

## Catecholamine Secretion as a Function of Perceived Coping Self-Efficacy

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The present research tested the hypothesis that perceived coping self-efficacy mediates the effects of environmental events on catecholamine secretion. Differential levels of perceived self-efficacy were induced in phobic subjects through modeling. Their level of catecholamine secretion was then measured as they were presented coping tasks in their high, medium, and low ranges of perceived self-efficacy. High perceived self-efficacy was accompanied by low levels of plasma epinephrine and norepinephrine during interaction with a phobic object, whereas moderate perceived self-inefficacy gave rise to substantial increases in plasma catecholamines. Both catecholamines dropped sharply when phobics declined tasks for which they judged themselves completely inefficacious. In contrast, dopac was released maximally by mere apperception of task demands that phobics regarded as overwhelming their coping capabilities. After perceived self-efficacy was strengthened to the maximal level by participant modeling, all of the tasks were performed without any differential catecholamine responses.

Recent years have witnessed the convergence of theory and research on the influential role of perceived control in stress reactions (Averill, 1973; Lazarus, 1981; Miller, 1980). A sense of controllability can be achieved either behaviorally or cognitively. In behavioral control, individuals take action that forestalls or attenuates aversive events. In cognitive control, people believe they can manage environmental threats should they arise. These two forms of controllability are distinguished because the relation between actual and perceived control is far from perfect.

Being able to exercise control over potential threats can diminish arousal because the capability can be used to reduce or to prevent painful experiences. But there is much more to the process of stress reduction by behavioral control than simply curtailing painful events.

In some studies of controllability, ordinarily stressful events occur undiminished, but they are promptly transformed to pleasant ones when their occurrence is personally controlled (Gunnar-vonGnechten, 1978). Here it is the exercise of personal control, not the curtailment of the events themselves, that reduces stress. That a sense of controllability diminishes stress was strikingly demonstrated by Mineka, Gunnar, and Champoux (in press) in a developmental study showing that experience in the exercise of control over appetitive events reduces fear arousal to novel threats. In situations in which the opportunity to wield control exists but is unexercised, it is the self-knowledge that one can exercise control should one choose to do so rather than its application that reduces stress reactions (Glass, Reim, & Singer, 1971).

As the studies just cited indicate, the phenomenon of particular interest is the impact of perceived control on stress reactions. Perceived control without the actuality has been shown to reduce stress reactions. People who are led to believe they can exercise some control over painful stimuli display lower autonomic arousal and less impairment in performance than do those who believe they lack personal control, even though they are

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equally subjected to the painful stimuli (Geer, Davison, & Gatchel, 1970; Glass, Singer, Leonard, Krantz, & Cummings, 1973). Repeated failures create stress reactions when ascribed to personal incapability, but the same painful experiences leave people unperturbed if ascribed to situational factors (Wortman, Panciera, Shusterman, & Hibscher, 1976).

In social cognitive theory, perceived self-efficacy operates as a cognitive mechanism by which controllability reduces stress reactions (Bandura, 1985). It is mainly perceived inefficacy to cope with potentially aversive events that makes them stressful. To the extent that people believe they can prevent, terminate, or lessen the severity of aversive events, they have little reason to be perturbed by them. People who judge themselves ineffective in coping with environmental threats dwell on their vulnerabilities and perceive many situations as fraught with danger (Beck, Laude, & Bohnert, 1974). As a result, they experience a high level of cognitively generated stress.

Several lines of research provide corroborative evidence that perceived self-efficacy operates as a cognitive mediator of stress reactions during coping with phobic threats. In some studies phobics' perceptions of their coping efficacy are raised to differential levels, whereupon their subjective stress is measured (Bandura, 1982; Bandura, Reese, & Adams, 1982). The more efficacious they perceive themselves to be in coping with various threatening tasks, the weaker the stress reactions they experience while anticipating or performing the activities.

The generality of the relation between perceived coping inefficacy and stress reactions has been further corroborated using autonomic indexes of stress reactions (Bandura et al., 1982). Phobics display little autonomic reactivity while coping with tasks they regard with utmost self-efficaciousness. On tasks about which they are moderately insecure about their coping efficacy, however, their heart rate accelerates and their blood pressure rises when anticipating and performing the activities. Phobic subjects promptly reject tasks in the range of weak perceived self-efficacy as too far beyond their coping capa-

bilities to even attempt them. Their cardiac reactivity subsides, but blood pressure remains elevated. After perceptions of coping efficacy have been strengthened to maximal level, everyone performs the previously threatened tasks without autonomic arousal.

Increases in heart rate and blood pressure in response to contact with phobic threats are probably mediated by catecholamine plasma epinephrine and norepinephrine (Dimsdale & Moss, 1980; Goldstein et al., 1982). New methods of plasma collection and catecholamine assays (Mefford et al., 1981) permit real-time analysis of changes in hormone secretion as a function of cognitive factors governing stress reactions.

The present research examined the physiological mechanism underlying the effects of perceived coping efficacy on stress reactions by linking strength of perceived self-efficacy to catecholamine secretion at a microlevel. Persons with spider phobias observed modeling of coping strategies with periodic self-efficacy probes until self-percepts of efficacy were induced that spanned the entire range of efficacy strength values. Subjects' levels of plasma epinephrine, norepinephrine, and dopac were then measured while they were administered, in counterbalanced order, tasks corresponding to their strong, medium, and weak strengths of perceived self-efficacy. It was predicted that the weaker the perceived self-efficacy, the greater would be the catecholamine secretion unless subjects declined to do tasks in their perceived inefficacy range, in which case their catecholamine reactivity would be expected to diminish.

After the formal experiment was completed, subjects received participant modeling treatment until their perceived self-efficacy was raised to maximal strength for all tasks. The temporal changes in catecholamine secretion were measured during separable phases of treatment. Catecholamines were expected to be elevated during initial contacts with the phobic object, to decline as coping strategies were mastered, and to rise again when the coping techniques were completely relinquished, thus divesting oneself of all means of control.

After perceived self-efficacy was strengthened to the maximal level, the same coping

tasks were readministered. It was predicted that subjects would no longer display differential catecholamine reactivity when they judged themselves completely self-efficacious.

## Method

### *Subjects*

The subjects were 12 women whose lives had been adversely affected by a phobic dread of spiders. They were recruited by public-service radio announcements broadcast in the San Francisco area calling attention to the phobia project. They varied in age from 19 to 40 years old with a mean age of 28 years.

They sought help because their phobic dread of spiders seriously impaired their daily functioning and created continual distress for them. Because spiders frequent all kinds of habitats and take up residence in homes, the phobia severely constricted the subjects' lives. They abandoned enjoyable pastimes and recreational activities that might have brought them into contact with spiders ("I don't garden or go hiking and camping though I love these activities." . . . "I have been reluctant to even just sit in the yard"). Because spiders are common uninvited houseguests, they debilitated the subjects' lives even more severely in the home. The subjects suffered dreaded apprehensions at the thought of having to cope with spiders on their own ("Whenever I am alone in the house I am very nervous with anticipation that I would have to deal with spiders on my own"). They could not enter places in the house where they had seen a spider ("If I saw one in my closet I could not go in it for days without help"). They perform laundry activities and get in and out of cars in record speed in garages, which they regard as favorite hangouts for spiders. Some were even more severely immobilized by their phobia:

One day I walked into the room and saw a spider on the wall so I ran to the bathroom in which another one was on the wall. I ran into the living room and another one showed up. I ran into the kitchen and sat in the chair in the middle of the room and cried until someone came home to kill them.

Sometimes the phobia fueled marital conflicts:

Because I feel a wave of nausea and panic upon sighting a spider, I have made it a habit for years of quickly checking all four walls and ceiling of any room upon entering it, looking for spiders. The subject has been a sore one with my husband. Spiders have been the primary source of arguments between us.

In addition to their phobic behavior, all the subjects were tormented by apprehensive vigilance, intrusive ruminations, and recurrent nightmares about spiders ("At home every room I walk into I check for spiders. At night I have nightmares and wake up and turn on the light. I am scared one might be in my car while I am driving." . . . "I have had nightmares about spiders at least once a week for 10-15 years. They are always on my mind in the evening when I have to turn on a light in a dark room. I'm hysterical if surprised by a spider, so I always have a light on in the bedroom").

We selected this type of phobia because spiders are a severe subjective threat to those who dread them. Moreover, performance tests requiring intimidating contact with spiders can be conducted while subjects are seated, thus permitting continuous catheter collection of blood samples. This type of real-life stressor provides an excellent paradigm for testing cognitive determinants of hormonal reactions under stringent laboratory control.

### *Test Procedures*

*Phobic behavior.* A female assessor first tested subjects for phobic behavior with a series of 18 performance tasks requiring increasingly more threatening interactions with a large Wolf spider. The tasks required subjects to look down at the spider in a plastic bowl; to place their bare hand in the bowl; to let the spider crawl freely on a stand in front of them; to tolerate it crawling on their gloved hand, bare hand, and forearm; to handle the spider with their bare hands; and to tolerate it crawling in their lap.

*Perceived coping self-efficacy.* Subjects were provided with the list of 18 performance tasks included in the performance test, and they recorded those tasks they judged they could perform as of then. For each task so designated, they rated the strength of their perceived self-efficacy on the 100-point scale, ranging in 10-point intervals from high uncertainty, through intermediate values of certainty, to complete certitude.

### *Vicarious Expansion of the Self-Efficacy Range by Modeling*

Because, at the outset, subjects presented a constricted range of perceived coping self-efficacy, modeling was used to raise perceptions of efficacy to encompass the entire range of strength values. The subject observed a male experimenter modeling coping activities with Wolf spiders that were different from those spiders used in the test phase of the experiment. The modeling, which was conducted individually, emphasized two aspects—predictability and controllability—that are conducive to the enhancement of perceived self-efficacy (Miller, 1980). To demonstrate predictability, the model repeatedly interacted with spiders in ways that showed how spiders are likely to behave in many different situations. To model controllability, the model demonstrated highly effective techniques for handling spiders in any situation that might arise. For example, he modeled how to control the course of the movements of such creatures as they scurried over his hands, forearm, and upper body. To expand even further the means of personal control, the experimenter modeled effective ways of catching spiders on the loose.

At periodic intervals during the modeling procedure, the experimenter readministered the self-efficacy scale. These self-efficacy assessments were repeated until subjects designated at least one task at each of the strong (100), medium (40-60), and weak (0-20) values of self-efficacy strength.

*Selection of coping tasks.* The three performance tasks for the test of catecholamine secretion were individually selected for each subject according to her perceived coping self-efficacy. The performance tasks corresponding to each of the three values of self-efficacy strength thus varied across subjects. For example, the task of touching a spider corresponded to weak perceived self-efficacy for

1 subject, corresponded to medium perceived self-efficacy for another subject, and corresponded to strong perceived self-efficacy for still another. This procedure provided the most stringent test of the hypothesis under study, because catecholamines were analyzed as a function of the differential strength of perceived self-efficacy regardless of what the particular task demands might be. The plasma collection procedure was instituted after the coping performance tasks were selected.

### *Plasma Collection Procedure*

Subjects ate a light breakfast, but they did not consume coffee, tea, or cocoa as instructed. None reported using alcohol or drugs for 12 hr prior to data collection. Blood samples for all subjects were collected between 9:00 a.m. and 1:00 p.m. Blood was collected continuously throughout the study through TDMAC-heparin-treated polyethylene tubing connected to a peristaltic pump (Gilson Minipuls 2, Gilson Medical Electronics) and then to a microfractionator (Gilson Model FC-100). One milliliter of blood was collected for each 1-min sample in all phases of the study except during the participant modeling treatment, when blood was collected at a reduced rate of 0.2 mL/min for 5-min samples. EDTA solution (80 mg/mL) was delivered simultaneously to the fraction collector. Each blood sample was centrifuged as it was collected at  $12,800 \times G$  for 10 min in a refrigerated centrifuge (Brinkman Model 3200), and the plasma was stored at  $-80^\circ C$  until assayed.

Blood samples were assayed using high-performance liquid chromatography with electrochemical detection for the amount of epinephrine, norepinephrine, and dopac secreted into plasma (Mefford et al., 1981). The comparability of high-performance liquid chromatography to radioenzymatic assay is excellent (DaPrada, 1980; Goldstein, Feuerstein, Izzo, Kopin, & Keiser, 1981). The amount of internal standard recovered from multiple pooled samples with the present technique in our laboratory is  $72.2\% \pm 3.8$  for epinephrine and  $75.4\% \pm 7.7$  for norepinephrine (Hjemdahl, Daleskog, & Kahan, 1978). The degree of variability among 10 samples drawn from pooled plasma was  $40.4 \pm 1.10$  for epinephrine and  $326.0 \pm 11.00$  for norepinephrine, which equals a standard deviation among samples of 3% (Hjemdahl et al., 1978).

### *Test of Catecholamine Secretion*

Following the venipuncture, subjects rested for 20 min while catecholamines were continuously drawn. Subjects were then administered the performance tasks while seated. To control for the effects of temporal factors and performance experiences, the order in which the coping tasks were presented was counterbalanced across subjects, with tasks corresponding to the three strengths of perceived self-efficacy appearing in the initial, middle, and final positions of the test sequence. The female assessor conducted the test.

A 3-min period was allocated for any spillover of catecholamines from the prior test and for the time needed to present the new coping task. The subsequent 3-min sample of plasma was used to test the relation between perceived coping self-efficacy and catecholamine release.

### *Maximizing the Strength of Perceived Self-Efficacy*

Assessment of the link between perceived self-efficacy and catecholamine secretion concluded the formal phase of the experiment. However, some additional exploration data were collected. After the catecholamine tests were completed, subjects received participant modeling treatment to raise their perceived self-efficacy to maximal strength for all three of their coping tasks. In this mastery-based treatment, which is highly effective in eradicating phobias (Rosenthal & Bandura, 1978), subjects were aided by a set of performance induction aids to master the activities they had found threatening. At brief intervals, the experimenter administered the self-efficacy scale until subjects judged themselves maximally self-efficacious (i.e., an efficacy strength value of 100) in managing each of their three coping tasks.

The blood samples were temporally linked to six demarcated phases of treatment: They included modeling techniques for controlling the actions of spiders; looking at a spider in a plastic container; initial physical contact by touching the spider in the container; mastery coping, in which subjects exercised full control over the spider as it ran over their arms and upper body; controlled handling, during which subjects let the spider crawl over their upper body but controlled its movement whenever they wished; and finally, suspension of coping techniques. In the latter phase, the spider roamed freely over the subject's body without the subject exercising any control whatsoever.

### *Maximal Perceived Self-Efficacy and Catecholamine Secretion*

The female assessor readministered the original set of three coping tasks for which subjects now judged themselves completely efficacious. The tasks were administered in the same order, and plasma was collected in 1-min samples as in the initial assessment.

## Results

Several extreme responders produced highly skewed distributions of catecholamine release. Hence, nonparametric tests were used to evaluate the significance of the differential reactivity under different strengths of perceived self-efficacy. Single-tailed tests were used in comparisons involving directional predictions. All subjects performed the task at their high perceived self-efficacy level, and 10 of the 12 subjects were able to execute the coping task at their moderate self-efficacy range. Because disengagement from a threatening activity alleviates stress, the data were analyzed separately for the total sample and for the 10 subjects who performed the coping task about which they were moderately self-efficacious. As the coping task at the weak level of perceived self-efficacy was presented,

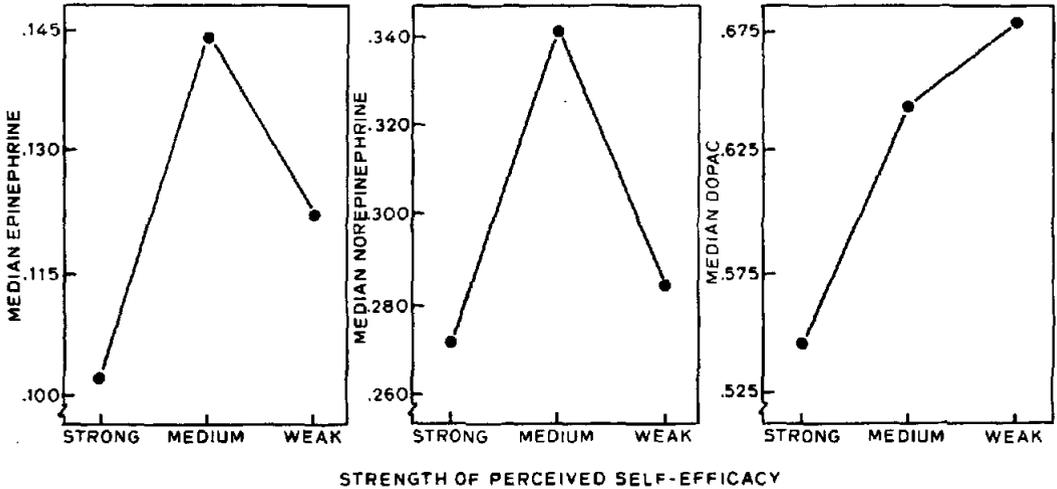


Figure 1. Median level of catecholamine secretion as a function of differential strength of perceived coping self-efficacy.

all subjects promptly declined it, and none of them could even attempt it.

#### Epinephrine

Presented in Figure 1 is the median level of epinephrine secretion as a function of strength of perceived coping self-efficacy.<sup>1</sup> The Friedman two-way analysis of variance shows strength of perceived self-efficacy to be a significant source of variance in epinephrine response,  $\chi^2(2) = 5.32, p < .04$ . Further comparisons of pairs of self-efficacy conditions were made using the Wilcoxon test. While performing the task at medium perceived self-efficacy, epinephrine secretion was much higher than for the task subjects regarded with utmost self-efficacy ( $z = 1.82, p < .05$ ) or for the one in their weak self-efficacy range, which they quickly rejected ( $z = 1.95, p < .025$ ).

Differences in epinephrine levels corresponding to the three strengths of perceived self-efficacy are even more significant if the analysis is confined to the 10 subjects who coped with the threat at the medium self-efficacy range,  $\chi^2(2) = 6.50, p < .02$ . The epinephrine level was much higher when coping with tasks at medium perceived self-efficacy than either at high ( $z = 2.48, p < .01$ ) or at low perceived self-efficacy ( $z = 2.31, p < .01$ ). The latter two conditions did not differ from each other.

#### Norepinephrine

Perceived coping self-efficacy affected the norepinephrine response in much the same way as it did secretion of epinephrine (see Figure 1). The Friedman analysis of variance yielded a significance of  $\chi^2(2) = 4.04, p < .07$ , for the total sample, and  $\chi^2(2) = 4.85, p < .05$ , for the subjects who performed the activities in their medium perceived self-efficacy range.

Individual comparisons for the total sample reveal that medium perceived self-efficacy generated a higher norepinephrine response than did either high ( $z = 1.95, p < .025$ ) or low ( $z = 1.56, p < .06$ ) perceived coping efficacy. The corresponding significance levels are  $z = 1.95, p < .025$ , and  $z = 1.78, p < .04$ , respectively, when the analysis is conducted on the norepinephrine responses of the subjects who performed the task at medium perceived efficacy.

#### Dopac

In Figure 1 the median dopac response is plotted as a function of differential strength of perceived self-efficacy. The Friedman analysis of variance performed on the scores for

<sup>1</sup> The liquid chromatography with electrochemical detection system was unable to detect epinephrine levels in 1 subject.

the total sample disclosed a significant difference,  $\chi^2(2) = 5.17, p < .04$ . Interestingly, unlike epinephrine and norepinephrine, which dropped sharply when subjects refused to cope with a task for which they judged themselves completely inefficacious, their dopac secretion continued to mount.

The dopac reactivity on the task at medium perceived self-efficacy did not differ from that of either high or low self-efficacy. Actually, 10 of the 12 subjects displayed a higher dopac response upon mere mention of the task for which they judged themselves completely inefficacious to handle than while coping with the task they regarded with utmost self-efficacy. Because of a highly divergent case, the results of the Wilcoxon test fell short of statistical significance, despite this uniform difference in dopac reactivity. However, the sign test, which is not affected disproportionately by the single divergent case, shows this uniform difference to be significant ( $p < .04$ , two-tailed).

Dopac seems to be released by mere mention of task demands that subjects regard as overwhelming their coping capabilities, even though they rejected the activity. Hence, deleting the 2 subjects who were unable to cope with the task at medium perceived self-efficacy reduced, rather than raised, the significance level of the obtained differences.

#### *Catecholamine Reactivity at Different Phases of Treatment*

Changes in catecholamine reactivity across the six separable phases of treatment are summarized in Figure 2. The patterns of response are highly similar. Catecholamine levels were high during the initial exposure to, and contact with, the phobic object. As subjects mastered effective techniques for controlling spiders, their catecholamine levels dropped, precipitously so, in the case of dopac and norepinephrine. During this phase, subjects controlled the movement of the spider as it crawled on their arms and upper body. When subjects were asked to suspend their controlling techniques so that the spider now crawled freely over their body, catecholamine levels promptly rose.

Subjects varied in how much treatment they required to raise their perceived self-

efficacy to the maximal level for the three coping tasks. Hence, not all subjects performed every step in the treatment. The reduced number of values at different phases of the treatment precluded statistical analysis of these catecholamine patterns.

#### *Maximal Perceived Self-Efficacy and Catecholamine Reactivity*

After perceived self-efficacy was strengthened to the maximal level, all subjects performed all of the coping tasks. Eleven of the 12 subjects participated in the catecholamine assessment in this final phase of the experiment. At this maximal strength of perceived self-efficacy, no significant differences appeared in either epinephrine,  $\chi^2 = 0.20$ , norepinephrine,  $\chi^2 = 0.18$ , or dopac,  $\chi^2 = 0.18$ , reactivity as subjects performed the previously intimidating tasks.

#### Discussion

Results of the present study lend support to the view that perceived coping self-efficacy operates as a cognitive mediator of stress reactions. Subjects displayed high epinephrine and norepinephrine secretion on tasks about which they doubted their coping efficacy, but as the strength of their perceived self-efficacy increased, their catecholamine reactivity subsided. Both catecholamines declined suddenly when subjects rejected activities they regarded as exceeding their coping capabilities. These biochemical changes are similar to changes obtained in autonomic reactivity as a function of strength of perceived self-efficacy (Bandura et al., 1982).

Interestingly, the dopac response differs markedly from the other catecholamines at the level of extreme perceived inefficacy. Whereas epinephrine and norepinephrine dropped upon rejection of the task, dopac rose to its highest level, even though subjects had no contact whatsoever with the phobic object. Dopac seemed to be triggered by the mere apperception of task demands overriding perceived deficiencies in coping capabilities.

These findings regarding dopac warrant further comment. Dopac has no known physiological function and arises entirely through the monoamine oxidase mediated degradation of dopamine. Peripheral dopamine is not

traditionally thought to play a significant role as either a hormone or a neurotransmitter, although elevation through a variety of stressors has been observed (Van Loon, Schwartz, & Sole, 1979).

Plasma concentrations of free dopamine are very low, typically 1–50 pg/mL. Greater than 95% of dopamine in plasma exists as the sulfate conjugate at the 1–5 ng/mL level (DaPrada, 1980). The physiological significance of plasma dopamine sulfate is unclear, but it has been proposed that intraneuronal

desulfation may occur, allowing  $\beta$ -hydroxylation to form norepinephrine (Unger, Buu, Kuchel, & Schurch, 1980). Dopac might be formed by intraneuronal degradation of free dopamine (after desulfation); thus dopac concentrations would parallel those of norepinephrine, as shown in Figure 2.

An alternative source of plasma dopac could be via central dopamine metabolism. Significant correlations have been described between central dopaminergic activity and plasma dopac and homovanillic acid concen-

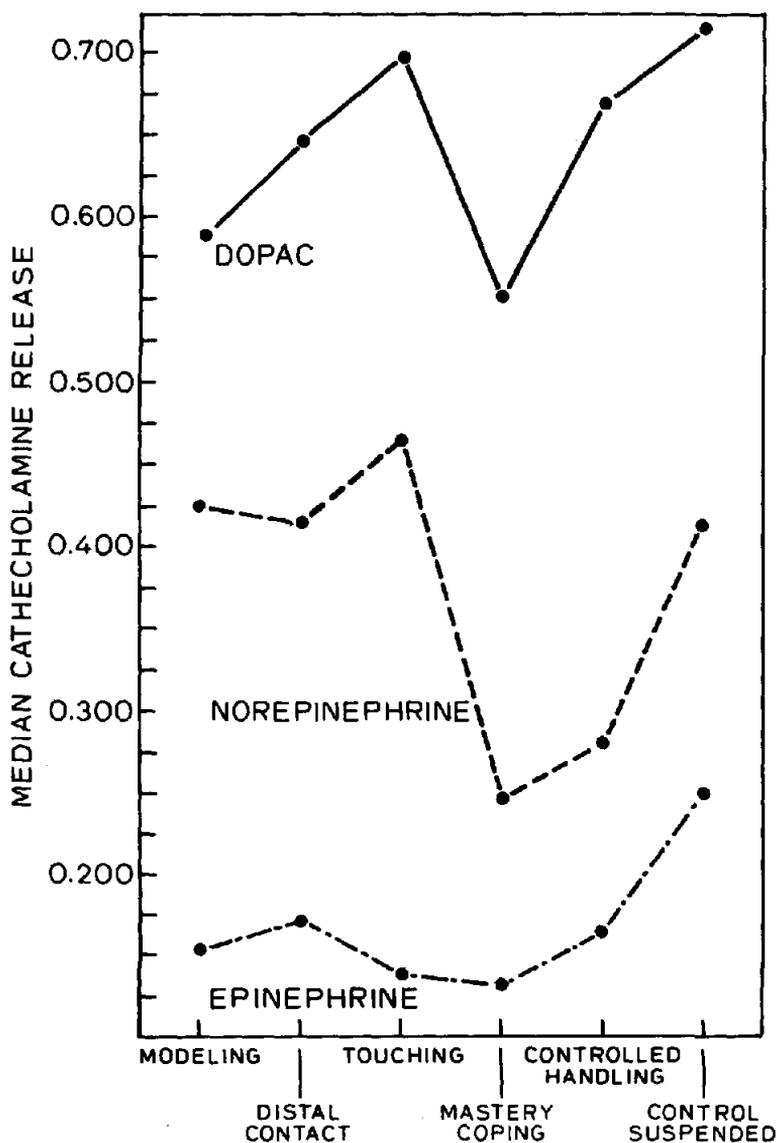


Figure 2. Changes in median level of catecholamine secretion as subjects master effective coping techniques.

trations (Bacopoulos, Hattox, & Roth, 1979). These data suggest that under some conditions plasma dopac could reflect activity of brain dopamine neurons. Such a central contribution would be consistent with the enhanced dopac concentration observed with the perception of inability to cope with a task, as shown in Figure 1.

Strengthening perceptions of coping efficacy to maximal level eliminated any differential catecholamine reactivity to the previously intimidating tasks. These findings indicate that the elevated catecholamine secretions observed in the initial primary test resulted from the degree of the perceived match between coping capabilities and task demands, rather than from properties inhering in the tasks themselves. When self-percepts are maximized, the tasks elicit equivalent catecholamine responses. That tasks, per se, are not the source of variance in reactivity is further corroborated in other studies using both intergroup and intrasubject designs (Bandura et al., 1982). Fear and autonomic reactions to coping tasks differ when perceived self-efficacy differs, but reactions to the identical tasks are the same when perceived self-efficacy is raised to the same maximal level. Thus, perceived coping efficacy determines the perceived dangerousness of interactions with phobic objects. People regard contact with phobic objects as potentially dangerous when they believe they cannot control them but regard contact as nondangerous when they believe they can exercise control over them.

Variations in the level of catecholamine secretion during different phases of treatment also provide information bearing on the hormonal concomitants of personal controllability. During the initial phase of treatment, when subjects lacked a sense of controlling efficacy even the mere sight or minimal contact with the phobic object activated catecholamine responses. Curtis and his associates similarly reported elevations of plasma growth hormone levels during brief exposure therapy when phobics had to cope with phobic objects without having been provided strategies for exercising control (Curtis, Nesse, Buxton, & Lippman, 1979). However, after subjects gained controlling efficacy in the present study, all three catecholamines dropped to the lowest level, even though subjects were

now interacting with the phobic object in the most threatening ways. When all personal control was relinquished, catecholamine reactivity promptly rose. This pattern of results is in accord with a mechanism involving controllability rather than simple extinction or adaptation over time. Gunnar-von-Gnechten (1978) has similarly found that whether or not an intimidating event is stressful to children depends on the amount of control they can exercise over it. Behavioral control decreases fear arousal over and above any benefits derived from predictability of the occurrences of threats (Gunnar, 1980; Miller, 1981).

It will be recalled from the earlier discussion that autonomic arousal to stressors is reduced by self-knowledge that one can wield control over them at any time even though that controlling capability is unexercised. Choosing not to exercise control at a particular time, but being able to do so whenever one wants to, should be distinguished from relinquished control in which one is deprived of all means of control while subjected to stressors. Relinquished control leaves one completely vulnerable, whereas freely usable control leaves one in full command.

Although the findings from the treatment phase are consistent with the obtained covariations between perceived coping efficacy and catecholamine secretion in the formal tests, the results from the treatment phase must be interpreted with caution. The values were too few to compute statistical significances. Participant modeling served as a vehicle for strengthening self-percepts of efficacy and was not, itself, the subject of study. A nontreated control group was not included because the primary purpose of this research was to test the relation between perceived self-efficacy and catecholamine reactivity, rather than to evaluate a mode of treatment. However, evidence from prior research (Bandura, 1982) reveals that control conditions do not alter phobics' perceived inefficacy or stress reactions, whereas participant modeling is uniformly powerful in instilling a strong sense of coping efficacy.

Systematic investigation of the mechanisms underlying human stress reactions present problems because the stressors created in laboratory situations are often weak, and real-life stressors are usually accompanied by

many uncontrolled factors. The phobia paradigm permits the study of one type of intense real-life stressor under controlled laboratory conditions. Powerful treatments provide the means for varying the strength of perceived self-efficacy and for measuring how such changes affect physiological and biochemical responses while coping with the stressor. Such research strategies are well suited for elucidating microrelations between psychosocial influences, cognitive mediators, and the neuroendocrine processes governing stress reactions.

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