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Cognitive Processes Mediating Behavioral Change

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The present experiment was designed to test the theory that psychological procedures achieve changes in behavior by altering the level and strength of self-efficacy. In this formulation, perceived self-efficacy influences level of performance by enhancing intensity and persistence of effort. Adult phobics were administered treatments based upon either performance mastery experiences, vicarious experiences, or they received no treatment. Their efficacy expectations and approach behavior toward threats differing on a similarity dimension were measured before and after treatment. In accord with our prediction, the mastery-based treatment produced higher, stronger, and more generalized expectations of personal efficacy than did the treatment relying solely upon vicarious experiences. Results of a microanalysis further confirm the hypothesized relationship between self-efficacy and behavioral change. Self-efficacy was a uniformly accurate predictor of performance on tasks of varying difficulty with different threats regardless of whether the changes in self-efficacy were produced through enactive mastery or by vicarious experience alone.

Current developments in the field of behavioral change reveal two major divergent trends. This difference is especially evident in the treatment of anxiety and defensive behavior. On the one hand, explanations of

behavioral change are relying more heavily upon cognitive mechanisms. On the other hand, it is performance treatments that operate through mastery experiences that are proving most powerful in producing affective, attitudinal, and behavioral changes. Regardless of the methods involved, treatments implemented through actual performance achieve results consistently superior to those based upon symbolic forms of the same approaches (Bandura, 1977a).

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According to social learning theory, behavioral changes produced by different meth-

ods are mediated by a common cognitive mechanism (Bandura, 1977a). Psychological procedures, whatever their format, serve as ways of creating and strengthening expectations of personal efficacy. In this formulation, efficacy expectations are distinguished from response–outcome expectancies. An outcome expectancy is defined as the estimate that a given behavior will lead to certain outcomes. An efficacy expectation is the conviction that one can successfully execute the behavior required to produce the outcomes. Efficacy and outcome expectations are differentiated because individuals can come to believe that a particular course of action will result in certain outcomes, but question whether they can perform those actions. The strength of convictions in one's own effectiveness determines whether coping behavior will be attempted in the first place. People fear and avoid threatening situations they believe exceed their coping abilities, whereas they behave assuredly when they judge themselves capable of managing situations that would otherwise intimidate them.

Perceived self-efficacy not only influences choice of activities but, through expectations of eventual success, it can affect persistence of coping efforts once an activity is initiated. Efficacy expectations are likely to determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences. The stronger the efficacy or mastery expectations, the more active the efforts. Those who persevere in activities that are subjectively threatening will gain corrective experiences that further reinforce their sense of efficacy and thereby eventually eliminate their fears. Those who cease their coping efforts prematurely will retain their self-debilitating expectations and fears for a long time.

In the social learning analysis, expectations of personal efficacy stem from four main sources of information. *Performance accomplishments* provide the most influential source of efficacy information because it is based on experiences of personal mastery (Bandura, Jeffery, & Gajdos, 1975). Successes raise mastery expectations; repeated failures lower them, especially if mishaps occur early in the course of events. However, the impact

of enactive attainments on perceived self-efficacy will depend upon cognitive appraisal of a number of informative factors, including the difficulty of the task, the amount of effort expended, the number of situational supports, and the pattern and rate of successes.

Many expectations are derived from *vicarious experience*. Seeing others cope with threats and eventually succeed can create expectations in observers that they too should be able to achieve some improvements in performance if they intensify and persist in their efforts. A number of modeling variables likely to affect mastery expectations have been shown to enhance the disinhibiting influence of modeling procedures (Bandura & Menlove, 1968; Kazdin, 1974a, 1974b; Meichenbaum, 1971). Vicarious experience, relying as it does on inferences from social comparison, is a less dependable source of information about one's own capabilities than is direct evidence of personal accomplishments. Consequently, the efficacy expectations induced by modeling alone are likely to be weaker and more vulnerable to change.

In attempts to influence human behavior, *verbal persuasion* is widely used because of its ease and ready availability. People are led, through persuasive suggestion, into believing they can cope successfully with what has overwhelmed them in the past. Efficacy expectations induced in this manner, lacking an authentic experiential base, are also likely to be weaker than those arising from one's own accomplishments. In the face of distressing threats and a long history of failure in coping with them, whatever mastery expectations are created by suggestion can be readily extinguished by disconfirming experience.

Emotional arousal can also influence efficacy expectations in threatening situations. People rely partly upon their state of physiological arousal in judging their anxiety and vulnerability to stress. Because high arousal usually debilitates performance, individuals are apt to consider themselves more able when they are not beset by aversive arousal than when they are tense and viscerally agitated. The experience of anxiety generates further

anxiety through the process of anticipatory self-arousal (Bandura, 1977b; Sarason, 1975). Although based on different theoretical rationales, many of the methods used to eliminate defensive behavior are principally aimed at diminishing emotional arousal.

By postulating a common mechanism of operation, this conceptual framework is designed to account for behavioral changes achieved by enactive, vicarious, exhortative, and emotive means. The present investigation tested predictions derived from social learning theory by use of enactive and vicarious treatments to produce differential levels of self-efficacy. These diverse procedures were chosen for study to determine the predictive value of self-efficacy created by quite different modes of treatment.

Empirical tests of the relationship between expectancy and performance of threatening activities have generally yielded weak, inconsistent results (Bandura, 1969; Davison & Wilson, 1973; Lick & Bootzin, 1975). Such findings are not surprising considering that in most studies the measures of expectations are mainly concerned with people's hopes of favorable outcomes rather than with their sense of mastery. Moreover, the outcome expectations are usually assessed at a single point in a change process in global terms as though they were a static, unidimensional factor. Participants simply judge how much they expect to benefit from undergoing a given procedure. Such global measures reflect a mixture of, among other things, hope, wishful thinking, belief in the potency of the procedures, and faith in the therapist.

Efficacy expectations vary on several dimensions that can have important performance implications. They differ in magnitude. Thus, when tasks are ordered according to level of difficulty, the efficacy expectations of different individuals may be limited to the simpler tasks, extend to moderately difficult ones, or include even the most taxing performances. Efficacy expectations also differ in generality. Some types of experiences create only limited mastery expectations, while others instill a more generalized sense of personal efficacy that extends well beyond the specific treatment situations. In addition, expectancies vary in strength. Weak expecta-

tions are readily modified by disconfirming experiences, whereas individuals who possess strong expectations of mastery will persevere in their coping efforts despite dissuading experiences.

This experiment was designed to gauge the differential power of direct and vicarious experience in creating efficacy expectations and to test the hypothesized relationship between self-efficacy and behavioral change. Severe snake phobics received either a participant modeling treatment operating through direct mastery experiences, modeling alone, or they received no treatment. The level, strength, and generality of efficacy expectations as well as approach behavior and fear arousal were measured prior to and after treatment. It was predicted that the treatment based upon enactive mastery would produce higher, stronger, and more generalized expectations than would the treatment relying solely upon vicarious experience. It was hypothesized further that level of self-efficacy would order variations in performance obtained between treatments, within the same treatment conditions and at the level of specific tasks.

Method

Subjects

Subjects whose lives were adversely affected by chronic snake phobias were recruited through advertisements placed in community newspapers. Their lives were restricted by anxious avoidance of social, recreational, and vocational activities in which a snake might conceivably appear, however remote the possibility. Virtually all were plagued by intrusive thoughts and nightmares over which they could exercise little control. The distressing anticipatory ruminations were especially troublesome during the summer months. Of the 33 subjects who participated in the study, 7 were males and 26 were females. They ranged in age from 18 to 50 years with a mean age of 33 years.

Pretreatment Measures

A multifaceted assessment procedure was used to provide the data required for a microanalysis of changes in self-efficacy 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. Subjects were in-

structed to approach a glass cage containing the snake, to look down at it, to touch and hold the snake with gloved and then bare hands, to let it loose in the room and then 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 0; 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. Based on this criterion, 27% of the respondents were excluded. To maximize the generality of the findings, all people who were sufficiently phobic on the behavior test were included in the 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. Efficacy expectations were measured after the behavioral avoidance pretest 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 performances included in the behavioral test and instructed to designate those they expected to perform before treatment. For each task so designated, they rated the strength of their expectations on a 100-point probability scale, ranging in 10-point intervals, from high uncertainty, through intermediate values of certainty, to complete certitude. 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 a boa constrictor similar to the one used in treatment.

Efficacy expectations were measured after the behavioral pretest, prior to the posttest which 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. The use of test snakes of varying degrees of dissimilarity from the one employed in treatment provided a measure of the generalized effects of treatment across different threats. Situational generalization 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 settings 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 snakes. Subjects were instructed to rate each item on a 7-point scale of fearfulness. The mean of the six ratings constituted the level of anticipatory fear arousal over confrontations 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 difficult social situations. Animals 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.

Treatment Conditions

Subjects were individually matched in triads according to pretreatment avoidance behavior and randomly assigned to one of three conditions. To ensure that the effects produced by the different treatments were due to the procedures rather than to the personal characteristics of a particular therapist, two female therapists administered each of the methods to different groups of triads. Both therapists proved to be equally effective in the changes they achieved with the different methods.

Participant modeling. In this treatment, which is described at length elsewhere (Bandura, Jeffrey, & Wright, 1974), defensive behavior is rapidly eliminated by enlisting a standard series of performance induction aids. The treatment was conducted with a rosy boa constrictor which was distinguishably different from the one used in the behavioral assessments.

To weaken subjects' inhibitions, the therapist initially modeled the threatening activities before subjects attempted to perform them. However, the modeling aid was used only briefly in this performance-based treatment, so as to minimize overlap of the modeling element in these two modes of treatment. The therapist then introduced performance aids sequentially from a preestablished hierarchy to en-

able subjects to perform the feared activities successfully. Intimidating performances were broken down into easily mastered steps of increasing difficulty ranging from looking at, touching, and holding the snake; placing open hands in front of its head as it moved about; holding the snake in front of their faces; allowing the snake to crawl freely in their laps, to letting the snake loose in the room and retrieving it. Joint performance with the therapist was used to facilitate performances that subjects could not execute on their own. Another method for overcoming inhibitions was to have subjects enact the feared behavior for increasingly longer periods. Protective conditions that reduce the likelihood of feared consequences (e.g., use of protective gloves, coats, and visors, and control of the snake by the therapist to ensure safety) were arranged as a further means of weakening dysfunctional restraints that retard change. If these various procedures proved insufficient, subjects performed the feared activities using the induction aids with a baby boa, which was much less threatening, and then with the larger boa.

As treatment progressed, the supplementary aids were withdrawn. After subjects completed all the activities, they engaged in self-directed performance for 5 min, during which they executed the various tasks entirely on their own. The inclusion of challenging tasks and progressive self-directed mastery was designed to ensure that subjects would ascribe their successes to enhanced personal efficacy rather than to external factors. The duration of treatment varied from 40 min. to 7 hours with the median time being 90 min.

Modeling. Subjects assigned to the modeling condition merely observed the therapist perform the same graduated set of activities. Because subjects in the modeling condition did not engage in any behavior themselves, they had no performance sources of information for their efficacy expectations. Modeling was administered for the same length of time as the matched counterparts in participant modeling engaged in their performance mode of treatment. Thus, for example, if a given subject required 1 hour of participant modeling to master all the therapeutic tasks, the matched subject in the modeling condition would observe 1 hour of comparable modeling.

Control condition. Subjects in the control condition were administered the assessment procedures after an equivalent period of time had elapsed according to their matched triad assignment without any intervening treatment.

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 expectancy and performance changes, subjects in each condition were

tested initially with a dissimilar 90-cm corn snake and then with the red-tailed boa used in the pretest. The two snakes were previously shown to be of equivalent threat value as measured by subjects' avoidance behavior and fear arousal (Bandura et al., 1974). 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 subjects' conditions.

Supplementary Treatment

Following the posttest, the controls and those in the modeling condition who failed to achieve terminal performances (all of the controls and 73% of the modeling subjects) received participant modeling until they performed all the therapeutic tasks successfully. They were then readministered the standard assessment procedures.

Follow-Up Assessment

In order to evaluate the durability of changes and the degree of congruence between efficacy expectations and behavior long after treatment, subjects returned for an additional assessment 1 month following completion of their final treatment. Except for four subjects, who could no longer be located, all participated in the follow-up assessment.

Results

Analysis of pretest scores revealed no significant initial differences between conditions except on the measure of fear arousal accompanying approach responses. The controls experienced less fear than did subjects assigned to the participant modeling, $F(1, 53) = 9.03$, $p < .01$, and the modeling, $F(1, 53) = 7.85$, $p < .01$, treatments. Separate analyses of variance were computed for each dependent measure, except for the changes in fear arousal which were evaluated by analysis of covariance with the pretest measure serving as the covariate. Table 1 shows the significance levels of the treatment effects, the differences between the various conditions, and the changes achieved by subjects within each condition.

Level of Self-Efficacy

The efficacy expectations and approach responses displayed by subjects at different

Table 1: *Significance of Treatment Effects, Intergroup Differences, and Within-Group Changes for Each Measure*

Response	Intergroup comparisons (<i>F</i> test)					Within-group comparisons (<i>t</i> test)			
	Treat- ment effects (<i>F</i> test)	Treatment × Phase (<i>F</i> test)	Participant modeling vs. modeling	Participant modeling vs. control	Modeling vs. control	Participant modeling	Modeling	Control	Treated controls
Level of efficacy expectations									
Total	7.56***	12.96****	5.19**	29.10****	9.71***	6.61****	4.28****	.73	11.44****
Similar threat	7.63***	13.22****	5.52**	32.24****	11.08***	6.42****	4.05****	1.25	12.17****
Dissimilar threat	7.63***	13.22****	4.31**	22.78****	7.27***	5.97****	4.24****	.19	3.02****
Strength of efficacy expectations									
Total	8.06***	20.50****	8.04***	31.68****	7.80***	9.76****	3.98***	.23	2.25**
Similar threat	8.40***	20.90****	12.68****	43.05****	9.00***	9.14****	3.57***	.28	1.07
Dissimilar threat	8.40***	20.90****	3.41*	17.85****	5.65**	7.05****	4.07****	.03	1.91**
Approach behavior									
Total	6.02***	26.44****	14.95****	36.48****	4.72**	11.71****	3.94***	2.94**	7.16****
Similar threat	6.02***	26.44****	8.44***	34.59****	8.86***	10.90****	4.33****	3.74***	8.60****
Dissimilar threat	6.02***	26.44****	19.30****	30.45****	1.27	9.69****	2.08**	1.49	5.37****
Fear arousal									
Initial approach									
Total	.63	23.56****	3.55*	20.45****	6.96**	11.70****	6.98****	2.78**	6.01****
Similar threat	3.10*	13.22****	1.37	15.30****	7.52***	10.92****	8.35****	2.98**	4.30****
Dissimilar threat	3.10	13.22****	5.19**	19.72****	4.67**	12.51****	4.70****	1.92*	5.36****
Total approach									
Total	.54	27.39****	3.67*	17.68****	5.24**	13.97****	6.72****	.80	3.94***
Similar threat	2.37	17.88****	7.07***	20.76****	3.60*	13.32****	6.76****	.97	3.11***
Dissimilar threat	2.37	17.88****	1.23	12.44****	5.84**	13.16****	5.86****	.43	2.82***
Generalized self-efficacy									
Snakes	7.20***	4.46**	4.62**	22.46****	6.70**	5.38****	3.23***	1.40	5.69****
Other animals	.28	.28				4.25***	2.79**	2.18*	1.83*
Social	.86	2.96*	.69	2.11	5.22**	2.28**	2.80**	.00	1.79
Generalized fear reduction	4.87**	5.41***	2.77	18.92****	7.21***	6.10****	2.23**	.03	5.93****

* $p < .10$.** $p < .05$.*** $p < .01$.**** $p < .001$.

phases of the experiment are presented graphically in Figure 1. Analysis of variance of the self-efficacy scores reveals that the main effects of treatment and the Treatment $\times$ Phase interaction are all significant for the threats considered separately and for the pooled scores (see Table 1). Regardless of treatment condition, subjects expressed higher self-efficacy in relation to the similar threat than toward the dissimilar threat, $F(1, 30) = 21.78, p < .001$.

All three measures based on the two threats and the combined data yield the same pattern of results: Control subjects did not alter their efficacy expectations and modeling produced moderate increases in self-efficacy, whereas participant modeling markedly enhanced efficacy expectations. Statistical comparisons of the posttest means of these conditions corroborate the differential power of the treatments. Participant modeling instated higher self-efficacy than did modeling which, in turn, surpassed the control condition.

Analysis of changes in self-efficacy as a result of performing the behavioral posttest disclosed only one significant difference. Subjects in the control condition showed a significant increase, $t(10) = 2.60, p < .05$, in self-efficacy in coping with the similar threat immediately after the posttest.

Approach Behavior

Results of the analysis of variance performed on the approach scores are reported in Table 1. With a few minor exceptions, the changes exhibited in approach behavior, including the threat difference, $F(1, 30) = 12.57, p < .01$, are similar to those achieved for level of self-efficacy. Participant modeling and modeling produced significant increases in approach behavior toward both threats. Compared to their pretest performance, the controls improved slightly in coping with the familiar threat the second time, but not toward to the dissimilar threat.

In intergroup comparisons of level of approach behavior during the posttest phase, subjects who received participant modeling surpassed those in the modeling and control conditions on all of the behavioral measures. Those receiving the modeling treatment also

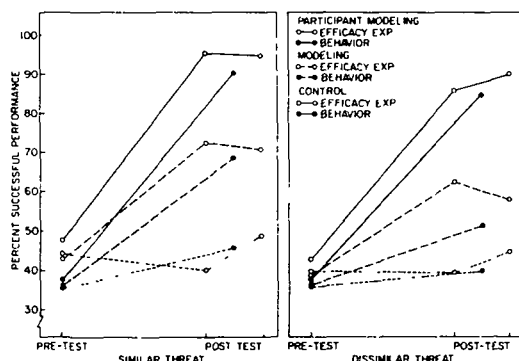


Figure 1. Level of self-efficacy and approach behavior displayed by subjects toward different threats after receiving vicarious or performance-based treatments or no treatment. (In the posttest phase, level of self-efficacy was measured prior to and after the behavioral avoidance tests with the two snakes.)

out-performed the controls on total approach and approach toward the similar threat but they did not differ with regard to the dissimilar threat. The latter finding was due largely to one subject in the modeling condition who executed fearlessly all the post-treatment behavioral tasks with the similar threat but performed well below her baseline level with the corn snake because of its unusually threatening behavior. For reasons known only to the reptile, it suddenly began weaving menacingly in an upright position, hissing, and rattling its tail, a dramatic performance that was never repeated with any other subject. Except for this case, subjects who received the modeling treatment surpassed the controls on the dissimilar threat as well, $t(9) = 2.28, p < .025$.

Microanalysis of Congruence Between Self-Efficacy and Performance

The relationships revealed by the aggregate measures are corroborated more precisely by a microanalysis of the congruence between self-efficacy and performance at the level of individual tasks. This measure was obtained by recording whether subjects judged themselves capable of performing each of the various tasks and computing the percentage of accurate correspondence between efficacy judgment and actual performance. Self-efficacy was a uniformly accurate predictor of individual task performance regardless of

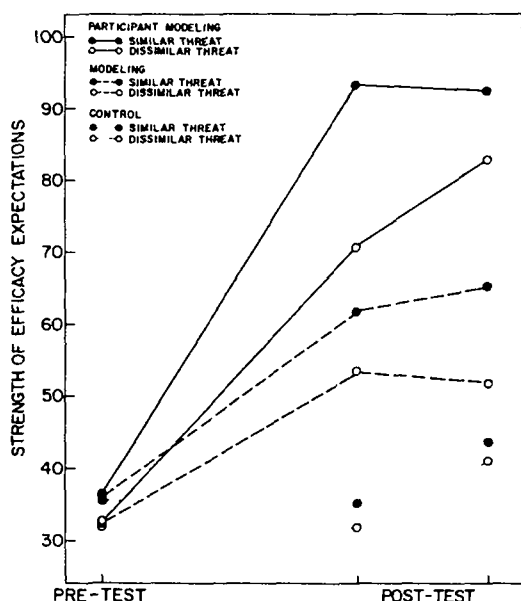


Figure 2. Changes in strength of self-efficacy displayed by subjects toward different threats after receiving vicarious or performance-based treatments or no treatment. (In the posttest phase, strength of self-efficacy was measured prior to and after behavioral avoidance tests with the two snakes.)

whether the changes in self-efficacy were produced through performance accomplishments (89%) or by vicarious experience alone (86%). The degree of congruence between perceived self-efficacy and subsequent behavior is equally high for enactive (82%) and vicarious (79%) treatments when the micro-analysis is conducted only on the subset of tasks that subjects had never performed in the pretest assessment period. Nontreated controls exhibited a similarly high level of congruence (90%). Although self-efficacy was an excellent predictor of performance under all conditions, the congruence was slightly higher, $F(1, 30) = 7.27$, $p < .025$, for the similar threat (92%) than for the dissimilar threat (85%).

After the controls received participant modeling, they displayed essentially the same marked changes on the various dependent measures (see Table 1) as did their counterparts who were originally assigned to this treatment condition. The high congruence between self-efficacy and behavior (86%) exhibited by the treated controls is consistent

with the results obtained from the other conditions.

Strength of Self-Efficacy

In the preceding analyses, efficacy expectations were considered without regard to their strength. A weak sense of self-efficacy thus received the same weight as one reflecting complete certitude. However, the intensity and persistence of effort, and hence level of performance, should be higher with strong than with weak self-efficacy.

To test the predicted differential effects of the treatments on strength of self-efficacy, the magnitude expectancy scores were summed across tasks and divided by the total number of performance tasks. The obtained changes in strength of the self-efficacy are depicted graphically in Figure 2 and evaluated statistically in Table 1. In addition to the significant treatment and Treatment $\times$ Phase interaction effects, subjects in all conditions manifested slightly stronger efficacy expectations in coping with the similar threat than with the dissimilar one, $F(1, 30) = 32.90$, $p < .001$.

As shown in Table 1, participant modeling created a strong sense of self-efficacy irrespective of threat or performance tasks that exceeded the other conditions. Modeling strengthened self-efficacy moderately and also differed significantly from the control condition. The controls, in turn, began with a weak sense of self-efficacy and did not change in this respect.

Detailed analysis of the likelihood that any given task will be performed depending on the strength of the corresponding efficacy expectation provides an even more stringent test of the relationship between self-efficacy and performance. The probability of successful performance of any given task as a function of strength of efficacy expectation is plotted in Figure 3. Because the control subjects performed few responses and had correspondingly restricted efficacy expectations, their data were plotted after they had received the participant modeling treatment. Regardless of whether self-efficacy was instated enactively or vicariously, the stronger the self-efficacy, the higher the likelihood that a particular task would be completed successfully. More-

over, the positive relationship between strength of self-efficacy and probability of successful performance is virtually identical for the two threats.

Differential Prediction from Behavior and Self-Efficacy in Participant Modeling

Subjects who received participant modeling, either as the primary or as the supplementary treatment, successfully performed all of the behaviors in treatment that were later assessed in the posttest. Although all had previously achieved maximal performances, not all expressed maximal efficacy expectations that they would be able to perform all the tasks under test conditions. The lingering self-doubts involved mainly the highly threatening tasks of holding a snake near their face and allowing it to move freely over their body. One can therefore compare the error rates of predictions of perfect test performance made from maximal past performance and from maximal efficacy expectations. It would be predicted from the proposed theory that, among the successful past performers, those who acquire maximal efficacy expectations should attain terminal performances, whereas those holding lower expectations should not.

If one predicts that subjects who performed maximally in treatment will likewise achieve terminal performances when assessed with similar tasks, the error rate is relatively low for the similar threat (28%) but high for the dissimilar threat (52%). If, on the other hand, one predicts that those who express maximal expectations will perform maximally, the error rate is comparably low for both the similar (21%) and dissimilar (24%) threats. The predictive superiority of efficacy expectations over past performance is significant for total approach behavior ($p < .04$) and for approach toward the dissimilar threat ($p < .04$), as evaluated by the sign test.

Differential Effects of Variations in Modeling on Self-Efficacy and Behavior

In order to equate for duration of treatment, subjects in the modeling condition were yoked to matched counterparts in participant modeling, who received treatment until they

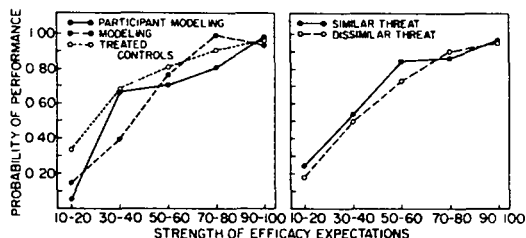


Figure 3 Probability of successful performance of any given task as a function of strength of self-efficacy (The left panel shows the relationship for vicarious and performance-based treatments; the right panel shows the relationship between strength of self-efficacy and successful approach responses toward similar and dissimilar threats combined across treatments.)

performed all the therapeutic tasks. Because subjects who received participant modeling varied in the time they required to complete the treatment, some of the subjects in the modeling condition had only brief exposure to successful performances, whereas others had the benefit of observing feared activities modeled repeatedly without any untoward consequences. These variations in length of exposure provided an opportunity to test the prediction that repeated observation of successful modeling increases efficacy expectations.

Approximately half (5) of the subjects in this condition received less than 90 min. of modeling, while the remainder had longer exposure to the modeled performances. Figure 4 summarizes the magnitude of change in efficacy expectations and behavior for those two levels of modeling. Compared to limited modeling, the more extended modeling produced a greater increase in self-efficacy toward the similar threat, $t(9) = 3.26$, $p < .001$, the dissimilar threat, $t(9) = 7.02$, $p < .001$, and on the combined measure, $t(9) = 4.72$, $p < .01$. Longer exposure also increased the strength of efficacy expectations on all three measures beyond the .001 significance level.

In general, the increases in approach behavior as a function of duration of modeling parallel the changes in self-efficacy. Repeated observation of successful performance, in contrast to brief modeling, resulting in significantly larger increments in overall approach behavior, $t(9) = 2.23$, $p < .05$, toward the similar threat, $t(9) = 2.32$, $p < .025$, but not

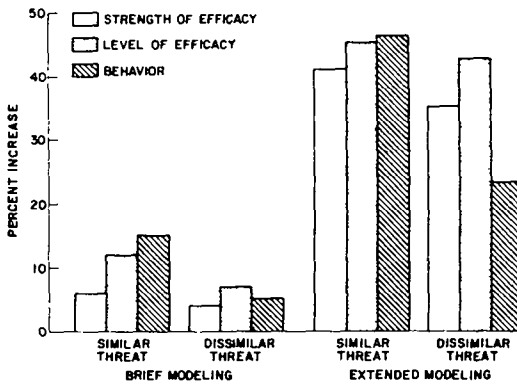


Figure 4. Magnitude of change in self-efficacy and behavior achieved by subjects who received either brief or extended modeling.

toward the dissimilar threat. The latter discrepancy is due almost entirely to the single case cited earlier in which the dissimilar snake behaved in an unusually menacing way. Except for this subject, those who had the benefit of extended modeling clearly out-performed the subjects who observed the same modeling for a shorter period, $t(9) = 2.61$, $p < .025$.

Fear Arousal Accompanying Approach Responses

Extinction of fear arousal accompanying approach responses was measured in several ways. The average level of fear elicited by responses that subjects performed before treatment was compared 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 analyses are shown in Table 1.

Subjects who received participant modeling and the modeling treatments displayed substantial reductions in fear arousal for the initial and total approach responses toward both threats. The controls experienced less fear the second time they performed the initial approach responses with the familiar boa, but their fear remained undiminished toward the dissimilar threat.

Although both treatments surpassed the controls, they did not differ much from each other. There are several reasons for the latter

finding. Both treatments achieved virtually complete extinction of fear arousal for the initial subset of approach responses, thus, reducing the possibility of obtaining a difference. In the case of the total approach responses, because subjects who received participant modeling performed more threatening tasks than did their counterparts in the modeling condition, the mean fear levels are based on differential performances. 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 comparable across conditions and is unaffected by having enacted that particular behavior. On this measure, participant modeling produced greater reduction in fear arousal than did the modeling treatment in relation to both the similar, $F(1, 64) = 11.57$, $p < .01$, and the dissimilar threat, $F(1, 64) = 13.01$, $p < .001$.

Situational Generalization

Inspection of Table 1 shows that the findings on the situational generalization of treatment effects are consistent with those obtained through direct assessment with the two different threats. Both participant modeling and modeling significantly reduced anticipatory fear and enhanced self-efficacy in coping with snakes in natural situations, whereas the controls showed no change on either measure. In accord with the previous results, participant modeling was more effective in instilling self-efficacy than was modeling alone. Both modes of treatment significantly enhanced self-efficacy in coping with other animal fears and stressful social situations but analysis of the intergroup differences failed to yield significance.

Correlational Analysis

Product-moment correlations were computed between self-efficacy at the completion of treatment and the other main posttest measures. The correlations were of comparable magnitude for the two threats and the two modes of treatment. Consequently, the scores were pooled across threats and the correlations computed separately on data from the two treatments were then averaged across

treatments by means of an r -to- z transformation.

The correlational analysis reveals that the higher the level of self-efficacy at the completion of treatment, the higher the level of approach behavior ($r = .84$, $p < .001$), the lower the anticipatory fear ($r = -.42$, $p < .05$), and the greater the sense of personal efficacy ($r = .72$, $p < .001$) in coping with snakes in natural situations.

Similar relationships were obtained between strength of self-efficacy at the completion of treatment and level of approach behavior ($r = .86$, $p < .001$), anticipatory fearfulness ($r = -.33$, $p < .10$), and personal efficacy ($r = .65$, $p < .001$) in managing designated snake encounters under naturally occurring conditions.

Because self-efficacy was measured prior to and after the behavioral posttest, it is of interest to compare the magnitude of the relationship between these factors separately for the two treatments at these two phases. Level of self-efficacy prior to the posttest and degree of behavioral change correlated .83 for the enactive treatment and .84 for the vicarious one. Having put themselves to the behavioral test, subjects altered slightly their expectations of personal efficacy to produce an even closer correspondence ($r = .94$ and $r = .97$ for enactive and vicarious treatments, respectively). However, the correlations before and after the posttest did not differ significantly from each other.

Follow-Up Assessment

As noted earlier, the control subjects and those in the modeling condition who achieved only partial improvement were administered the participant modeling treatment after the formal experiment was completed. The follow-up data therefore reflect the enduring effects of enactive mastery. Comparisons of measures obtained after treatment and 1 month later show that subjects not only maintained their gains in self-efficacy and approach behavior, but achieved some further improvements on measures of generalization. They exhibited greater approach behavior, $t(28) = 2.96$, $p < .01$, and lower fear arousal, $t(28) = 2.73$; $p < .02$, toward the dissimilar

threat, additional reductions in fear in coping with snakes in natural situations, $t(28) = 1.71$, $p < .10$, and increased social self-efficacy, $t(28) = 1.73$, $p < .10$. The congruence between self-efficacy and behavior was as high 1 month after treatment (95%) as it was in the immediate posttreatment period.

After 6 months had elapsed, subjects were sent questionnaires measuring the extent to which they were able to participate in vocational, recreational, and social activities they previously avoided because of their snake phobia, as well as modifications in the incidence of nightmares and other frightening thoughts of reptiles. Changes in these areas of functioning were rated on 5-point scales ranging from a worsening of debilities, through no improvement, to marked improvement. Subjects were requested to supplement their ratings with concrete examples of the changes they had undergone. In addition, they indicated how often, if ever, they used the treatment strategies to eliminate their fears in other areas of functioning. Of the subjects, 70% were available for the extended follow-up assessment.

The data on the transfer effects of treatment further corroborate results of the standardized assessments. Subjects reported either marked (61%) or moderate (39%) relief from aversive thoughts and recurrent nightmares about reptiles. They were no longer preoccupied with frightening ruminations concerning snakes ("Everytime I went outside I was on guard. During my waking hours a lot of 'what ifs' entered my mind. Now I am not 'what ifing' as much . . . I just don't worry about 'the possibility' of encountering a snake now. If it happens I can deal with it."). Evidence that mastery experiences fostered through performance accomplishments can eliminate distressing nightmares of long-standing is especially noteworthy ("I had nightmares about twice a month. I used to be afraid every time I walked into a dark room or got into a car alone at night, thinking that maybe there was a snake on the floor. I haven't had a nightmare since the treatment program. I also used to feel revulsion whenever I even heard the word 'snake.' My body tensed up, and I would



often get a chill and feel sick to my stomach. That never happens anymore.”).

Following treatment, all subjects reported that they had begun to participate in one or more activities (e.g., camping, hiking, picnicking, gardening, swimming, field trips) they formerly avoided because of their dread of snakes. Of the subjects, 23% indicated moderate improvement and 77% reported marked improvement in this respect. For some, elimination of a phobia that had plagued them for years was a particularly liberating experience (“For the first time I am able to go on walks around our neighborhood which has a lot of wooded areas.”).

In describing the benefits they derived from treatment, subjects often commented on their enhanced sense of self-efficacy (“As a result of feeling more confident and in charge of myself I can manage other fears . . . I have a greater self-confidence. When something comes up that is new or unknown to me I feel, ‘Well, I can handle that.’”). It is evident from the questionnaire data that self-efficacy concerning other threats does not derive solely from past accomplishments. In the course of treatment, subjects learned a generalizable skill for dealing successfully with stressful situations. Indeed, 41% of the subjects reported using a participant modeling procedure to overcome a variety of dysfunctional fears and inhibitions. Having a generalizable skill at one’s disposal for managing aversive aspects of an environment not only contributes to one’s sense of personal efficacy, but affects how the environment is perceived. Potentially stressful situations that one can control are likely to be viewed as less threatening.

Discussion

The theoretical formulation of the cognitive mechanism mediating behavior change systematizes the diverse findings obtained in this study. In accord with prediction, participant modeling produced higher, more generalized, and stronger expectations of personal efficacy than did modeling alone. Self-efficacy, in turn, proved to be a consistently accurate predictor of performance on tasks varying in difficulty, with dissimilar threats,

and for diverse modes of treatment. This is most evident in the microanalysis of the high congruence between self-efficacy and performance on the various individual tasks.

It can be recalled that, in the social learning analysis, cumulative accomplishments are considered to be among the most influential sources of efficacy information. The pattern of results yielded by participant modeling indicates that the experiences associated with this mode of treatment altered subjects’ sense of personal competence rather than merely provided behavioral cues for judgments of self-efficacy. Although all subjects who received participant modeling observed themselves perform maximally, not all developed maximal efficacy expectations. Their subsequent approach behavior toward a dissimilar threat was better predicted from their expectations of personal efficacy than from their past performance.

The conceptualization receives additional support for the variations in self-efficacy and behavior change produced by modeling alone. In this condition, subjects observed the therapist behave fearlessly, but because they themselves performed no responses, they had no behavioral sources for their self-efficacy. Nevertheless, the efficacy expectations produced vicariously were just as highly predictive of subsequent approach behavior as were those instilled enactively.

As a further test of the generality of the theory under discussion, a recently completed study (Bandura & Adams, Note 1) included a microanalysis of efficacy expectations instated by systematic desensitization, which is aimed at reducing emotional arousal. This approach, originally founded on the theory that anxiety activates defensive behavior, assumes that defensive behavior is diminished because anxiety is eliminated by associative reconditioning of threatening stimuli to relaxation (Wolpe, 1974). Evidence from several lines of research shows that anxiety and defensive behavior are coeffects rather than causally related (Bandura, 1977b; Bolles, 1972; Herrnstein, 1969; Rescorla & Solomon, 1967). Moreover, subjects who have been thoroughly desensitized to threats vary substantially in their behavioral improvement. The effects of

this treatment must therefore result from some other mechanism of operation.

In the social learning analysis, treatments aimed at reducing physiological arousal improve performance because they raise expectations of personal efficacy rather than by eliminating a drive that supposedly instigates defensive behavior. The social learning perspective thus places greater emphasis on the informative function of physiological arousal than on its automatic energizing property. Phobics whose anxiety reactions to visualized threats have been thoroughly extinguished do, indeed, emerge from the desensitization treatment with differing efficacy expectations (Bandura & Adams, Note 1). The higher the efficacy expectations created by desensitization, the higher the subsequent performance.

The proposed cognitive mechanism provides a basis for predicting the variable responses that characteristically accompany social persuasion and attributional approaches to behavioral change. Additional tests of the generality of this formulation need to be extended to efficacy expectations arising from these other modes of conveying efficacy information. Analyses are also needed of the factors influencing the cognitive appraisal of efficacy information conveyed by each of the major sources of self-efficacy.

It is possible to generate alternative explanations for particular subsets of data, but the mechanism set forth in the present theory appears to account for the different sets of findings. It might be reasoned that self-efficacy was a reliable predictor of behavioral change in the treatment involving enactive mastery because subjects were simply judging their future performance from their past behavior. However, this type of interpretation has no explanatory value for the vicarious and emotive treatments, in which perceived self-efficacy is an equally accurate predictor of performance although subjects engaged in no overt coping behavior. Even in the enactive treatment, self-efficacy proved to be a better predictor of behavior toward unfamiliar threats than did past performance. Moreover, when changes are measured during the course of participant modeling treatment itself, self-efficacy derived from partial enactive mastery

accurately predicts subsequent performance on stressful tasks that subjects had never done before (Bandura & Adams, Note 1).

One might invoke a superordinate mediator that controls both efficacy expectations and behavior. However, it would have to be an exceedingly complex one to account for the diverse sets of relationships. To cite but a few examples, it would have to affect differentially efficacy expectations and behavior resulting from maximal enactive mastery; somehow it would have to produce different levels of self-efficacy from equivalent reductions in emotional arousal; and it would have to generate some variation in efficacy expectations from similar partial mastery experiences. The theory presented here posits a central processor of efficacy information. That is, people process, weigh, and integrate diverse sources of information concerning their capabilities. They then regulate their choice behavior and effort expenditure on the basis of their perceived self-efficacy.

Evidence that subjects develop somewhat different efficacy expectations from similar enactive mastery and fear extinction deserves comment. One possible explanation for the variance is in terms of cognitive processing of efficacy information. The information conveyed by events must be distinguished from the information as processed and transformed by the individual. To the extent that subjects differ in how they cognitively appraise their attainments, their percepts of self-efficacy will vary to some degree. A second possibility concerns the multiple determination of self-efficacy. Because people have met with different types and amounts of efficacy-generating experiences, providing one new source of efficacy information would not be expected to affect everyone uniformly. Thus, for example, extinguishing fear arousal to threats will enhance self-efficacy, but more so in subjects whose past coping attempts have occasionally succeeded than in those who consistently failed.

In testing the relative power of diverse modes of treatment, alternative experimental designs are available. Matched subjects can be randomly assigned to different methods that are administered until some terminal cri-



terion is attained. Such a design, however, creates problems of implementation and analysis. In the case of modeling, in which subjects observe but perform no responses, there are no explicit criteria for when the demonstrations of coping behavior should be concluded. Furthermore, when length of treatment is free to vary across conditions, the mode effects become confounded by variation in duration of application. An alternative design, and the one adopted in the present study, equalizes length of treatment by yoking matched subjects to a treatment of established superiority. This design also presents certain difficulties, although of lesser magnitude. Because the enactive subjects determined the length of treatment for their matched counterparts, some of the modeling subjects may have received more treatment than they needed, while others may not have received enough. Had the modeling treatment been tailored to their own individual requirements, it might well have proven somewhat more effective. Nevertheless, results of other experiments, in which length of treatment is not delimited, show that enactive mastery produces substantially greater behavioral changes than does modeling, and in a shorter time (Bandura, 1977a).

Within the social learning framework, self-efficacy is not the sole determinant of behavior. Expectation alone will not produce desired performances if the requisite competences are lacking. Moreover, there are many things that people can do with certitude of success that they fail to perform because they have no incentives to do so. Given sufficient capabilities and incentives, however, efficacy expectations are likely to be a major determinant of people's choice of activities, how hard they strive, and how long they will persist in their attempts. These were the conditions that obtained in the present study. All subjects had at their disposal the responses necessary for the interaction tasks and they all were motivated to overcome their phobic behavior. Under conditions in which people differ significantly in capabilities and motivation, skill and incentive factors will contribute to variance in performance.

Efficacy expectations do not operate independently of contextual factors. Some tasks

require greater skill and more arduous performances and carry higher risk of feared consequences than do others. Expectations will vary accordingly. For example, the level and strength of perceived self-efficacy in public speaking will differ depending upon the subject matter, the format of the presentation, and the types of audiences that will be addressed. Hence, the present theory is based on discriminative operation of percepts of self-efficacy rather than on global personality traits or motives of effectance. To elucidate how perceived self-efficacy affects behavior therefore requires a microanalysis of both factors.

Discrepancies between efficacy expectations and performance are most likely to arise when performance requirements and situational circumstances are ill-defined. In the present study, the generalization test threat was labeled simply as an "unfamiliar snake," which does not convey much information about its intimidating potential. However, there would be little reason for subjects to assume that it was any more dangerous than the species with which they had been pretested and treated. Although perceived self-efficacy was an accurate predictor of approach behavior toward both the familiar and unfamiliar threats, the discrepancy between expectation and performance was slightly higher in the more ambiguous test situation.

The operative process involved in the relationship between efficacy expectations and action requires further investigation. Efficacy expectations are presumed to influence level of performance by enhancing intensity and persistence of effort. In this experiment, the behavioral tasks were ordered in level of threat and subjects either persisted in their attempts until they completed all of them or they quit at varying points along the way. The number of tasks successfully completed reflects degree of perseverance. As a further step toward elucidating the intervening process, it would be of interest to measure the intensity and duration of effort subjects exert in attempts to master arduous or insoluble tasks as a function of level and strength of their efficacy expectations.

Reference Note

- 1 Bandura, A., & Adams, N. E. *Analysis of self-efficacy theory of behavioral change*. Unpublished manuscript, Stanford University, 1977.

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