjects also rated the situations described above in terms of how effectively they could cope with snakes were they to encounter them in their everyday life. The ratings were averaged to provide a score of perceived self-efficacy in dealing with snakes. In addition, they rated their self-efficacy in coping with other animals they feared and with difficult social situations. Animal and social threats were selected to provide additional measures of generalization of perceived self-efficacy along a dimension of similarity to the threat that was the focus of treatment.

### *Systematic Desensitization*

A female therapist administered to subjects individually the systematic desensitization treatment. As in the standard procedure, deep muscular relaxation was successively paired with imaginal representations of snake scenes arranged in order of increasing aversiveness. During the first session subjects received training in muscular relaxation. In addition, they were provided with audio cassettes and relaxation tapes for use at home to

improve their facility at inducing deep relaxation. They continued the home practice in relaxation twice a day over 4 consecutive days.

In subsequent treatment sessions, after being deeply relaxed, subjects were instructed by the therapist to visualize the least threatening item in the hierarchy of anxiety-provoking scenes. The anxiety hierarchy contained a total of 51 scenes ranging from relatively innocuous activities such as visualizing themselves looking at pictures and toy replicas of snakes to handling live snakes in ways that would be highly fear-provoking. Whenever subjects signaled anxiety to visualization of a threatening scene it was withdrawn, relaxation was reinstated, and the same item was repeatedly presented until it ceased to evoke anxiety. If relaxation remained unimpaired in the imagined presence of the threat, subjects' anxiety reactions to the next item in the hierarchy were extinguished. This procedure was continued throughout the graduated series of aversive scenes until subjects' anxiety reactions to the most threatening events were completely eliminated. The average duration of the desensitization treatment, not counting the relaxation training, was 4 hours, 27 minutes.

### *Posttreatment Measures*

The assessment procedures used in the pretreatment phase of the study were readministered within a week after the completion of treatment. Efficacy expectations were measured prior to, and after, the behavioral posttest to examine the reciprocal influence between expectations and performance accomplishments.

To gauge the generality of changes in self-efficacy and performance, subjects' approach behavior was measured initially toward the dissimilar corn snake and then with the red-tailed boa used in the pretest. Subjects were tested with the dissimilar snake first to minimize possible transfer effects from performance improvements during the posttest, which would be more likely to occur in dealing with a familiar threat a second time than in coping with a new one.

The same female tester who conducted the pretest administered the posttreatment measures. To control for any possible bias, she was not informed of the conditions to which subjects had been assigned.

### *Supplementary Treatment*

Subjects who failed to achieve terminal performances in the posttest after completing the desensitization treatment were administered participant modeling until they performed all the therapeutic tasks successfully.

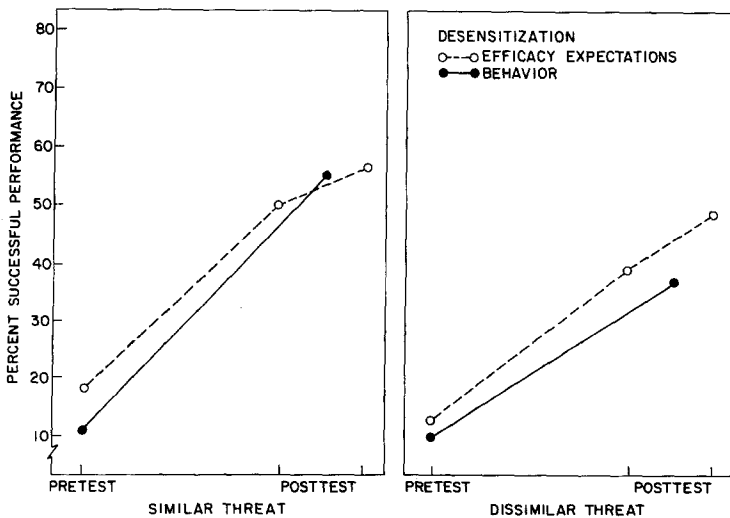
The therapist first modeled the relevant activities and then guided the subject with response induction aids through the graded hierarchy of tasks until they were fully mastered. The subjects were then readministered the standard assessment procedures.

## RESULTS

### *Level of Self-Efficacy*

Phobics whose anxiety arousal to visualized threats was thoroughly extinguished emerge from the desensitization treatment with widely differing expectations of personal efficacy. The mean level of efficacy expectations and approach responses displayed by subjects at different phases of the experiment are presented graphically in Figure 1. Table I shows the significance of the changes achieved by subjects, as evaluated by the *t* test for correlated means.

Comparison of efficacy expectations prior to treatment and following treatment, but before the posttest, confirms that extinction of anxiety arousal through symbolic desensitization significantly enhances self-efficacy toward similar and dissimilar threats alike (Table I). Analysis of



**Fig. 1.** Level of efficacy expectations and approach behavior displayed by subjects toward different threats after fear arousal to symbolic representations of threatening activities was eliminated through systematic desensitization.



Table I. Significance of Intragroup Changes for Each Measure

Measure	Desensitization	Participant modeling
	Pretest vs. posttest ( <i>N</i> = 10)	Posttest vs. supplemental test ( <i>N</i> = 8)
Level of efficacy expectations		
Total	4.06 <sup>a</sup>	4.83 <sup>b</sup>
Similar threat	4.04 <sup>a</sup>	5.64 <sup>b</sup>
Dissimilar threat	3.83 <sup>a</sup>	3.79 <sup>a</sup>
Strength of efficacy expectations		
Total	3.99 <sup>a</sup>	3.61 <sup>a</sup>
Similar threat	4.06 <sup>a</sup>	3.94 <sup>a</sup>
Dissimilar threat	3.89 <sup>a</sup>	2.47 <sup>c</sup>
Approach behavior		
Total	6.00 <sup>b</sup>	8.15 <sup>b</sup>
Similar threat	5.51 <sup>b</sup>	5.19 <sup>b</sup>
Dissimilar threat	4.17 <sup>a</sup>	5.84 <sup>b</sup>
Fear arousal		
Initial approach		
Total	5.16 <sup>b</sup>	3.31 <sup>a</sup>
Similar threat	5.44 <sup>b</sup>	2.80 <sup>c</sup>
Dissimilar threat	5.07 <sup>b</sup>	2.38 <sup>c</sup>
Total approach		
Total	3.52 <sup>a</sup>	4.30 <sup>a</sup>
Similar threat	3.05 <sup>c</sup>	5.23 <sup>b</sup>
Dissimilar threat	3.08 <sup>c</sup>	3.20 <sup>a</sup>
Anticipatory fear arousal		
Total	4.78 <sup>b</sup>	2.85 <sup>c</sup>
Similar threat	5.33 <sup>b</sup>	2.90 <sup>c</sup>
Dissimilar threat	4.17 <sup>a</sup>	2.41 <sup>c</sup>
Generalized self-efficacy		
Snakes	5.64 <sup>b</sup>	3.44 <sup>a</sup>
Other animals	2.54 <sup>c</sup>	1.83
Social	1.46	.36
Generalized fear reduction	6.55 <sup>b</sup>	3.75 <sup>a</sup>

<sup>a</sup>*p* < .01.<sup>b</sup>*p* < .001.<sup>c</sup>*p* < .05.

mean approach responses yielded a similar pattern of significant increases in approach behavior toward both threats.

Although subjects expressed significantly higher self-efficacy ( $t_{(9)} = 2.53$ ,  $p < .05$ ) and performed more approach responses ( $t_{(9)} = 2.58$ ,  $p < .05$ ) toward the similar than toward the dissimilar threat, the degree of correlation between efficacy and performance was similar regardless of the nature of the threat. The higher the level of perceived self-efficacy at the

completion of treatment, the higher was the level of approach behavior ( $r = .75, p < .01$ ).

### *Microanalysis of Congruence Between Self-Efficacy and Performance*

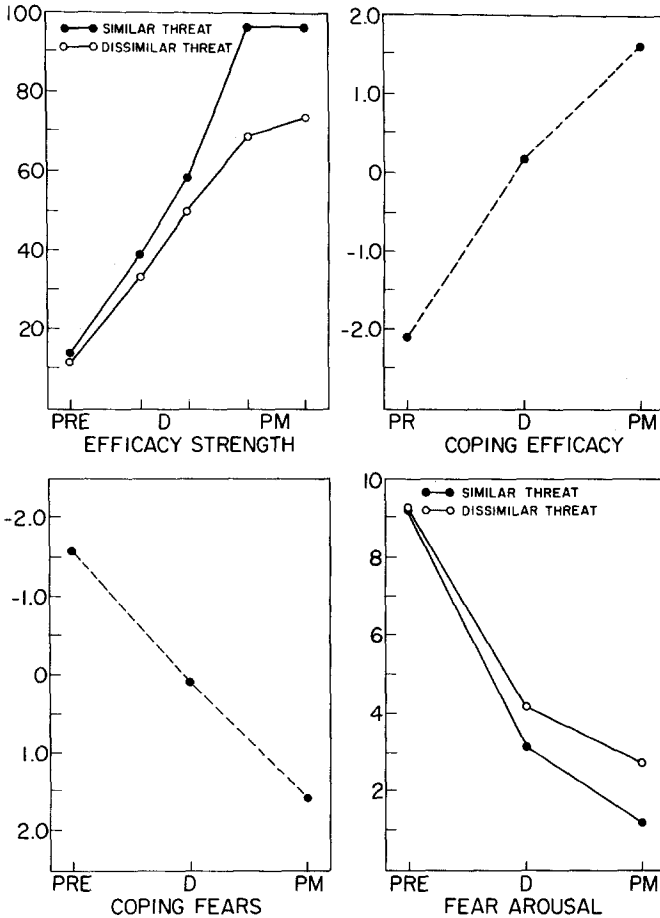
Correlations based upon aggregate measures do not fully reveal the degree of correspondence between self-efficacy and performance on the specific tasks from which the aggregate measures are obtained. A subject can display an equivalent number of efficacy expectations and successful performances but they might not correspond entirely to the same tasks. The most precise index of the relationship is provided by a microanalysis of the congruence between self-efficacy and performance at the level of individual tasks.

The microanalytic measure of congruence is obtained by recording whether or not subjects considered themselves capable of performing each of the various tasks at the end of treatment and computing the percent of accurate correspondence between efficacy judgment and actual performance. Self-efficacy was a highly accurate predictor of approach behavior exhibited on tasks varying in difficulty toward both threats by subjects who had been thoroughly desensitized (84% congruence). The efficacy-behavior congruence for the similar threat (85%) was comparable to that for the dissimilar threat (82%).

The preceding indices of congruity are based on all of the assessment tasks, some of which subjects performed in the pretest. When the microanalysis is conducted only on the subset of tasks that subjects had never performed in the pretest assessment, the degree of congruence between perceived self-efficacy and subsequent behavior is equally high toward similar (83%) and dissimilar (81%) threats. It should be noted in passing that the relationship between efficacy judgments and performance reported in an earlier article (Bandura, 1977a) differs slightly from the correlational and congruence indices given above because additional subjects were added to the sample since the earlier report.

### *Strength of Self-Efficacy*

In the preceding analysis, a weak sense of self-efficacy received the same weight as one reflecting complete certitude. However, one would expect intensity and persistence of effort, and hence level of performance, to vary as a function of strength of perceived self-efficacy. The results reveal that desensitization enhances strength, as well as level, of efficacy expectations.



**Fig. 2.** Changes in strength of efficacy expectations (upper left panel), self-efficacy in coping with snake encounters in natural settings (upper right panel), fear of snake encounters in natural settings (lower left panel), and fear arousal accompanying interaction responses toward the test snakes (lower right panel) displayed by subjects after receiving desensitization (D) and participant modeling (PM) treatments.

Prior to treatment, subjects expressed relatively weak performance expectations. The desensitization treatment, however, increased the strength of subjects' perceived self-efficacy (Figure 2). As summarized in Table I, these differences are highly significant for both threats and for the pooled data. The stronger the performance expectations at the completion of treatment, the higher the level of approach behavior ( $r = .72, p < .01$ ).

Because of the high congruence between self-efficacy and performance, subjects did not alter their efficacy expectations much after

completing the behavioral posttest. They raised the strength ( $t_{(9)} = 3.79$ ,  $p < .05$ ), but not the level, of their efficacy expectations on the basis of their achievements in the posttest.

### *Fear Arousal Accompanying Approach Responses*

Reduction in fear arousal accompanying approach responses was evaluated by comparing the average level of fear elicited by responses that subjects performed before treatment with the fear levels reported in the posttest for the same subset of approach responses, and for the total number of approach responses they completed successfully. Results of the statistical analysis are shown in Table I. In accord with evidence of previous studies (Bandura, Blanchard, & Ritter, 1969), symbolic desensitization produced substantial reductions in fear arousal accompanying the initial and total approach responses toward both threats, with the familiar threat eliciting the weaker fearful reactions ( $t_{(9)} = 2.29$ ,  $p < .05$ ).

Decreases in the level of anticipatory fear evoked in the posttest by the approach task that subjects could not perform in pretest provides an index of fear extinction that is unaffected by having previously performed that particular behavior. This measure also reveals a significant decrement in fear arousal in relation to both threats (Table I).

The activation of anxiety has traditionally been depicted as a process in which anxiety arousal is elicited directly either by the conditioned aversive properties of stimuli or by their symbolized representations of unconscious forces. Neither the conditioning nor the psychodynamics theories require much in the way of conscious involvement of the person in the activation process. In the social learning theory of anxiety, it is mainly the perceived lack of efficacy to manage potentially aversive aspects of the environment that makes them fearsome. People fear potential aversive events that they construe as exceeding their coping capabilities, but do not find them fearsome if they believe they can manage them.

The correlational analysis lends some support to the view that perceived self-efficacy mediates anxiety arousal. The higher the subjects' level of self-efficacy following treatment, the less was their anticipatory arousal at the prospect of performing threatening tasks they previously avoided ( $r = -.71$ ,  $p < .025$ ), and the weaker was the accompanying arousal when they subsequently performed the various interaction tasks ( $r = -.65$ ,  $p < .025$ ). A similar pattern of relationships was obtained between strength of self-efficacy and degree of arousal. A strong sense of self-efficacy was associated with low anticipatory arousal ( $r = -.54$ ,  $p < .10$ ) and weak anxiety arousal while performing threatening tasks ( $r = -.60$ ,  $p < .05$ ).

### *Situational Generalization*

The findings on the situational generalization of treatment effects are consistent with those obtained through direct assessment with the two different threats (Table I). Extinguishing arousal to symbolic representations of threats reduced anticipatory fear and enhanced self-efficacy in coping with snakes and with other animals in natural situations.

### *Supplementary Treatment*

It will be recalled that subjects who achieved only partial improvement were administered participant modeling after the formal experiment was completed. Only one of the subjects achieved terminal performance through symbolic desensitization alone. This is not surprising because most of the subjects in the sample (80%) were exceedingly phobic, refusing in the pretest assessment to enter the test room or even to view the snake at a safe distance. Of the remaining nine subjects, eight were available and received the supplemental treatment using participant modeling.

Compared to the scores obtained following desensitization treatment, participant modeling instated marked changes on all measures (Table I). It boosted substantially the level, strength, and generality of self-efficacy; it enabled all but one subject to achieve terminal performances; it completely extinguished anticipatory and performance fear arousal; and it enhanced self-efficacy in coping with reptiles and other animals under varying natural conditions.

In the microanalysis of efficacy-performance congruence, which is the evidence of primary theoretical interest, efficacy expectations were highly reliable predictors of subsequent approach behavior toward similar (97%) and dissimilar (76%) threats on all tasks. The corresponding congruence between self-efficacy and behavior toward similar (94%) and dissimilar (62%) threats was also high even for the restricted number of highly threatening tasks that subjects were unable to perform either in pretest or following completion of desensitization treatment.

### **MICROANALYSIS OF SELF-EFFICACY AND PERFORMANCE CHANGES DURING THE COURSE OF PARTICIPANT MODELING**

The series of experiments completed to date examined the value of efficacy expectations in predicting behavioral changes at the completion of enactive, vicarious, and emotive modes of treatment. The present study in-

vestigated the process of efficacy and behavioral change during the course of treatment itself. A microanalysis of the process of change as treatment progresses provides an especially rigorous test of the explanatory and predictive power of self-efficacy theory. Participant modeling was selected for this purpose because the amount of treatment can be well regulated and it promotes rapid change.

In the design of this experiment, performance tasks were segmented into blocks of activities that were progressively more difficult and threatening. Phobic subjects received participant modeling treatment only for the block of items at which they failed in the hierarchy of tasks. Treatment was continued until they could perform the activities in the failed block, whereupon they were tested for their efficacy expectations and approach responses on all succeeding blocks. This sequence of treatment on the failed block followed by tests on succeeding blocks was repeated until subjects achieved terminal performances. Based on the central thesis that perceived self-efficacy is the mechanism through which treatments reduce avoidance behavior, it was hypothesized that changes in efficacy expectations instated by partial mastery experiences would accurately predict the level of subsequent behavioral change.

## METHOD

### *Subjects*

Six severe snake phobics recruited from the same population through a newspaper advertisement served as subjects in this experiment.

### *Sequential Microanalytic Procedure*

The various treatment activities were divided into 11 natural blocks of tasks of increasing difficulty and threat value. Items in the initial block included looking at a caged boa constrictor from progressively closer distances until subjects could stand along side the cage. Succeeding blocks included placing gloved and bare hands against the glass side adjacent to the snake's body and head area, looking down at the snake with the cover drawn partially and then fully open, placing gloved and bare hands inside the cage; touching and then lifting the snake inside the cage with gloved and bare hands for increasing intervals. The higher level blocks required subjects to hold the snake outside the cage with gloved and bare hands for progressively longer periods; to let the snake loose in the room, retrieve it, and

return it to the cage; to hold the snake in front of their faces; and finally to tolerate the snake crawling in their laps for an extended period while they held their hands passively by their sides.

*Behavioral Pretest.* At the beginning of the experiment, a female tester administered the behavioral avoidance test. As previously described, the test consists of a series of 29 tasks requiring increasingly more threatening interactions with the boa constrictor.

*Sequential Treatment and Assessment.* A different female experimenter administered individually the treatment procedure. She first modeled the full range of activities while subjects observed from a distance in the room. Subjects then received the participant modeling treatment for the block of items they failed in the hierarchy of pretest assessment tasks. In implementing the procedure, the therapist enlisted whatever response induction aids were required to enable subjects to perform the tasks within the failed block and then faded out the supplementary aids so that subjects eventually performed the activities unassisted. This treatment approach, including the standard set of response induction aids, is described at length elsewhere (Bandura, Jeffery, & Wright, 1974).

After subjects successfully performed the previously failed block of tasks, the experimenter departed and the subjects proceeded to a designated section of the room where the self-efficacy recording forms were enclosed in a folder. Subjects recorded privately which of the 29 performance tasks they judged themselves capable of completing as of then, and rated the strength of their efficacy expectations using the format described earlier. When subjects finished recording their level and strength of self-efficacy, the tester administered the behavioral avoidance test. Subjects who attained terminal performances received no further treatment. For those who achieved only partial improvement, the sequence of treatment on the failed block followed by assessments of self-efficacy and approach behavior on succeeding blocks was repeated until they achieved terminal performances.

## RESULTS

Figure 3 presents the level of self-efficacy and performance instated by each fractional treatment for each of the subjects. The numbers appearing immediately below the bar graphs refer to the block of activities on which the subjects received treatment. As can be seen from the figure, almost all the subjects required treatment on the intermediate block of activities. At this block 6 level, subjects were aided through participant modeling to touch the snake in the cage. Interestingly, although all subjects successfully performed these same activities, they varied considerably in

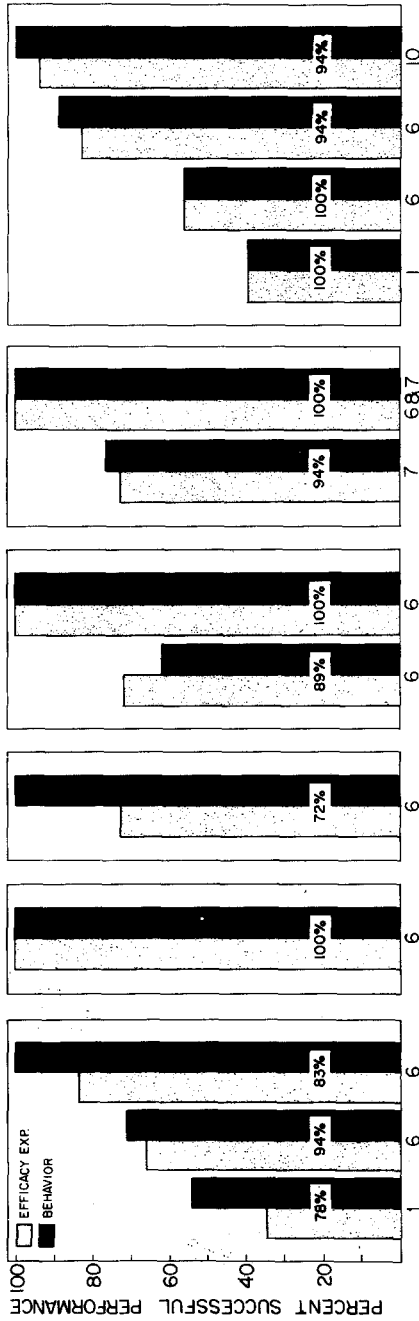


Fig. 3. Degree of congruence between self-efficacy and behavior shown by each of six subjects during the course of participant modeling treatment. The numbers appearing below the bar graphs refer to the blocks of activities on which each subject received treatment; the percentages reported on the bar graphs show the degree of congruence between efficacy judgments and subsequent performance after subjects mastered subsets of activities they previously failed.



their subsequent performance attainments on the behavioral avoidance test. Some failed similar tasks during assessment and required a repeat treatment on the same level of activities; others moved slightly beyond the treated level; and still others achieved terminal performances after being aided to touch the snake.

It is of further interest to note that of the subjects who failed to perform the intermediate level activities, which they had previously mastered in treatment, virtually all achieved terminal performances after they were again treated on the identical intermediate task. Thus, it is evident from the widely variable performances that follow the same partial mastery in treatment that past performance is of limited value in predicting what subjects would be able to do when tested on more threatening tasks.

### *Efficacy-Performance Congruence*

Although previous behavior is a weak predictor of subsequent performance, inspection of Figure 3 shows perceived self-efficacy to be an excellent predictor. This is revealed most precisely in the microanalytic measure of the degree of congruence between self-efficacy and behavior on each task. These congruence indices are reported separately on the bar graphs for tests conducted after the completion of each partial treatment.

To provide an aggregate index of fit, the congruencies between efficacy judgments and performance were summed across tasks, fractional treatments, and subjects. Self-efficacy predicted subsequent performance as measured at different points in treatment in 92% of the total assessment tasks. This relationship holds even when the measure of congruence is based only on the subset of activities that subjects could not perform in treatment because they extended beyond the failed block of activities. Efficacy expectations formed through partial mastery experiences during the course of treatment predicted at an 84% level of accuracy performance on highly threatening tasks that subjects had never done before.

## **DISCUSSION**

Results of the present series of experiments, combined with previous findings (Bandura et al., 1977), lend substantial validity to the theory that psychological influences alter defensive behavior by enhancing the level and strength of perceived self-efficacy. First, it provides a common theoretical framework for explaining and predicting behavioral changes accompanying diverse modes of treatment. Thus, efficacy expectations predict with considerable accuracy the level of performance regardless of whether self-effi-

cacy is changed through enactive mastery, vicarious experience, or extinction of anxiety arousal by systematic desensitization.

Prediction of differential changes in behavior by people receiving the same mode of treatment provides an even more stringent test of the explanatory mechanism. Although anxiety reactions to visualized threats were thoroughly eliminated by desensitization in all subjects, nevertheless, their performance attainments varied from 10% to 100% of the tasks, a rather large dispersion. Knowing that they achieved equivalent extinction of anxiety arousal is of little aid in predicting how much they would change behaviorally. However, percepts of self-efficacy instated by the desensitization treatment account well for the variability in performance.

The findings of the microanalysis of the process of change during the course of participant modeling not only lend further support for the social learning theory but provide a basis for comparing the predictive value of behavior and perceived efficacy. Knowing that all subjects successfully performed intermediate level activities was of little value in predicting their performance attainments on subsequent tasks because the same mastery achievements produced varied changes in behavior. The same level of enactive mastery also produced differential levels of self-efficacy, which were excellent predictors of performance.

Evidence that comparable behavioral enactment and arousal extinction create differing efficacy expectations underscores other aspects of self-efficacy theory that require investigation. One important constituent function concerns the cognitive processing of efficacy information. The efficacy information conveyed by enactive, vicarious, and emotive experiences must be distinguished from the information as processed, transformed, and integrated by the individual. For example, the efficacy judgments formed from behavioral enactments will depend on how people appraise the difficulty of the tasks, the amount of time and effort they had to expend, and the number of situational aids they needed to achieve the requisite performances. To the extent that people differ in how they judge the many factors bearing on their performance, their percepts of self-efficacy will vary to some degree.

The effects on self-efficacy of information conveyed by visceral arousal will similarly depend on how it is cognitively appraised. A number of factors, including appraisal of the sources of arousal, the situational circumstances under which arousal is elicited, and past experiences on how level of arousal affects one's performances figure in the cognitive processing of emotional reactivity. To cite a familiar example, seasoned dramatic actors, who become anxious before a performance but lose their apprehensiveness once the play gets under way, are likely to ascribe their arousal to common situational factors rather than to personal deficiencies. For people who find moderate levels of arousal facilitatory rather than debili-

tating, arousal will have different informative value than those for whom arousal usually portends inadequate performances.

A second aspect of the theory relates to the multiple determination of self-efficacy. The impact of any single source of efficacy information will partly depend on the total configuration of efficacy experiences in which it occurs. Because people have met with different types and amounts of efficacy-relevant experiences, there is little reason to assume that providing one new source of efficacy information will affect everyone uniformly. Extinguishing fear arousal to threats will raise efficacy expectations, but more so in persons who have had occasional performance successes than in those who have consistently failed in their coping attempts.

Another issue that warrants some discussion concerns the measurement of self-efficacy. Proponents of radical behaviorism are quick to find fault with measures based on verbal indices. They usually relegate such measures to the subordinate status of mere "verbal reports," which supposedly have an ill-defined relationship to the cognitive events they represent. Among the behaviorally oriented theorists, those who are willing to embrace cognitive factors in their conceptual schemes generally favor physical indicants of cognitive activities in the form of autonomic or motor reactions.

Review of the research literature suggests that ascriptions of limitations to verbal judgments often arise more for reasons of conceptual orthodoxy than for lack of predictive or explanatory power. Consider the results of several different lines of research. In studies in which verbal, autonomic, and motor responses to weak stimulation are measured concurrently, verbal indices generally prove to be comparable or superior discriminators of sensory stimuli (Eriksen, 1960). In both operant and classical conditioning, verbalized hypotheses about environmental contingencies are by far the best predictors of performance changes during the course of conditioning (Bandura, 1969; Dulany, 1968; Spielberger & De Nike, 1966; Dawson & Furedy, 1976). In the series of experiments under discussion, efficacy judgments are better predictors than is past behavior of changes in performance resulting from enactive treatments, and the only effective predictors of behavior instated by vicarious and emotive modes of treatment, none of which involve motor responding during the induction phase (Bandura et al., 1977). And finally, to take a common example from everyday life, vast numbers of people are outfitted by ophthalmologists with suitable corrective eyeglasses on the basis of verbalized discriminations of printed stimuli. In brief, there exists little empirical justification for revering autonomic reactions or muscular contractions more highly than cognitive judgments arrived at by processing, weighing, and integrating vast amounts of relevant information concerning one's capabilities.

Among the reservations routinely expressed about verbal indices is that they can be used to misrepresent cognitive events. This is undoubtedly true. Individuals can be easily outfitted with defective eyeglasses by reporting that the blurred stimuli are the clearer ones. However, this would hardly constitute justification for renouncing the optometric enterprise. It should also be noted here that the potentiality for falsification of psychological changes applies equally to behavioral indices. People usually learn more than they represent in action due to deficiencies in motor reproduction or to insufficient positive incentives. Indeed, when certain behaviors are nonrewarded or punished, verbal accounts provide better measures of what people have acquired than do their spontaneous performances (Bandura, 1965). Should they choose to do so, people can easily manipulate their operant rates and learning performances to misrepresent what they have learned or believe. They can easily feign learning deficits. They can produce high stable performances under fixed-interval schedules of reinforcement and low episodic responding under variable ratio schedules. And they can respond in the presence of stimuli signifying nonreward ( $S^A$ ) and withhold responses in the presence of stimuli that are discriminative for reinforcement ( $S^D$ ). Thus, under disadvantageous conditions, "behavioral reports" can be just as misleading as so-called verbal reports. Given reason to do so, people can deceive by their actions as they can by their words.

The moral is that the functional role of thought in the regulation of behavior should be studied under conditions in which people are motivated to express judgments that reflect what they are thinking. To conduct such experiments under circumstances in which people have incentive to misrepresent their thoughts exemplifies a deficiency in selection of research strategy rather than in judgmental indices. It would likewise be pointless to study the determinants of learning and performance changes under conditions in which participants are intent on leading researchers astray by deceptive actions.

The preceding remarks should not be misinterpreted as advocacy for substituting verbal indices for measures of behavior, as so commonly happens in psychotherapy outcome studies. The best measure of behavior is behavior, not reports about it. But, as shown by research cited above, under appropriate conditions verbal indices provide a measure of thought for examining the explanatory and predictive power of cognitive factors in psychological change.

The basic mechanisms of behavioral change have been explored in this research with severe snake phobias. There are several reasons for the choice of this psychological condition. First, although a phobic dread of snakes appears at first glance to be a circumscribed problem, in fact, it has generalized debilitating effects on vocational and recreational activities, and provides a chronic source of distressing ruminations (Bandura et al., 1974,

1977; Bandura, Jeffery, & Gajdos, 1975). Second, the phobic behavior is relatively refractory to change, especially if measured in terms of the stringent criterion of elimination, rather than simply reduction, of phobic behavior. Third, the level and generality of behavioral change can be assessed precisely. Unless one measures with some precision how people behave, one lacks the essential requirement for a meaningful microanalysis of efficacy determinants of behavior.

The fourth, and particularly important, benefit derives from the fact that reptiles are rather retiring creatures that tend to keep to themselves and their intimates in unpopulated locales. Consequently, treatment effects are rarely confounded by extratherapeutic encounters with the threats during the course of treatment. In most other psychological conditions, the effects of treatment are almost invariably confounded by experiences arising from periodic contact with the feared events between sessions. Consider a few examples. People receiving treatment for assertiveness are repeatedly confronted with situations requiring assertive action; acrophobics are faced with elevated locales all around them that they are required to enter from time to time; and those who are developing social and cognitive skills can hardly avoid drawing on them in their everyday life. Any successes achieved in these extratherapeutic encounters make treatment look good, whereas intervening failures detract from its apparent effectiveness. The longer the interval over which the procedures are applied, the greater the likelihood of confounding from extraneous sources of influences.

For these various reasons, severe snake phobias provide a reliable, standardized procedure with high experimental control, for measuring the relative power of alternative modes of influences for producing efficacy and behavioral changes (Bandura, 1978). In extending self-efficacy theory to other forms of behavior, investigators will have to give greater consideration to precise assessment of gradations in behavior, to confounding extra-treatment influences, and to the time elapsing between measurement of self-efficacy and behavior.

## REFERENCES

- Agras, W. S. Transfer during systematic desensitization therapy. *Behaviour Research and Therapy*, 1967, 5, 193-199.
- Bandura, A. Influence of models' reinforcement contingencies on the acquisition of imitative responses. *Journal of Personality and Social Psychology*, 1965, 1, 589-595.
- Bandura, A. *Principles of behavior modification*. New York: Holt, Rinehart & Winston, 1969.
- Bandura, A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 1977, 84, 191-215. (a)
- Bandura, A. *Social learning theory*. Englewood Cliffs, New Jersey: Prentice-Hall, 1977. (b)
- Bandura, A. On paradigms and recycled ideologies. *Cognitive Therapy and Research*, 1978, 2(1), in press.

- Bandura, A., Adams, N. E., & Beyer, J. Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology*, 1977, 35, 125-139.
- Bandura, A., Blanchard, E. B., & Ritter, B. The relative efficacy of desensitization and modeling approaches for inducing behavioral, affective, and attitudinal changes. *Journal of Personality and Social Psychology*, 1969, 13, 173-199.
- Bandura, A., Jeffery, R. W., & Gajdos, E. Generalizing change through participant modeling with self-directed mastery. *Behaviour Research and Therapy*, 1975, 13, 141-152.
- Bandura, A., Jeffery, R. W., & Wright, C. L. Efficacy of participant modeling as a function of response induction aids. *Journal of Abnormal Psychology*, 1974, 83, 56-64.
- Barlow, D. H., Leitenberg, H., Agras, W. S., & Wincze, J. P. The transfer gap in systematic desensitization: An analogue study. *Behaviour Research and Therapy*, 1969, 7, 191-196.
- Bolles, R. C. The avoidance learning problem. In G. Bower (Ed.), *The psychology of learning and motivation* (Vol. 6). New York: Academic Press, 1972.
- Dawson, M. E., & Furedy, J. J. The role of awareness in human differential autonomic classical conditioning: The necessary-gate hypothesis. *Psychophysiology*, 1976, 13, 50-53.
- Dulany, D. E. Awareness, rules, and propositional control: A confrontation with S-R behavior theory. In T. R. Dixon & D. L. Horton (Eds.), *Verbal behavior and general behavior theory*. Englewood Cliffs, New Jersey: Prentice-Hall, 1968.
- Eriksen, C. W. Discrimination and learning without awareness: A methodological survey and evaluation. *Psychological Review*, 1960, 67, 279-300.
- Herrnstein, R. J. Method and theory in the study of avoidance. *Psychological Review*, 1969, 76, 49-69.
- Rescorla, R. A., & Solomon, R. L. Two-process learning theory: Relationships between Pavlovian conditioning and instrumental learning. *Psychological Review*, 1967, 74, 151-182.
- Spielberger, C. D., & De Nike, L. D. Descriptive behaviorism versus cognitive theory in verbal operant conditioning. *Psychological Review*, 1966, 73, 306-326.
- Weiner, B. *Theories of motivation*. Chicago: Markham, 1972.
- Wolpe, J. *The practice of behavior therapy*. New York: Pergamon, 1974.

## REVIEWER A

The present manuscript reports two experiments that establish the predictive validity of self-efficacy ratings for performance improvement among snake phobics. The experiments were conducted with care and sound methodology. The report is very well written. The main demonstration, very convincingly shown, is that subject predictions of posttest behavior correlate very highly with posttest performance, subsequent to extensive desensitization (Experiment I) or during participant modeling (Experiment II). The role of cognitive self-efficacy in mediating fear reduction is strongly supported.

I would like to raise some issues of interpretation for the authors' consideration, however.

The authors argue that complete desensitization of a 51-item hierarchy guarantees that the anxiety reactions of all subjects are equally and completely extinguished. Without independent confirmation of this argument, it is not wholly warranted. Although the authors thoughtfully comment on the use and abuse of physiological measures in the discussion sec-

tion, physiological evidence in support of their argument seems to be required to make that argument convincing. At any rate, as the design and results stand now, the authors can only conclude that subjects no longer subjectively experienced anxiety during symbolic presentation. Laboratory and clinical research suggest that signaling of anxiety during desensitization is a complex function of a variety of internal responses and external stimuli, and that such determinants vary among individuals. That physiological reactions and self-reports of fear are not always congruent and that incongruence (i.e., physiological reaction in the absence of reported fear in response to hierarchy images) is related to lack of outcome improvement have been reported by several investigators. Thus, I question whether the operational definition of "arousal extinction" (i.e., desensitization until no further anxiety *signals*) is unambiguously valid. If it is not, the major premise for the independence of subsequent self-efficacy variability is undermined.

Experiment II, of course, does not relate to desensitization theory. Experiment I does, but the design does not allow absolute statements regarding desensitization mechanisms. The experiment does demonstrate a *contribution* of cognitive self-efficacy to desensitization outcome but does not separate extinction processes due to repeated imaginal exposures from self-efficacy by-products. Even assuming complete elimination of anxiety arousal (a doubtful assumption as argued above), the outcome data still at best reflect the additive effects of hypothetical extinction processes and hypothetical cognitive processes. As such, the design does not rule out an extinction contribution. A complete design to address these issues would involve 3 groups: (a) desensitization without efficacy effects, (b) efficacy change without repeated imaginal exposure, and (a) and (b) together as in the present study. I'm sure the authors would argue that desensitization cannot be separated from efficacy change, since they feel that efficacy changes are inherent to desensitization process. However, there may be methods to establish this condition and it would be well worth the effort in terms of powerful, unequivocal conclusions. For example, a condition involving desensitization conducted under nontherapeutic instructions without demand to show posttest improvement could be employed. (Several studies, incidentally, have found improvement under such conditions. Unfortunately, efficacy has never been assessed in that context. If no efficacy effects are found, improved performance would be due to some other desensitization mechanism, e.g., extinction.) The second condition might be adequately represented by simply offering a money incentive to show improved posttest performance. I'm certain such an incentive would result in both increased efficacy and increased performance. Such a condition would provide a separate assessment of efficacy change independent of desensitization process.

Although efficacy ratings were obtained “privately” before the post-test, I’m sure the subjects realized the ratings would ultimately be viewed by research staff, so they are not wholly free of demand influences; and once the predictions are made under such conditions, there is demand to match the predicted performance at posttest.

While clearly severe phobics were employed (much to the author’s credit), and while several good reasons are offered in the discussion for use of such a problem, the degree of generality is indeed markedly limited and thus overgeneralized conclusions about desensitization process are all the more unwarranted.

### REVIEWER B

This article sets out “To test the theory that desensitization changes behavior through its intervening effects on efficacy expectations . . .” (p. 290). I don’t think the studies reported here actually achieve this goal. In some sense, I think the data are oversold. I’m certainly not arguing against cognitive mediation—just the present operationalism. I view the correlational findings as very interesting but providing a weak test of the experimental question.

I hope we have not reached the point where we are surprised that an immediately preceding and adequately conducted self-report is better than a behavioral test carried out before the intervention. Self-report here has the advantage in that subjects can judge their current skill level after the additional input of the treatment procedure (whether it be a skill training or instructional format). Additionally, even though the author has reduced the social pressure on conforming to prediction, the subject may still self-impose this pressure. It would be most interesting to manipulate self-efficacy in cases where motor skill development was required to gauge the actual instrumental nature of the self-efficacy concept. If designed appropriately this might also allow for confirmation of the assumption that self-efficacy is related to persistence of effort.

Needless to say, I find the paper, even with its flaws, enticing. That is also true of the self-efficacy theory. Both should prompt a good deal of thought and work on cognitive contributions to behavior change. The paper is also well presented and the emphases on adequate assessment of generalization and operationalized self-report are sorely needed.