

# Selye's Guide To Stress Research

*VOLUME 3*



edited by  
**Hans Selye**

## **SELYE'S GUIDE TO STRESS RESEARCH (VOLUME 3)**

**Edited by Hans Selye**

"Life is not things, details; it is the relationship between all these details that constitutes life." With these words stress-concept originator Dr. Hans Selye lays the foundation for Volume 3 of *Selye's Guide to Stress Research*. His urgent message is that researchers too often immerse themselves in one detail and fail to see the whole. Here he brings you up to date on the expert views of leading stress researchers who have holistic views of the human condition. Dr. Selye himself has carefully selected for this major work only the most current and influential themes in stress research.

He gives you access to path-breaking research findings on psychological, social, and biochemical aspects of stress. Detailed analyses are provided of:

- Hypervigilant reactions to stress
- Psychosomatic illnesses and disease susceptibility
- Occupational stress in hospitals
- Childhood stress
- The nonspecific response of the adrenocortical system to stress
- Stress-induced changes in hormone production
- Xanthurenic acid excretion as a measure of strain
- Renal failure and stress

Featured information on the interaction between physiological and psychological factors — the heart of the holistic approach — will be invaluable to your understanding of stress and how to deal with it constructively. Stress-management techniques are examined with respect to their effectiveness in preventing and treating biological and mental disorders as well as coping with daily stress. You'll find a storehouse of vital data on dietary strategies, autogenic training, relaxation training, biofeedback, self-analysis, gestalt therapy, and meditation. A separate section clearly explains principles for helping children understand stress and describes special stress reduction methods for them.

*(Continued on back flap)*



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# **SELYE'S GUIDE TO STRESS RESEARCH**



# **SELYE'S GUIDE TO STRESS RESEARCH**

**VOLUME 3**

**Edited by**

**Hans Selye, C.C., M.D.,  
Ph.D., D.Sc.**

*President,*

*International Institute of Stress*

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## Preface

I would like to introduce some thoughts on current medical research. Today, the great majority of medical researchers are eager to study and dissect life at its most minute level, beginning with men's organs and cells. For example, with the aid of an electron microscope, a single cell can be pinpointed and dissected, optically, into organelles so small they are difficult to imagine. Nonetheless, they are components of life. In the chemical field, we also dissect: we do not simply take the total weight of a kidney, we fractionize it into proteins, salts, and so forth. We attempt to isolate molecules characteristic of certain organs, or certain chemical messengers that circulate in the blood. We seek out the smallest and try to see ever closer.

This recalls an experience I had. In my opinion, the greatest electron microscopist of our time is Dr. Humberto Fernandez-Moran V, to whom I dedicated my book, *In Vivo: The Case for Supramolecular Biology*, who works in Chicago. Not only has he examined tissues under a microscope, but he is also a physicist and makes the most powerful electron microscopes in the world. One day, in his laboratory, he showed me an object that had been magnified two million times! Can you imagine? With good "definition," meaning clarity, one could see an object enlarged two million times! Up to then, no one had ever seen molecules. There, you could see large molecules, with the eye, just like that. But once I had calmed down, I said to myself: "This great genius has spent all these years narrowing his field of vision two million times!" Do you understand the difference between molecular biology and supramolecular biology, biology *in vivo*, that is in a living being? We try to go into the smallest details and forget that the more we narrow our field, the less we will see of unexpected things on the periphery. It is all very well to develop a discovery by concentrating on one point, but we will

never discern the unexpected by trying to limit ourselves to a single point. What do we want to concentrate on when we do not know what we expect to find?

That is why three years ago, I edited the first volume of *Selye's Guide to Stress Research*. I hoped that it would evolve to serve as a forum for colleagues from the diverse areas of stress research. My effort was to integrate the interdisciplinary aspects of the subject. This third volume should again satisfy those professionals who want to keep up-to-date with the rapid progress being made in this field.

To my mind, the essence of any scientific endeavor has always been to facilitate coordination and cooperation amongst specialists.

To use the example of molecular biology once again, the great biochemist Szent-Györgyi, the discoverer of vitamin C, once said: "When you dissect life into increasingly smaller particles, somewhere along the road life itself disappears." The smallest particle is no longer alive. An atom of iron in my hemoglobin, which I need in order to breathe, is exactly the same as the iron in a hammer. It is not living. Life is not things, details; it is the relationship between all these details that constitutes life.

My rationale has been to remind researchers that we will always need the nonspecialist, the general practitioner of medical research, just as we will always need the general practitioner of practical medicine. We need to correlate and see the whole, not simply to become immersed in one detail. We need both. That is my philosophy of research, and the function of this volume.

HANS SELYE

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# **SELYE'S GUIDE TO STRESS RESEARCH**



# 1

## Hypervigilant Reactions to Threat

**Irving Janis**

*Yale University*

**Peter Defares**

*University of Wageningen, The Netherlands*

**Paul Grossman**

*Foundation for the Study of Stress, Wageningen, The Netherlands*

### **SYMPTOMS OF HYPERVIGILANCE**

Most experimental research on human emotion deals mainly with the lower and middle range of the fear continuum. Typically in this type of research college students are brought into a psychology laboratory and confronted with relatively mild fear-arousing stimuli, such as the threat of failing on a so-called intelligence test or the threat of being exposed to a harmless electric shock that might be momentarily painful. For obvious ethical reasons, controlled experiments are rarely carried out dealing with human reactions in the upper segment of the fear continuum. The main sources of evidence on the causes and consequences of extreme fear reactions among men, women, and children are clinical case studies of acute traumatic neurosis, survey data from combat soldiers and from civilians of all ages exposed to wartime or peacetime disasters, and quasi-experimental studies of people who are voluntarily engaging in dangerous sports, such as parachute jumping, or who are confronting life-threatening health hazards, such as undergoing major surgery. Although such data are not dependable for determining cause-and-effect relationships, they do, nevertheless, converge on a number of

important determinants of traumatic stress reactions. They also enable us to see at least dimly a few pathways that might lead to prevention of some of the most acute disruptive reactions and perhaps also to effective treatment of chronic overreactions to fear-arousing threats.

From a review of the literature on psychological trauma, disaster behavior, and reactions to emergency warnings that require prompt protective action to avert serious health hazards, Janis and Mann<sup>66</sup> have described a hypervigilant pattern which, in its most extreme forms, consists of an extremely agitated state of panic or near-panic. It is characterized by indiscriminant attention to all sorts of minor and major threat cues as the person frantically searches for a means of escaping from the anticipated danger. Other salient characteristics of hypervigilance are temporary impairment of cognitive functioning and defective decision making in which excessive vacillation is followed by impulsive choice of "a hastily contrived solution that seems to promise immediate relief often at the cost of considerable postdecisional regret" (p. 51).<sup>66</sup> When people suddenly realize that they may be entrapped in a danger situation, such as a rapidly approaching tornado, they tend to become so agitated that they fail to use whatever time is available to find the best escape route and fail to notice obvious defects of the one they impulsively choose. Similar failures to make full use of their cognitive capabilities and other available resources have been observed in the emergency decision making of people who display hypervigilance when confronted with community warnings about potential radiation hazards in a nearby atomic energy plant, or with personal warnings from a physician about the possibility that a skin growth might be malignant. Many of them temporarily become obsessed with images of horrifying things that may happen to them. They may become overwhelmed with informational overload as they indiscriminately pay attention to all sorts of warnings, advice, and rumors about the threat.

Sometimes when people become extremely jittery their impulsive action takes the form of unwarranted fight rather than flight.

The disruptive effects of a high level of stress in circumstances requiring immediate protective activity are illustrated by the thoughtless [aggressive] action taken by a law enforcement agent during the race riot in Detroit in 1967, as described in the Report of the National Advisory Commission on Civil Disorders (1968, p. 98). A white National Guardsman believed that his own life was in immediate

danger from snipers when he heard shots nearby after having been summoned by a nightwatchman to investigate looting. Instead of taking cover and watching to see what was going on, he promptly decided to shoot to kill when he caught sight of a black man holding a pistol. The victim turned out to be the nightwatchman, who had shot his pistol into the air to scare off the looters (p. 61).<sup>66</sup>

Janis and Mann assume that everyone is capable of becoming hypervigilant from time to time, whenever certain crucial conditions are present. They specify that a very high level of stress involving intense fear, shame, or guilt is one of the necessary conditions (although not a sufficient condition) for hypervigilance to become the dominant reaction to any threatening situation.<sup>66</sup> Thus, although the hypervigilance pattern does not occur every time a person is in a state of very high fear, the probability that it will occur is nevertheless considerably increased whenever a person's fear mounts to a high level. Accordingly, by examining the conditions that make for high fear we can expect to learn something about the determinants of hypervigilant reactions.

Three main indicators are commonly used by psychologists and psychiatrists to assess a person's level of fear or any other unpleasant emotion—verbal reports, behavioral avoidance reactions, and physiological symptoms of arousal. But these three indicators, as Lang points out,<sup>75</sup> have so often been found to be weakly correlated with each other in research on emotional reactions that they cannot be regarded as measuring exactly the same thing. "Fear," Lang says, "is not some hard phenomenal lump that lives inside people, that we may palpate more or less successfully." He is undoubtedly correct for low and medium levels of fear, which are the intensities examined in most systematic studies. But, in a sense, when fear is aroused strongly enough to reach near-panic levels, it becomes sufficiently "lumpy" and remains alive long enough to be palpable when examined in different ways. For example, immediately after tornadoes, earthquakes, explosions, destructive conflagrations, air raids, and other large-scale disasters, large number of survivors admit that they feel terrified and at the same time display marked signs of jitteriness along with high physiological arousal.<sup>58,61,95</sup> During the first 15 to 30 minutes after the end of the danger episode these extreme reactions subside in most survivors, but in a minority of cases symptoms of jitteriness persist for days and sometimes even weeks, along with excessive physiological arousal in response to noises

and minor threats, trembling of the hands, preoccupation with possible recurrences of danger, terrifying nightmares and intrusive "daymares" in which traumatic events are reexperienced.<sup>56,58</sup> This persisting state of hypervigilance may alternate with feelings of numbness, denial of losses, efforts to ward off exposure to reminders of the disaster, and other manifestations of extreme defensive avoidance tendencies.<sup>58</sup>

In a study of novice parachute jumpers, Fenz and Epstein found that subjective reports of fear along with psychophysiological measures of heart rate, respiration, and psychogalvanic response all reached a peak just before the jump. All these indicators decreased markedly after the jump. In contrast, when the same investigators examined veteran parachute jumpers who had habituated to the danger situation, they found marked discrepancies between the verbal and the psychophysiological measures. These results for habituated jumpers are similar to those reported by Lang and others for situations that evoke low or moderate levels of fear.<sup>34,75</sup>

Rachman points out that a lack of correspondence among verbal, behavioral, and physiological measures is to be expected whenever people act courageously or manage to continue approaching a threatening situation despite their apprehensiveness. Social pressures, a sense of commitment, and various internal conflicts that give rise to bravado or counterphobic behavior can also reduce the correlations among the different types of indicators, especially when fear is at a low or moderate level.<sup>95</sup> For example, young men who volunteer to donate blood in response to persuasive pressures during a Red Cross campaign sometimes display a pattern of defensive avoidance, verbally denying feeling fearful when they come to the blood bank clinic. For a time they may successfully struggle against displaying any avoidance behavior, but they cannot inhibit signs of acute physiological disturbance, manifested by hyperventilation or blanching of the cheeks, which belies their verbal denials.<sup>36,91</sup>

At higher levels of fear, as we have indicated, the hypervigilant pattern is more likely to be dominant, in which case the verbal, behavioral, and physiological indicators of negative emotional arousal all tend to agree. As Rachman (p. 20) says, "*all* correlations between the various measures or response systems are likely to increase at extremes of the scales."<sup>95</sup> Nevertheless, the correlations are likely to be far from perfect, partly because hypervigilance is not always the dominant pattern even when people are terrified; extreme forms of defensive avoidance some-

times alternate with hypervigilance and in some cases predominate as the sole coping pattern. Whenever defensive avoidance becomes the dominant reaction to threat it is likely to result in a lack of agreement between the frightened person's verbal denials and the behavioral and physiological indicators of fear.<sup>66</sup>

## PHYSIOLOGICAL ASPECTS

The emotional state of panic or near-panic that is at the core of the hypervigilant pattern appears to involve what Selye calls the initial "alarm" stage of the "general adaptation syndrome" evoked by powerful stressors.<sup>100,101</sup> During this stage there is a high degree of physiological arousal with marked increases in sympathetic-adrenal activity. According to Selye, it is followed by a stage of physiological resistance and then a final stage of exhaustion or collapse.

Undoubtedly, in humans, with their highly developed central nervous system, emotional arousal is one of the most frequent initiators of somatic stress . . . The resulting nervous signals reach certain neuroendocrine cells in the median eminence (ME) of the hypothalamus, where they stimulate the secretion of CRF (corticotrophin-releasing factor), a chemical messenger. In this way a message is relayed to the pituitary, causing a discharge of ACTH (adrenocorticotropic hormone) into the general circulation.

While these events are taking place, another important pathway is utilized to mediate the stress response. Other stress hormones, such as catecholamines (e.g., adrenaline and noradrenaline), are liberated to activate mechanisms of general adaptation. Adrenaline in particular is secreted to make energy available, to accelerate the pulse rate, to elevate blood pressure and the rate of blood circulation in the muscles, and to stimulate the central nervous system. The blood coagulation mechanism is also enhanced as a protection against excessive bleeding if injuries are sustained in the encounter with the stressor (pp. 94-95 and 97).<sup>102</sup>

The alarm or emergency reaction to a powerful stressor includes a variety of physiological changes, some of which, as Selye points out, are mediated by the activity of the adrenal glands. The main changes that have been repeatedly observed constitute a well-known pattern that ever

since the time of Cannon has been interpreted as a mobilization of the body's resources for immediate protective action.<sup>13</sup> Included are rapid heart beat; increase in blood supply to muscles and the brain, with a corresponding decrease in blood supply to viscera and skin; release of glucose transformed from glycogen stored in the liver; increase in activity of sweat glands; dilation of the pupils; dilation of the bronchi in the lungs; and deeper and more rapid breathing.<sup>45</sup>

The last of these changes is of special interest because changes in breathing, although often involuntary, are nevertheless much more subject to voluntary control than changes in heart rate and other physiological reactions that directly ensue from activation of the autonomic nervous system. Furthermore, recent research suggests that changes in breathing may be a crucial first step leading to other major physiological and psychological changes evoked when people are exposed to powerful threat stimuli.<sup>48</sup> In response to oncoming danger or anticipations of imminent threat, practically everyone will start breathing hard. This, in effect, changes the rate and depth of respiration in the direction of hyperventilation, which is characterized by respiratory activity in excess of immediate metabolic requirements. Given a threatening enough situation, hyperventilation may be so pronounced within just a few minutes that the massive amount of exhalation resulting from the rapid breathing has blown too much carbon dioxide out of the body and the level of CO<sub>2</sub> in the arterial bloodstream has dropped significantly below normal.

It has been difficult to determine to what extent people respond to threatening stimuli by overbreathing, since hyperventilation occurs most readily in just those situations of extreme fear in which experimental manipulations are ethically unacceptable.<sup>10,17,93</sup> Still, a number of experimental studies dealing with less extreme forms of stress make it apparent that increased respiratory activity, in the direction of hyperventilation, is a normal response to somewhat elevated levels of fear or anxiety and mental load.<sup>48,93</sup> Furthermore, there are indications that, for either physiological or psychological reasons, some individuals seem to manifest a predisposition toward hyperventilation even under circumstances of relatively mild threat.<sup>51</sup>

Much better known than the antecedents of hyperventilation are its physiological, behavioral, and psychological<sup>11,23,50,82</sup> correlates. Along with the reduction of CO<sub>2</sub> in the bloodstream and a concomitant lowering of blood acid level, numerous systemic alterations are likely to

occur in the body. These include increased sympathetic activity, changes in renal function, increased risk of cardiac dysrhythmias, elevation of heart rate, decreased oxygen supply to brain tissue, and heightened cerebral vasoconstriction. The last two alterations, in turn, are accompanied by changes in brain activity as manifested by EEG recordings.

Feelings of acute anxiety tend to be augmented whenever appraisal of an external threat is accompanied by hyperventilation. People who suffer a hyperventilation attack at a time when they are facing danger usually do not identify their physiological symptoms as arising from their increased breathing but rather focus upon the threatening situation as the source of the disturbance. This misidentification is quite understandable because the environmental situation that brings about a hyperventilation episode is usually extremely alarming and the physiological consequences of overbreathing, which are not attributed to the respiratory system, are in themselves very disturbing (e.g., muscular tremors and palpitations). Such symptoms occur, of course, as a result of a number of other different causes, but when they are induced by overbreathing under conditions of extreme threat they may contribute to the intensity of concomitant anxiety reactions. However, when a normal person voluntarily hyperventilates, while exercising or in response to a physician's instructions, feelings of anxiety are usually not aroused.

The altered patterns of cerebral electrical and vascular activity probably are largely responsible for the psychomotoric and cognitive impairments that hyperventilation induces. Substantial impairments of memory, concentration, discriminative abilities, and perceptual-motoric functioning have all been reported as sequelae of severe hyperventilation.<sup>48</sup> These findings suggest that *many of the characteristic symptoms of hypervigilance may be directly traceable to hyperventilation.*

Where external threat is less pronounced and hyperventilation does not occur, the arterial CO<sub>2</sub> will be maintained at the normal steady state level. However, other alterations in breathing (not necessarily involving a drop in CO<sub>2</sub> level) are capable of drastically modifying numerous physiological and psychological processes, which may prove to be related to specific forms of hypervigilant reactions. Changes of various parameters of the respiratory pattern, including those of depth, rate, and inspiration and expiration times are known to alter cardiac sympathetic-parasympathetic balance.<sup>48</sup> There is also further evidence that such respiratory modulations of autonomic activity can occur at all lev-

els of the spinal chord. Hence numerous organ systems may be affected by changes in respiration pattern.<sup>15,43,71,72</sup>

Alterations in autonomic balance produced by rapid breathing may be responsible for the diverse psychological changes that parallel the physiological ones. Numerous studies clearly indicate that voluntary changes in breathing pattern can modify one's ability to cope with pain and with threatening fear-provoking situations.<sup>14,35,69,86,114</sup> Some of these investigations have shown that slowing down the respiratory frequency increases depth of breathing significantly, reduces the subjective experience of anxiety under stressful conditions, and raises one's threshold of tolerance to pain. Voluntarily increasing respiratory frequency, on the other hand, seems to have the opposite effects. Additional reports indicate that voluntary changes of the breathing pattern can enhance certain mental abilities involved in the acquisition and processing of new information.<sup>92</sup> All of these various findings taken together suggest the potential utility of a breathing therapy for treatment of stress disorders related to hypervigilant responses. Later on, we shall see that some persons suffering from acute anxiety reactions to mildly threatening situations will improve markedly if they are trained to control their respiratory pattern.

The exact causal mechanisms relating respiratory function to other physiological systems are yet to be clarified. But from what is already known, it appears that the autonomic changes accompanying either voluntary or involuntary respiratory alterations fit consistently with general sympathetic nervous system responses when alarm or emergency reactions occur.

One of the effects of sympathetic nervous system activation in response to any stressor, as Selye has pointed out, is secretion of catecholamines from the adrenal medulla. Such secretions have been detected in urine specimens of persons exposed to such varied stress situations as being immersed in water, anticipating painful shocks, undergoing dental treatment, and taking a college examination.<sup>19</sup> A series of studies by Levi indicates that within each subject there tends to be a positive correlation between the amount of catecholamine excretions and the reported intensity of emotional arousal. But there are also indications in Levi's data that this positive relationship between catecholamine levels in urine and subjective arousal exists regardless of whether the arousal is pleasant or unpleasant. Consequently, it does not seem likely that the adrenal activity which results in large quantities of

catecholamine secretions is distinctive of states of high fear as compared with other equally intense emotional states.<sup>80</sup> Nevertheless, it may be worthwhile for subsequent research to pursue a major question that arises from Levi's central findings: Are catecholamine secretions greater when a person displays a hypervigilant reaction to a threat than when he or she displays a more moderate reaction?

In a variety of acute and sustained stress situations, many studies have been carried out on secretions of the adrenal *cortex*, which, like the catecholamine secretions from the adrenal *medulla*, result from activation of the sympathetic nervous system. The main measures used include urine levels of 17-hydroxycorticosteroids, plasma levels, and production rates. The findings to a degree parallel those for catecholamines in that increased corticoid secretion is found for a variety of stressors and yet high levels of corticoids do not appear to be distinctive of high fear.

Mason cites evidence to support the argument that those investigations that measure a variety of endocrine secretions simultaneously hold the promise of arriving at distinctive physiological patterns for each specific type of emotion-eliciting stimuli. Perhaps this line of research will yield a distinctive endocrine pattern for hypervigilant reactions, but so far the extensive research on the psychophysiology of emotions does not appear to have made much progress in this direction.<sup>85</sup>

## PSYCHOLOGICAL FACTORS THAT PLAY A CAUSAL ROLE

### Predispositional factors

People who react with hypervigilance to any given external threat of bodily damage, such as an impending surgical operation, are more likely than others to respond in that same fashion whenever they are exposed to new physical threats or to actual physical danger. Supporting evidence for this predispositional tendency comes from studies of hospitalized patients in both surgical and maternity wards.<sup>2,59,61,78</sup> The correlational and case study findings indicate that persons who show symptoms of hypervigilance before surgery or delivery show essentially the same pattern during and after the main ordeal, even when confronted with such minor threats as a nurse or physician entering their hospital room.

This readiness to become jittery, agitated, and preoccupied with frightening images in response to any threat of physical danger is

thought to be related to a number of different personality variables. Among the predisposing attributes frequently mentioned in the literature on personality research are chronic anxiety neurosis, low ego strength, low self-confidence, poor problem-solving ability, and low capacity for developing or using a network of social supports.<sup>68</sup> Empirical findings bearing on such variables, however, are not clear-cut and sometimes are mutually contradictory. Methodological refinements are obviously needed in personality research in order to determine the predisposing variables related to different ways of coping with threat.<sup>16</sup>

### Traumatic Conditioning

Somewhat more dependable evidence is available on situational variables that are thought to be primary or secondary factors that induce or contribute to an extremely high level of fear, which increases the likelihood of hypervigilant reactions. Research in the field of animal learning has consistently shown that intense fear reactions can be elicited in response to initially neutral signals that are paired with pain or other powerful noxious stimuli. There are a few reports of long-lasting fear reactions that are resistant to extinction during hundreds of unreinforced trials, which have been induced in rats, dogs, and other species after only a few exposures—sometimes just one exposure—to a traumatic unconditional stimulus that elicits pain.<sup>39,107</sup>

Many psychologists believe that these findings can be extrapolated to humans, but extrapolation remains questionable unless there is dependable evidence of traumatic conditioning in human subjects. In general, ethical and humanitarian considerations have generally deterred such experimentation ever since the time of the first notorious emotional conditioning study of a young child by Watson and Rayner, which was too poorly controlled to warrant any definite conclusions.<sup>110</sup> In a nonexperimental study, however, Edwards and Archer obtained some suggestive evidence of long-term retention of a conditioned emotional response in human subjects by reexposing naval personnel to a bell that had been an alarm signal when they were on combat duty. Many years later the men showed strong psychogalvanic reactions when the investigators rang that bell in the laboratory.<sup>29</sup>

Cogent experimental evidence was obtained in 1964, at a time when there were no human subjects committees to monitor research. A controversial study of traumatic conditioning was carried out by Campbell,

Sanderson, and Laverty with human adults, all of whom were hospitalized alcoholics.<sup>12</sup> The investigators justified exposing them to a traumatic stimulus that created a temporary state of utter terror on the grounds that it does not cause any known physical damage and the subjects had volunteered for the experiment with the hope of being helped to cut down on drinking. The traumatic experience was produced by administering Scoline, a rapid-acting drug that promptly induces a horrifying state of complete paralysis, which prevents breathing for about two minutes and creates intense fear. All the subjects exposed to the Scoline injection said afterwards that they were extremely frightened because they thought they were dying of suffocation. One subject said that it was worse than a traumatic experience he had had as a combat flyer during World War II.

Each of the five subjects in the experimental group was given a single trial in which the tone of a bell was paired with the Scoline injection. All the subjects showed clear-cut signs of emotional conditioning on four psychophysiological indicators. Long after the effects of Scoline wore off, presentation of the tone alone elicited changes in psychogalvanic reactions, breathing rate, heart rate, and muscle tension similar to those that had been elicited by Scoline. All five subjects showed enormous resistance to extinction during 100 trials of exposure to the tone alone, given over a period of three weeks. Comparative results from six additional subjects in two control groups indicated that the emotional changes were attributable to the pairing of the conditioned with the unconditioned stimulus: three hospitalized alcoholics who were given the tone only and three others who were given the unconditioned stimulation only (the Scoline injection) showed no subsequent change in response to the tone.

The persistent fear reaction evoked by the tone was presumably *not* mediated by cognitive expectations that the tone would be followed by the traumatic event. During the hundred extinction trials the subjects knew that they were not going to be injected with Scoline again and they had ample opportunity to learn that the tone was not a signal for a repetition of the horrifying suffocation experience.

Of course, this experiment was done only with chronic alcoholics and, in any case, no single experiment like this one could be regarded as conclusively demonstrating one-trial Pavlovian conditioning of fear in humans unless it were replicated with normal (nonalcoholic) subjects. But it would be unethical to repeat any such experiment on traumatic

conditioning with human subjects, especially since the subjects in the experiment by Campbell and his collaborators showed considerable psychological distress that led to long-lasting fear reactions.

### Near-miss Exposures to Danger

Considerable evidence of the effects of exposure to traumatic stimuli has accumulated from case studies and surveys of people who have been injured or have undergone narrow escapes in accidents or disasters.<sup>61</sup> Even in individuals with stable personalities, emotional shock and hypervigilant behavior usually occur at least temporarily following direct involvement in a disaster. Most survivors recover from emotional shock within an hour or so, but some remain hypervigilant for weeks, months, or even years in response to reminders of how close they came to being badly hurt or killed. The critical determinant of sustained hypervigilance seems to be what MacCurdy has labeled a "near-miss" as against a "remote-miss" disaster experience.<sup>83</sup> Studies of wartime and peacetime disasters indicate that the most intense and prolonged symptoms of hypervigilance tend to develop among those survivors who were in close proximity to actual danger and had undergone near-miss experiences such as narrowly escaping serious injury when their home was destroyed, being pinned down by fallen debris, losing relatives or friends, and seeing maimed bodies.<sup>58,95,112</sup>

Survivors who had remote-miss experiences, on the other hand, showed a marked tendency toward increased tolerance for stress, manifested by decreased fear with successive exposure to the same type of danger, presumably as result of habituation or emotional adaptation. Studies of civilians in cities exposed to air attacks in England, Germany, and Japan during World War II consistently indicate that among those persons who do not undergo any near-miss experiences, "there appears to be a general tendency toward emotional adaptation under conditions of repeated danger exposures" (p. 113).<sup>58</sup> This tendency may help to account for the remarkably high degree of resilience and the low incidence of mass panic or psychiatric casualties observed among people repeatedly exposed to wartime or peacetime dangers, contrary to the expectations of many psychologists and psychiatrists.<sup>95</sup>

Grinker and Spiegel present a series of case studies in which they trace the onset of hypervigilant reactions of American combat fliers (all of whom had to be grounded because of inefficient performances) to

near-miss experiences. They assert that the mediating psychological process is a loss of feeling of personal invulnerability induced by one or more unnerving experiences of feeling helpless in the face of danger, which presumably leads to a marked lowering of self-confidence. This hypothesis appears to be plausible in light of impressionistic observations in peacetime disasters, but has not yet been tested systematically.<sup>46,60,112</sup>

### **Additional Determinants of Extreme Fear Reactions**

In addition to near-miss exposures there are other factors that apparently augment fear during disaster situations, which may hamper recovery from hypervigilance following frightening encounters with extreme danger. Among the factors most frequently implicated as antecedents of hypervigilant reactions in the extensive research literature on human fear reactions are the following: (1) lack of contact with family members or other supportive persons, (2) restrictions of activity, (3) lack of perceived control over dangerous events, and (4) lack of preparatory information about what stressful events are to be expected or about what to do to build up one's coping skills.<sup>19,27,33,42,61,67,90,95</sup> Field studies indicate that these factors can increase the probability of hypervigilant reactions, although not in all circumstances. Considerable research effort will be required to determine the conditions under which each of these factors has the expected detrimental effect as against a favorable effect or no effect at all.

Another contributory factor that is much more difficult to investigate is a high background level of recently accumulated sources of stress. When a series of minor stresses occurs day after day without any let up, people suffering from illness or other adversities become demoralized and display a mixture of depression and anxiety.<sup>61</sup> Some afflicted persons regard a series of relatively minor distressing events as unrelenting misery and it gradually undermines their feelings of personal invulnerability to the point where hypervigilant reactions ensue, resembling those that follow a single near-miss experience. This effect of accumulated minor stresses might help at least partially to account for the remarkable relation that has been observed between number of stressful life events and onset of physical illness.<sup>19,44,54,55,96</sup>

A series of stressful events, such as those that occur when a man suffers from chronic illness or loses his job and moves to another city to

seek employment, can keep the person in a continually agitated state as one alarm reaction after another is evoked by a succession of threat cues. Even positive life changes, such as promotion to a more responsible job, could contribute to a sustained hypervigilant reaction insofar as they pose new threats of failure and new demands that may tax further the person's coping capabilities at a time when he or she is already overloaded with an accumulation of other life stresses.<sup>76</sup> In terms of Selye's stress response syndrome, continued hypervigilance would lower the threshold for alarm reactions, which might then occur in such rapid succession when the person is subjected to multiple sources of stress that each new one starts before the person has recovered from the last. This could lead to an end state of exhaustion with lowered resistance to disease. Selye asserts: "Whatever is lost during stress is not merely caloric energy, since even with sufficient food, exhaustion ensues. One would think that once adaptation occurred, and energy is amply available, resistance should go on indefinitely. But just as any inanimate machine gradually wears out, even if it has enough fuel, so does the human machine sooner or later become the victim of constant wear and tear (p.94)." <sup>102</sup>

### Time Pressure as a Determinant of Hypervigilance

In Janis and Mann's analysis of emergency decision making, considerable emphasis is given to *time pressure* as a major determinant of hypervigilance when people are exposed to serious threats of physical injury or death.<sup>66</sup> Disaster studies indicate that panic, the most extreme form of hypervigilance, tends to occur when people perceive that danger is imminent and that escape routes are rapidly closing off. That is to say, people facing danger are likely to become hypervigilant if they expect to be helpless victims of oncoming disaster unless they act very quickly to escape. It is under these conditions that the most extreme instances of cognitive impairment, poor judgment, and maladaptive impulsive actions have been observed. There is even some evidence suggesting that when people are told that an oncoming disaster is expected to strike within a few minutes, their frantic escape attempts are so unrealistic that they increase rather than decrease the danger, and the people would be better off with no warning at all.<sup>38,66</sup>

In a series of laboratory experiments that confronted subjects with the threat of unusually painful electric shocks, Kelley and his co-

workers found that paniclike reactions resulting in entrapment were likely to be manifested when subjects were under extreme time pressure. The findings indicate that when fear is aroused in a threat situation that allows for only a short time to escape, people frantically take action without regard for the available opportunities that would enable them to escape successfully.<sup>70</sup>

Janis and Mann postulate that the hypervigilance pattern is fostered by deadline pressures whenever people must take action to avert any kind of threatened loss, whether it affects their personal safety, career goals, social or financial status, the welfare of their loved ones, or any other important values. At such times people are likely to become excessively preoccupied with the threatened losses and to display other symptoms of hypervigilance if they receive information that leads them to believe that they have insufficient time to search for a good solution. Under these pressing conditions they become indiscriminantly receptive to rumors about terrible things that might happen. They fail to take account of evidence indicating the improbability of exaggerated dangers, vacillate as they try to avoid each of the risky alternatives that could lead to catastrophe, and finally choose hastily the one that at the moment seems least dangerous.<sup>66</sup>

As an illustrative example of just such a hypervigilant reaction, Janis and Mann describe the behavior of Herbert Porter, a minor official working for the reelection of President Nixon at the time of the Watergate scandal. Porter had handled the funds used to give illegal payments of \$100,000 to the Watergate burglars. He was told by his superior that the money had been used for illegitimate "dirty tricks" and was asked to commit perjury in order to protect the President and his aides from being damaged by attacks in the press. At the Senate Watergate Hearings, Porter testified that he became "rather excitable" when his superior told him that government investigators could "come in at any moment and swoop in on our committee and take all of the files and subpoena all of the records and you know what would happen if they did that." Porter added that he "conjured up in my mind that scene" and in his aroused emotional state agreed to tell a false cover story to account for the funds that had been used illegitimately. Having made this commitment, Porter lived up to his hastily made decision. He committed perjury three times—when questioned by the FBI, by a Federal Grand Jury, and by the court at the trial of the Watergate burglars, which resulted in his being sent to jail.

Some persons may be under constant time pressures as a result of either situational demands that create an overloaded daily schedule of urgent obligations or personality predispositions or both. Whatever the cause may be, such persons can be expected to become hypervigilant much more readily than others in response to warnings and approaching deadlines. If so, their decisions would be characterized by considerable emotional arousal, vacillation, and ill-considered choices that are frequently followed by postdecisional conflict and frustration.

It is noteworthy that a chronic sense of time urgency has been found to be a major component of "type A personalities," who are at high risk with regard to coronary heart disease.<sup>41</sup> Another relevant component of the Type A syndrome is a high degree of frustration, often resulting from decisions and plans that do not work out well. Since these two components—chronic time pressure and frustration—are likely to be indicative of a high frequency of hypervigilant reactions, we would expect them to be related to peptic ulcers and a number of other stress-related disorders in addition to coronary heart disease. These considerations pose several new problems for subsequent research on psychosomatic disorders: Do hypervigilant reactions occur more frequently among Type A personalities than among other types of people? If so, are such reactions linked to the onset of heart attacks and other forms of heart disease? Do Type A personalities also show a higher incidence of other stress-related diseases? If so, are hypervigilant reactions implicated in their onset?

Whether or not there are any psychosomatic consequences, sudden unexpected threat combined with extreme time pressure to avert the danger appears to be among the prime conditions that foster a state of hypervigilance in which people are likely to commit themselves impulsively to courses of action that they soon have cause to regret. That treacherous combination is most likely to occur, according to Janis and Mann, when decision makers have disregarded earlier warnings about the threat.<sup>66</sup> When reactions to the initial warnings take the form of defensive avoidance, rather than vigilance, people ignore the warnings, fail to search for relevant information, and do not adequately appraise the risks entailed by the alternative courses of action. They evade decisional conflict by shifting responsibility for the decision to someone else, by procrastinating, or by constructing wishful rationalizations that bolster the least objectionable alternative, which results in their minimizing the losses to be expected. This coping pattern is most likely to occur

when people are in a state of high decisional conflict about the risks entailed by choosing any of the alternatives they know about, and when they believe that there is little hope for finding a satisfactory solution.

When defensive avoidance is the dominant pattern, decision makers remain inattentive to corrective information until they are confronted by a sudden dramatic threat that catches them by surprise, which sets the stage for a hypervigilant reaction. The same thing is likely to happen if decision makers misunderstand or fail to grasp the significance of earlier warnings and, as a result, feel genuinely unconcerned about the risks or dangers that might lie ahead. This pattern, which Janis and Mann designate as "unconflicted inertia," leaves decision makers just as unprepared for dramatic bad news about threats of serious losses as defensive avoidance. Unconflicted inertia and defensive avoidance in response to early warnings about a given danger can be regarded as psychological factors that increase the probability of hypervigilance in response to a subsequent confrontation with that danger.

## BEHAVIORAL CONSEQUENCES

Among the main consequences of hypervigilant reactions to any warning about an anticipated threat are errors in deciding how to cope with it. Lazarus<sup>76,77</sup> asserts that coping with stress is essentially a matter of problem solving under conditions where it is not clear what to do. Problem-solving activities become grossly inefficient when people are in a state of hypervigilance and, as a result, they are likely to fail to choose an adaptive course of action that will reduce the risks posed by the anticipated danger. Their efforts to escape or to aggress against the perceived source of threat tend to be misdirected and ineffectual.

In an analysis of defective patterns of coping with decisional conflict evoked by challenging information about impending threats, Janis and Mann<sup>66</sup> specify the behavioral consequences of hypervigilance in terms of seven major criteria of effective decision making. These criteria were extracted from the extensive literature on the quality of problem-solving procedures that lead up to the act of commitment to a chosen course of action. Hypervigilance tends to result in either partial or complete failure to meet all seven of the criteria, according to the analysis by Janis and Mann: In a state of hypervigilance the decision maker fails to: (1) thoroughly canvass a wide range of alternative courses of action; (2) take account of the full range of objectives to be fulfilled and the values

implicated by the choice; (3) carefully weigh whatever he or she knows about the costs or drawbacks and the uncertain risks of negative consequences, as well as the positive consequences, that could flow from each alternative; (4) intensively search for new information relevant for further evaluation of the alternatives; (5) conscientiously take account of any new facts or expert judgments that are obtained, especially those that do not support the course of action he or she initially prefers; (6) reexamine the positive and negative consequences of all known alternatives, including those originally regarded as unacceptable, before making a final choice; and (7) make detailed provisions for implementing or executing the chosen course of action, with special attention to contingency plans that might be required if various known risks were to materialize.<sup>66</sup>

Janis and Mann assert that although systematic data are not yet available on the long-term effects, it seems plausible to assume that low-quality decisions, in the sense of failing to satisfy the seven procedural criteria, have a poorer chance than others of attaining the decision maker's objectives and of being adhered to. The more such defects are present before the decision maker starts to implement the decision, the greater the chances that he or she will undergo unanticipated setbacks, which create postdecisional regret and a reactivation of stressful conflict. Such stress reactions entail repeated psychophysiological arousal, which, as we indicated earlier in this chapter, might contribute to the onset of psychosomatic disorders. Furthermore, when people realize that they have made gross errors, they become demoralized and lose self-confidence about being able to deal with similar threats in the future. This can, in fact, reduce their efficacy when protective action is subsequently required.

Taking account of pertinent clinical observations reviewed by Horowitz and by Janis and Mann, we are led to postulate that there are two main sources of cognitive inefficiency whenever someone becomes hypervigilant, which could account for failures to meet the criteria for effective decision making.<sup>56,66</sup> One source is the diffusion of attention that characterizes excessive alertness to all signs of potential threat. Persons in a hypervigilant state are highly aroused and appear to be strongly motivated to engage in thorough search and appraisal. But as they try to carry out essential cognitive tasks, such as searching for reliable information about what seems to be a promising course of action (by consulting an expert or trying to remember what happened

when they had to deal with similar threats in the past) they are constantly distracted and their train of thought gets derailed. Their attention shifts rapidly to all sorts of other threat cues, many of which are spurious or unimportant but nevertheless alarming to them. They are also likely to be distracted from essential cognitive tasks by obsessional ideas about all the things that could go wrong and by nightmarish fantasies about the worst possible outcomes. Because of their indiscriminate attentiveness to all sorts of threats, relevant and irrelevant, much of the time and energy available for working out a satisfactory decision about the best available course of protective action is wasted. Then when a deadline is at hand, they are likely to seize upon an ill-conceived solution that is mainly useful for mitigating the specific source of danger that happens to be most salient at the moment but that may be a poor solution because it overlooks other threats which also need to be taken into account. A cancer patient in dire need of extensive surgery, for example, may suddenly decide not to have the recommended operation and leave the hospital in a state of near-panic immediately after hearing a horror story from a thoughtless visitor.

An experiment by Sigall and Helmreich provides impressive evidence of the tendency for people in a state of fear to fail to discriminate between credible and noncredible sources of a persuasive communication, which results in indiscriminate acceptance of the message. Male undergraduates were led to believe that they were participating in two unrelated experiments. Half of the subjects were exposed to a high-threat condition by informing them that in one experiment they would be required to undergo a blood test and by showing them the syringes and other blood sampling equipment to be used; the other half were in a low-threat condition that did not require undergoing a blood test. After that, subjects in both groups were exposed to a videotaped speech advocating the legalization of drugs like marijuana and LSD. In one version the speaker was presented as a biologist at a leading university who was an expert in drug research; in another version the speaker was represented as a postal clerk who was interested in the issue. After the speech, subjects in the low-threat condition showed the expected discriminating evaluations: They expressed much agreement with the conclusion if the speech was by the highly credible communicator but little agreement if it was by the communicator with low credibility. Subjects in the high-threat condition, however, agreed with the communicator's conclusion irrespective of whether his credibility was low or high.<sup>105</sup>

The failure to make discriminatory evaluations and also the failure to adopt a critical stance in evaluating the authenticity, plausibility, and personal applicability of warning messages may be due partly to the diffusion of attention and partly to the second main source of error that makes for defective decision making. The second source is the lowering of mental efficiency that occurs whenever a person is in a state of high emotional arousal. Although psychologists disagree as to whether emotional arousal can be represented by a unidimensional continuum<sup>81</sup> or requires a multidimensional model of various different aspects of arousal,<sup>74</sup> practically all agree that behavioral disorganization occurs whenever any form of distress reaches a very high level.<sup>1</sup> The main symptoms of behavioral disorganization at high levels of emotional arousal are loss of cognitive efficiency on tasks requiring memory, reasoning, or concentrated attention as well as impairment of motor skills.

All sorts of errors of judgment are likely to occur as a result of the marked decline in cognitive functioning. (See the reviews of experimental and field studies by Hamilton, and by Janis and Leventhal.)<sup>49,65</sup> Easterbrook has described the disruptive effects of high emotional arousal on the most demanding cognitive tasks, which are those requiring the person to use a large number of cues in order to make adequate judgments.<sup>28</sup> This is precisely the type of cognitive task that a person needs to carry out in order to meet the criteria for effective decision making whenever a conflictful dilemma involves multiple threats. When people become hypervigilant they may display not only excessive lability of attention over time (e.g., easily distracted by any sudden or unexpected stimulus), but also excessive rigidity of attention to the most salient cues at any given time.

Along with cognitive constriction there is a marked tendency toward stereotyped thinking in terms of oversimplified categories and reliance on simple-minded decision rules. In fire emergencies that occur in crowded theaters or restaurants, for example, where fear is very high and decision time is very short because the danger is rapidly approaching, people tend to follow the simple decision rule that the best way to escape is to do what everyone else is doing, to run to whichever exit the crowd is heading for. Other available escape routes are overlooked as everyone converges on the same exit, which soon becomes blocked and, as a result, many people unnecessarily lose their lives.<sup>99</sup> But if someone who is perceived as a leader is present in panic-inducing situations, mass convergence into a bottleneck can be prevented by authoritative direc-

tives. In such instances, the simple decision rule to do whatever others are doing appears to be replaced by the equally simple rule to do whatever an authority figure tells you to do. Both of these decision rules may reflect a general increase in social dependency that occurs under conditions of high fear, which is manifested by overt efforts to avoid being separated from companions, strong preference for contact with authority figures who are capable of giving reassurances, increased compliance, and other indicators of a heightened need for affiliation.<sup>61,98</sup>

Many controlled psychological experiments have been carried out in which the effects on subjects' cognitive performances are tested after exposing them to threats, such as telling them that they are going to be given painful electric shocks. In general, it appears that the more serious the threat, the more profound the temporary impairment in cognitive functioning.<sup>61</sup>

A series of investigations carried out with Army recruits by Berkun and his associates exposed subjects to the most extreme threats ever used in any controlled experiment with human beings.<sup>7</sup> Like the traumatic conditioning experiment described earlier, these experiments were carried out before the time when responsible committees were set up in research institutions to protect the rights of human subjects and to prevent potentially damaging mental or physical harassment from being inflicted for research purposes. In one of the experiments, military trainees were sent up in an airplane, which suddenly began to lurch violently. The trainees were informed over the intercom by the pilot that because of both engine trouble and malfunctioning of the landing gear, he was going to make an emergency landing on the ocean, which everyone knew meant little chance for survival. While circling around before the emergency landing, a crew member told the harassed men to fill out insurance forms that would be jettisoned in a special container and would survive the crash. These forms, which allegedly would facilitate life-insurance payments to their next of kin, contained disguised tests of memory and mental efficiency. After everyone filled them out under the frightening conditions of preparing for a crash landing, the plane landed at a military air base. After verbal and biochemical measures were obtained to study fear reactions, the men were dehoaxed.

The findings from questionnaires and from steroid assays in urine specimens indicate, as expected, that fear was very strongly aroused. The mental efficiency tests embedded in the insurance forms revealed that the men exposed to the life-threatening situation made many more

errors and showed much poorer retention of information than a comparable group of men in the control condition, which involved filling out the same forms while on an uneventful routine flight.

In another experiment by the same investigators, essentially the same detrimental effects on cognitive efficiency were found when Army recruits were exposed to a situation in which social anxiety and guilt were strongly aroused. The situation was rigged in such a way that each subject in the experimental condition was led to believe that he was responsible for blowing up a building and he heard cries for help from another soldier who presumably was dying from the resulting blast injuries. The findings indicate that arousal of intense fear of social punishment and/or guilt can have the same detrimental effects on cognitive functioning as arousal of intense fear of being injured or killed.

Other behavioral consequences of strong arousal of dysphoric emotions have also been investigated in field studies of natural disasters and in laboratory experiments. Closely related to the temporary loss of cognitive efficiency are temporary loss of perceptual acuity, perceptual-motor coordination, and motor skills.<sup>26,111</sup> Clumsiness on manual tasks is partly attributable to the muscular tenseness that occurs in states of high fear arousal, which is manifested by stiffening of muscles all over the body and muscular tremors. Facial expressions also tend to become rigid, partly because of taut facial muscles.<sup>30,57</sup> Stereotypic motor behavior is also likely to be manifested—tics, head scratching, finger or foot tapping, and certain kinds of speech disturbances such as repetitive stuttering. All of these symptoms of intense fear are used by clinicians to judge whether clients are overreacting emotionally to relatively mild threats and need help to avoid the errors of judgment that are likely to occur if they remain in a state of hypervigilance.<sup>84</sup>

## PERSPECTIVES ON PREVENTION AND CURE

In recent years a variety of psychological techniques have been designed to prevent the onset of hypervigilant reactions in threatening situations or to cure such reactions if they have already developed. These include benign preexposure to the threatening situations, stress inoculation via preparatory communications, counseling procedures designed to counteract defective coping patterns, controlled breathing and relaxation procedures designed to moderate physiological responses to emotion-arousing situations. Studies of the effectiveness of these techniques,

although seldom sufficiently well-controlled to provide definitive results, suggest that each of them is at least partially successful for some people in some circumstances.

### **Benign Preexposure to the Threatening Situation**

Influenced mainly by a learning-theory analysis of the acquisition and inhibition of fear reactions, some specialists in the field of psychological stress have attempted to develop a form of behavioral prophylaxis for people who are facing a threatening situation by preexposing them to it. In doing so, they try to arrange preexposure trials in such a way that emotional adaptation or habituation will be fostered. They strive to make the preexposure trials benign in two main ways: (1) taking care to avoid pain or any other unconditioned stimulus that might reinforce fear, and (2) having a calm, sensitive person present who will give verbal reassurances if the person starts to show signs of becoming apprehensive.

Relatively little research has been done with human subjects to assess systematically the effectiveness of benign preexposure to a potentially threatening situation. An exceptionally well-controlled human experiment, however, has been reported by Poser and King, which used a "latent inhibition" procedure similar to one that has been found to be effective in animals.<sup>94</sup> Their subjects were young children who were going to be taken to a dentist for the first time. In the experimental group, each child was brought into the dentist's office beforehand and was given a mock dental examination that did not hurt. The dentist, who was kept uninformed as to which children were in the experimental or control groups, subsequently judged each child's emotional behavior during the actual dental treatment session. The dentist was fairly successful in discriminating those who were in the preexposed group from those who were not. Similar results were obtained from independent judges, who observed videotapes of the first three minutes of the initial dental treatment of each child.

A number of problems arise in attempting to use a preexposure technique with people facing future threat situations. First of all, it is difficult and extremely costly to arrange for preexposures to many common sources of threat, such as those that arise during postsurgical hospitalization. Second, clinical observations indicate that preexposures sometimes fail to foster adaptation and produce undesirable sensitiza-

tion instead.<sup>61</sup> Our present state of knowledge is not yet sufficiently far advanced to tell us exactly when and when not to expect the intended effect.

### Stress Inoculation

Much more feasible than the preexposure technique is the use of stress inoculation, which seems to have widespread applications to many kinds of threat situations. This technique relies upon preparatory communications containing realistic descriptive information, reassurances, and recommendations about how to deal with impending dangers.<sup>59,61,88</sup> Stress inoculation procedures sometimes supplement preparatory communications with guided imagery and role playing in order to help people anticipate how they might react to distressing events. One of the primary purposes of stress inoculation is to prevent hypervigilant reactions if and when the anticipated events occur. It is also intended to prevent failure to take protective action as a result of either defensive avoidance or unconflicted inertia, which sets the stage for subsequent hypervigilance if the threat materializes.

Considerable evidence from systematic studies (reviewed by Janis)<sup>64</sup> indicates that stress inoculation can be effective for preventing extreme emotional reactions when people are exposed to pain-inducing situations, such as intrusive medical treatments, childbirth, or surgery. Stress inoculation has also been found to be effective for preventing some of the postdecisional regret and anxiety that typically arise in socially stressful situations after a person chooses a career, switches to a new job, relocates to a new city, or obtains a divorce.<sup>66</sup> The findings show that stress inoculation usually works but sometimes does not. Research is currently underway to determine the conditions under which stress inoculation is most likely to be successful.<sup>64</sup>

Although used most frequently for preventive purposes, stress inoculation procedures have also been developed for purposes of alleviating or curing previously acquired emotional reactions, such as symptoms of excessive fear among people confronted with needles to be used for medical blood tests or injections. Clinical studies indicate that this curative use of stress inoculation is sometimes successful in alleviating various kinds of persistent fears, including hypervigilant reactions that interfere with test performances and speaking in public.<sup>37,42,87</sup>

Whether used for preventive or curative purposes, stress inoculation

procedures generally include the same basic components: (1) informative warnings about what to expect, which make people aware of their vulnerability to realistic sources of threat; (2) reassuring information about positive features of the situation and social coping resources that build up self-confidence about being able to tolerate and master the ordeal; (3) suggestions about useful coping techniques, including plans for effective action and positive self-talk that enhances a sense of self-efficacy.<sup>3</sup> In some procedures, preparatory communications containing these components are followed by a graded series of exercises in imaginary stress situations or with self-pacing of exposures to real-life situations resembling those that the person is trying to master.<sup>32,87</sup>

A number of different mediating processes have been suggested which could account for successful instances of stress inoculation.<sup>64</sup> Among the mediating variables that appear to be promising candidates in light of available observations are: (1) predictability of noxious stimuli; (2) enhancement of overt and cognitive coping skills as a result of "the work of worrying"; (3) heightening self-confidence and hope of mastery; and (4) perceived control over the outcome. None of these potentially mediating variables has as yet been investigated sufficiently to warrant drawing any definitive conclusions as to which ones either alone or in combination are crucial for successful stress inoculation.

### **Counteracting Defective Coping Patterns**

A number of counseling procedures have been developed by Janis and Mann (1977) based on their hypotheses about effective and ineffective coping patterns extracted from the stress literature bearing on emergency decision making in circumstances of objective threat or danger.<sup>66</sup> Certain of Janis and Mann's hypotheses pertain to the three basic conditions specified as major determinants of an effective vigilant response to realistic warnings about impending dangers: (1) awareness of serious *risks* if one either does nothing or carries out any of the available courses of protective action; (2) *hope* about finding a better alternative that will keep the risks to a tolerable minimum; and (3) belief that there is *adequate time* in which to search and deliberate. Hypervigilance occurs, according to their analysis, when the first two conditions are met but not the third condition. It follows that whenever a counselor discovers from talking with a client that the conditions making for hypervigilant reactions to realistic threats are present the counselor might help

to prevent continuation of such reactions by focusing on the time pressures. The counselor can attempt to modify beliefs about insufficient time being available by pointing out what can be accomplished in the limited time available. In some cases when a socially imposed deadline is very near at hand, the counselor can encourage the client to see if an extension of the deadline can be negotiated. And, of course, a counselor can also provide reassurances concerning any unrealistic sources of threat about which the client appears to be unnecessarily fearful, which may help the client's fear to subside to a more moderate level.

Additional counseling procedures have been suggested for counteracting defensive avoidance and unconflicted inertia, which are likely to lead to hypervigilance later on if the threat materializes.<sup>66</sup> For example, the lack of hope about finding an adequately protective course of action, which is a major determinant of defensive avoidance, might be counteracted if the counselor conveys a warranted sense of optimism and calls attention to the availability of experts or individuals in the client's social network who might suggest good solutions to the problem. If the client's dominant pattern is unconflicted inertia, however, the counselor's efforts to counteract the defective coping pattern would be in the direction of calling attention to serious risks that the client appears to be overlooking and suggesting dependable sources of information about the real dangers that should be anticipated.

Research on these proposed counseling treatments and related training techniques for self-help designed to promote vigilant search and appraisal is just getting underway.<sup>64</sup> Pilot work suggests that decision counseling and skill training hold considerable promise for preventing hypervigilance and other maladaptive reactions to threatening situations. But at present insufficient evidence is available for evaluating the effectiveness of the proposed procedures.

### **Relaxation Training**

In recent years, relaxation training has become one of the standard techniques used in the treatment of persons suffering from anxiety symptoms. Often it is only one component in a treatment program that includes a mixture of other standard forms of treatment, such as gradual exposure to anxiety-arousing situations, biofeedback, psychotherapy, environmental changes, and supportive counseling.<sup>18,103</sup>

Experimental evidence indicates that relaxation instructions can

moderate the level of fear, as manifested by physiological measures of autonomic nervous system arousal. For example, in a laboratory experiment, Defares, Van Loon, and Vrolijk found positive effects of relaxation training when fear was induced by the threat of electric shock (without any actual delivery of the shock).<sup>24</sup> During the period when they were anticipating the onset of the shock, subjects given relaxation instructions showed markedly less rise in heart rate than control subjects, who were not given such instructions.

Systematic desensitization developed by Wolpe has been one of the most widely used treatments for phobias in clinical work during the past two decades and employs relaxation as one of the central components.<sup>113</sup> At the beginning of the treatment the subject is given training in progressive muscular relaxation. Then, in a manner similar to certain stress inoculation procedures, the subject is asked to imagine one fear-evoking scene after another in a graduated series while he or she is in a calm state of relaxation. A number of experimental studies indicate that the systematic desensitization procedure is sometimes effective for persons who are excessively fearful of snakes or of other common phobic objects.<sup>95</sup> But the technique is not uniformly successful; the reduction of anxiety evoked by the imagined stimuli may not transfer from the therapist's office to the real-life phobic situation.<sup>103</sup>

Relaxation training often involves voluntary control over the depth and rate of breathing. In the procedure described by Benson, Beary, and Carol, for example, trainees are instructed to prolong their expiration by repeating to themselves after each inhalation a long series of nonsense syllables (equivalent to what Buddhist meditators call a "mantra"). Their procedure was modeled after that of transcendental meditation and various related traditions in eastern religions that encourage people to relax physically in order to achieve a state of mental calmness by repeating a long religious mantra each time they exhale.<sup>5</sup>

Benson, Rosner, Marzetta, and Klemchuk report successful use of this relaxation technique in modifying certain of the physiological functions that enter into emotional arousal. According to these authors "a wakeful hypo-metabolic state may be induced by the use of simple, non-cultic mental techniques or by traditional meditational practices" (page 289).<sup>6</sup> They add that this state "seems to represent an integrated hypothalamic response, termed *the relaxation response*, which is consistent with a state of decreased sympathetic nervous system activity" (page 289).<sup>6</sup> In their account of the relaxation technique, Benson and his col-

laborators explicitly refer to changes in breathing as an essential component. In fact, the changes induced by the technique involve the opposite of hyperventilation.<sup>6</sup>

Several other well-designed experimental studies verify Benson's notions about the importance of breathing in the modification of emotional arousal during relaxation training.<sup>14,35,52,86</sup> Typically these investigations have manipulated rate of respiration during exposure of subjects to anxiety-arousing situations. For example, in one study,<sup>14</sup> women who were initially highly fearful of dental treatment were presented with a filmed sequence of a rather gory dental procedure. Some women were instructed to slow down their breathing while viewing the film (8 cycles per minute), others to speed it up (24 cycles per minute). Three additional groups were also used: One group was asked to breathe at an intermediate rate, which is the approximate mean resting respiration frequency found in many studies (16 cycles per minute); another group merely was required to track a visual display of lights used to pace respiration in the aforementioned conditions; the last group received no treatment. All women were later administered a scale designed to measure subjective levels of anxiety. Results indicate that the 8-cycle-per-minute group reported the least amount of anxiety with reference to the experimental situation, while the 24-cycle-per-minute group reported the greatest subjective discomfort. There were no differences among the other three groups. Furthermore, the correlation between self-reports and breathing frequency were both high and significant.

It is conceivable, therefore, that at least some of the favorable effects of relaxation training are mediated by alterations in breathing patterns, which, in turn, may induce an overall systemic change in autonomic balance.<sup>47</sup> Changes in breathing patterns might also account for some of the favorable effects of controlling autonomic responses that are occasionally achieved by biofeedback training.<sup>47</sup> For example, some persons suffering from cardiac arrhythmias have been able to exercise control over their heart beat and achieve normal heart rates by being given on-line feedback from an electrocardiograph.<sup>8,36</sup> Neal Miller suggests that tachycardia and other psychosomatic symptoms involving visceral functions might be mediated by voluntary skeletal muscles that produce hyperventilation.<sup>89</sup> If so, it is plausible to expect that when a biofeedback technique succeeds in alleviating psychosomatic reactions to threat stimuli it does so partly because the patients change their rate and pattern of breathing, without necessarily being aware of it, in a way that

avoids hyperventilation. Their reduced rate and depth of breathing might, at the same time, have a quieting effect by increasing vagal tone, thus reducing the relative amount of sympathetic activity.

### **Self-regulation of Respiration**

Taking account of the possibility that voluntary changes in respiration might induce a pattern of decreased autonomic arousal and thereby offer the means for emotionally disturbed persons to gain control over their labile affect, Defares and Grossman have reported a new technique that involves training subjects to control their breathing in situations that arouse fear or anxiety.<sup>23</sup> Defares and co-workers have developed an apparatus that gives clear-cut auditory signals for regulating the subject's rate and depth of breathing. The main purpose of this technique is to correct faulty patterns of respiration that result in hyperventilation or other respiration-related stress disorders. In a preliminary clinical study, a series of 10 patients suffering from traumatic neurosis have been treated with this technique.<sup>21</sup> All of the patients had shown persistent manifestations of hypervigilance and related anxiety symptoms whenever they were exposed to threat cues that reminded them of the traumatic events. According to the clinical records, after only a single session each of the 10 cases improved in the sense that the person no longer displayed hypervigilance or any ancillary anxiety symptoms in the specific situation dealt with in the therapy session which had formerly evoked distressing overreactions. Defares and Grossman have also reported successful use of this particular form of respiratory therapy with hyperventilation patients.<sup>23</sup>

These clinical observations are being currently followed up in controlled experiments with a larger series of cases. The results might help to explain when and why certain forms of yoga, transcendental meditation, autogenic training, and various relaxation methods are effective in reducing fear or anxiety.

### **Theoretical Rationale: Interrupting Psychophysiological Feedback Loops**

The promising observations of improvement resulting from training in relaxation and in breathing control among persons who had been showing hypervigilant reactions raises an important theoretical question: What might be the mediating changes that could account for the

improvement? If subsequent investigations can pin down the successive links in the causal chain, we may be able to devise more effective methods for preventing and curing hypervigilant reactions.

A plausible theoretical assumption that might lead to some productive research is the following: Voluntary efforts to relax one's muscles or to control one's breathing markedly reduce the level of fear arousal in response to any threatening situation by interrupting a psychophysiological feedback loop that is one of the sources of disruptive emotional behavior. It seems likely that whenever a threatening situation evokes fear of sufficient intensity to approach the level where hypervigilance occurs, the person responds with a pattern of physiological arousal that itself contributes to the build-up of fear.<sup>97</sup> Earlier we mentioned the increase in heart beat, muscular tension, sweating, rapid breathing, and other typical physiological changes that a person is quite capable of noticing along with accompanying disruptive changes in behavior. For example, when people hyperventilate as a result of panting in fright during a sudden emergency that arises while working on a job, they become aware of performing much more poorly on whatever tasks they are expected to carry out. For at least a brief period after the frightening episode they still have difficulty concentrating, remembering what they are supposed to do, and executing motor tasks that require manual skills and muscular control.

Suppose, for example, that the typical decreases in cognitive and motor efficiency occur in a novice pilot flying alone in a small aircraft who becomes fearful when the sudden threat of a thunderstorm requires him to make an emergency landing. In his excited state, the pilot realizes that he cannot trust his judgment, cannot remember all the emergency procedures he is supposed to follow, and cannot count on executing the tasks at hand as skillfully as when he practiced them during training. The objective danger has actually increased as a result of the disruptive effects of the pilot's emotional reaction to the threat situation and he knows it.

We conceptualize the build up and persistence of high fear in such instances as a positive feedback loop resulting from the person's awareness of his excited state. In many cases a crucial component of the loop is the person's correct appraisal of his or her current state of deficient self-control for coping effectively with the danger situation. The person's self-derogatory appraisals not only augment the magnitude of per-

ceived threat but also markedly lower self-confidence; these two adverse factors are well-known determinants of the level of fear.<sup>76,87,95</sup>

A positive feedback loop would persist on the basis of correct appraisals of an objective increase in threat whenever successful escape or avoidance of physical danger depends upon how adequately the endangered person carries out emergency actions. It would also occur even when the self-derogatory appraisals are incorrect, especially in situations where the threat involves purely social dangers, such as the possibility of being rejected and humiliated as a result of a poor performance during an oral examination or employment interview. If the candidate says to himself "My God, I'm so nervous I'm going to blow the whole thing," this self-appraisal could augment his nervousness to the level of panic and become a self-fulfilling prophecy.

Among persons suffering from stage fright, each time they have to give a public performance the positive feedback loop would result in a relatively poor performance—for example, stuttering, strained speech, incomplete sentences, memory lapses, and failure to improvise intelligible answers to audience questions. For each subsequent performance, the person has less self-confidence and is less able to reassure himself because he remembers how badly he performed on preceding occasions. The more such failures, the more dependably the feedback loop will be reactivated, and the more difficult it will be for the panic-stricken person to terminate it.

But all this could change when people suffering from stage fright are given psychological treatment that includes training in controlled breathing in order to counteract the tendency to hyperventilate. Their initial emotional arousal in response to the threat situation might be the same as it had been, but the positive feedback loop will be interrupted and, as a result, their level of emotional arousal will not increase. In effect, training in controlled breathing can create a *negative feedback* loop to counteract the build-up of emotional arousal.

We suspect that counteracting hyperventilation might prove to be the most successful way to intervene in order to prevent the vicious cycle generated by the person's awareness of his or her physiological arousal in the presence of fear-arousing stimuli. The main reason for this expectation is that breathing, unlike autonomic physiological changes, can easily be brought under voluntary control. Most people probably can be taught in a relatively short time how to breathe properly when emotion-

ally aroused and, with appropriate additional training, many of them may be able to apply what they learn in real-life threat situations.

When people have learned to breathe slowly in a fear-arousing situation it may become easier for them to distract or reassure themselves, which could contribute to lowering their level of emotional arousal. The newly learned breathing technique may itself provide them with a built-in opportunity to distract and to reassure themselves. By concentrating on carrying out the technique in the right way they can keep from thinking about the terrible outcome that is so frightening. Perhaps even more important, their realization that they are able to control their own emotional responses to the threatening situation provides a realistic basis for calming self-talk about mastery. They can honestly reassure themselves with statements like: "All I have to do to keep from becoming too nervous is to use the new technique," which would decrease the perceived magnitude of the threat at the same time that the positive feedback loop is terminated, so that it becomes a benign self-fulfilling prophecy. They could then make fuller use of their skills and obtain the social rewards from a satisfactory performance. Thereafter, when confronted with similar threat situations, they would have more self-confidence and greater expectations of mastery, which would contribute to a steady lowering of the level of emotional arousal.<sup>3</sup>

The same favorable effects would be expected from relaxation training and any other therapeutic approach that prevents physiological arousal from mounting when a person starts to feel fearful.<sup>104</sup> Fear may be kept from increasing by any procedure that disrupts the vicious cycle of the physiological feedback loop. This theoretical assumption might help to explain the following empirical generalization put forth by Rachman in his review of the literature on fear reduction: "In general, the order of change in response to therapy is declining physiological reactivity, followed by behavioral improvements, and, finally, by subjective improvements (p. 17)."<sup>95</sup>

As the person practices a systematic relaxation procedure, his or her breathing rate, heart rate, muscle tension, and other perceptible psychophysiological changes are kept within normal levels, which prevents the build-up of the positive feedback loop. Instead of making derogatory self-appraisals, such as "Here I go again getting so jittery that I'm going to fail," the person can realistically say to himself, "This time I am controlling my emotions by breathing deeply and relaxing and I am performing better than I used to." Such changes in what the person says

to himself in a therapist's office might prove to be an important ancillary factor, or perhaps even a crucial factor, in producing a beneficial carry-over effect that reduces the chances of a hypervigilant reaction on the next exposure in real life to the threatening situation.

The same type of psychological gain is to be expected if relaxation training or breathing training is given to persons whose jobs require them to face emergency danger situations—police, fire fighters, airline pilots, etc. Especially during their training as novices and in the early months of their careers, it could reduce the chances of hypervigilant reactions. The same considerations might also apply to any population exposed to recurrent disasters, such as tornadoes, hurricanes, floods, earthquakes, and fires, which require adequate performances to escape injury or death.

So far, all of our examples pertain to changes in the *objective* degree of threat perceived by people when they appraise their capabilities for dealing with a potentially dangerous situation in which their protective actions could become inept and maladaptive as a result of emotional excitement. What about threat situations in which there is practically nothing that a person can do to reduce the chances of undergoing pain or sustaining serious losses? Consider, for example, a fearful patient lying on a surgeon's operating table at a time when a serious operation with a local anesthetic is about to begin. In such circumstances the patient's activities are so constrained that there is little motor activity in which he can engage to try to relieve his emotional tension. But, if properly trained, he could exercise voluntary control to breathe slowly. Here again we would expect that a breathing-control technique could decrease the likelihood of a hypervigilant reaction by interrupting the positive feedback loop that otherwise would contribute to the build-up of fear. When the feedback loop is touched off in such circumstances and contributes to paniclike reactions it has little or nothing to do with realistic appraisals of an increase in objective danger. The patient's fate in the operating room depends almost entirely upon what the surgeon does and practically not at all upon the patient's own actions, as long as he or she just passively lies there. So it does not matter very much if the patient is temporarily inefficient in cognitive or motor performances. And yet the same feedback loop is likely to become activated by the patient's awareness of his or her own symptoms of physiological arousal, which could considerably augment the level of stress and perhaps interfere with recovery.

Our assumption that the feedback loop occurs in such circumstances in response to the mere self-perception of bodily signs of intense emotional arousal is supported by suggestive (although controversial) findings from experiments on false physiological feedback. This line of research began with Valins' finding that males' positive emotional responses to pictures of nudes were augmented when subjects were given false information that led them to believe that their heart rates were much higher than they actually were.<sup>108,109</sup> Using basically the same procedure with pictures of wounded, bleeding people, Bloemkolk, Defares, Van Enckevort, and Van Gelderen found an increase in ratings of unpleasantness when male and female subjects heard what they thought was their own heartbeat increasing from 79 per minute to 100 per minute.<sup>9</sup> Simpson also reported increases in self-ratings of anxiety as a result of giving subjects false feedback of heart rate while exposed to a mildly stressful situation.<sup>106</sup> Another study by Defares, Van Enckevort, Van Gelderen, and Schendelaar showed a complementary effect in a situation where imminent threat of shock was experimentally induced: Level of fear, as assessed by subjective reports and heart rate measurements, was reduced when subjects were given false heart-rate feedback indicating that they were in a relatively relaxed state.<sup>24</sup>

Other experiments also suggest that fear aroused by a warning message is increased by false physiological feedback of galvanic skin response<sup>53</sup> and of heart rate.<sup>20,73</sup> An impressive experiment by Krisher, Darley, and Darley showed that false heart-rate feedback not only augmented the fear reactions evoked by a realistic warning about health hazards but also interfered with acceptance of the authoritative medical recommendation contained in the warning message.<sup>73</sup> Two equivalent groups of male students were given the same warning message, which described the dangers of becoming sterile and suffering other distressing consequences from catching mumps. It concluded with a strong recommendation to obtain a free vaccination against mumps at the University Health Service. During exposure to the warning message, one group was given false heart-rate feedback (an increase from 70 to 140 beats per minute) and the other group was not. The group given the false feedback reported significantly higher self-ratings than the other group on a combined measure of subjective fear (which included feeling "anxious," "frightened," and "scared"). The false feedback group also were significantly less likely than the comparison group to go to the

University Health Department to obtain the recommended vaccination (20% versus 60%).

In this study, the heightened fear arousal induced by the false heart rate feedback appears to have had the effect of inducing a disruptive pattern of defensive avoidance. Under conditions where the initial level of fear evoked by a dire warning message is much higher, we would expect that the same physiological feedback would induce the pattern of hypervigilance. This inference, however, has not been tested experimentally and may never be because of ethical objections to inflicting the psychological suffering of such a high level of induced fear that people become terrified, distraught, and disorganized. Nevertheless, from the evidence now at hand, it appears fairly likely that the physiological feedback that people receive from their bodily changes, evoked by warnings and other threat stimuli, can augment the intensity of their subjective feelings of fear and can affect their overt protective actions.

It is noteworthy that most of the experimental evidence we have just reviewed comes from studies in threatening situations where escape from or mitigation of the danger does not depend on skillful cognitive or motor performances of the subject (e.g., looking at photographs of injured people, listening to a tape recording, and looking at illustrative slides that convey a warning message). Since the subjects' augmented fear cannot be attributed to realistic expectations of increased danger resulting from their own poor performance, it is necessary to consider other mediating processes that might account for the positive feedback loop. Among the candidates are explanations in terms of cognitive dissonance theory<sup>9</sup> and self-attributions based on self observation.<sup>4</sup> A learning-theory explanation along the lines of the interpretation of the traumatic conditioning experiment by Campbell and his associates discussed earlier might also be plausible.<sup>12</sup> For example, the verbal label "My heart is pounding" evoked by the sounds of one's heart beating rapidly might have become a conditioned fear stimulus by virtue of having been paired with exposure to traumatic stimuli in the past and might be extremely resistant to extinction (just as in the Campbell et al. experiment), or it might prevent habituation to relatively nondangerous threat stimuli.<sup>33</sup>

Research designed to investigate the implications of these and other alternative theoretical explanations might lead to important advances

in clinical techniques for preventing and curing disruptive emotional reactions, particularly if they can be interrupted at an early stage before they build up to a high level of arousal. For the present, it appears to be plausible to expect that introducing muscular relaxation or an anti-hyperventilation form of breathing is beneficial when a person is starting to feel fearful about any type of threat because it interrupts or dampens the typical pattern of physiological feedback and thereby helps to prevent emotional arousal from mounting to the level where disruptive hypervigilant reactions are likely to occur.

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## 2

# Stress: Etiology, Assessment, and Management in Holistic Medicine

**Kenneth R. Pelletier**

*Assistant Clinical Professor, Department of Psychiatry, and Langley Neuropsychiatric Institute, University of California School of Medicine, San Francisco, California*

When Louis Pasteur and Robert Koch announced the existence of tuberculosis bacilli to their colleagues in the 1890s they were rebuked because the prevailing opinion of that period was that tuberculosis was a product of social and environmental factors. By contrast, when contemporary researchers assert that this infectious disorder, as well as a host of others, involves psychophysiological, psychosocial, and environmental dimensions, their data are suspect since the prevailing model is based primarily upon microorganisms. At the turn of the century Pasteur's "germ-theory" was directly contradicted by the physician Claude Bernard, who postulated the existence of the "milieu interieur" (1878 and 1879),<sup>11</sup> the organism's internal environment which could be isolated from the external environment with all of its indeterminate and unpredictable influences. Throughout the history of medicine there has been controversy concerning these internal versus external determinants of health and disease despite its fallacious foundation in Cartesian dualism. Today the debate is more evident than ever in the research and clinical approaches related to stress. For a well-documented and exhaustive history of the development of medicine from 450 B.C. to 1914, there is the three-volume set entitled *Divided Legacy: A History of the Schism in Medical Thought*<sup>16</sup> by Harris Livermore Coulter, who spent fourteen years documenting these opposing points of view. In his

incisive medical history Coulter identifies the two contending paradigms as the "empirical," or the approach that considers the whole organism and its environment, versus the "rationalist," which emphasized isolatable, physiological processes subject to the laws of logic. Based upon Coulter's analysis, it is evident that these two paradigms will remain artificially irreconcilable as long as they are believed to be mutually exclusive. If that were the only alternative there could be little optimism for a true advancement of an understanding of the fundamental role of stress and its properties in both disease and health. In order to assess the etiology, assessment, and alteration of stress in the context of holistic medicine, this article addresses the following areas: (1) the convergence of psychosocial and biomedical approaches to stress, disease, optimum health in the emerging field of holistic medicine; (2) stress as a specific instance of a phenomena most adequately addressed in such a context; (3) psychosocial, neuroendocrine, and psychoimmunological aspects of stress; (4) differentiation of Type I versus Type II stress responses; (5) illustrations of these principles by focusing upon the role of stress in cardiovascular disease and cancer; and (6) techniques and resources of stress management which can be utilized in clinical practice. Overall the intent is to provide an empirical, research-based model for evaluating and preventing stress disorders.

It is evident that preventive care requires an assumption that psychosocial and environmental factors in complex interaction determine what is observed as illness or optimum health.<sup>84</sup> A reconciliation of the opposition between biomedical and psychosocial approaches to stress disorders is necessary for both the formulation of comprehensive diagnostic methods such as the Health Hazard Appraisal and its more recent and more comprehensive adaptations,<sup>56</sup> and the implementation of the stress management approaches which are the focus of this article. After an assessment is obtained, the first obstacle to be surmounted is how to implement the necessary life-style modifications to promote optimum health. Patients are caught in a "Catch-22" dilemma at this point since the activity of attempting to alter self-destructive patterns may inherently induce further stress. Yet there are means of implementing change without incurring further disability, and these means are largely contingent upon individual adaptation to stressors. Among the most pressing issues in current research and clinical practice is not if but how excess stress induces disease. It is important to note that the emphasis is "not with the role of psychosocial factors in *causing* disease, but in

altering individual susceptibility to disease”<sup>25</sup> (emphasis in original quotation). Unanswered questions remain regarding who becomes ill under stress, why the same stress triggers different disorders in various individuals, and why others remain totally unaffected and healthy under stress.<sup>34</sup> More specifically, the investigations have focused upon the psychophysiological interactions which might be responsible for the observed individual variability in susceptibility to disease, including the full spectrum of conditions ranging from attainment of optimum health to degeneration into morbidity. A few researchers have begun to consider adaptation to stress or “ability to rally after a challenge to adapt”<sup>55</sup> to be a more predictive aspect of health than the simple absence of stress. Much of this information was considered at length in *Mind as Healer, Mind as Slayer*,<sup>60</sup> particularly regarding the neurophysiological responses to stress internal to the individual. Before proceeding any further, it is important to make one point unequivocally clear, and it is that an individual’s ability to manage and adapt to stress is ultimately more important in clinical practice than the underlying biochemistry. Virtually all stress research has tended to assume a passive organism and monitored the subsequent biochemical results of exposure to prolonged stress. However, with people in everyday circumstances it is evident that “the intensity of stress appears to be less important than the way it is handled.”<sup>4</sup> It is this observation that lends great optimism to the field of clinical intervention with stress disorders since individuals can and do learn active and effective stress management techniques which serve to prevent further complications of stress reactivity. At this point, the primary emphasis is citing related research concerning psychosocial influences, and ultimately to outline specific means by which individuals can engage in positive responses to potentially deleterious stress.

Although Pasteur’s invaluable contribution has served as the basis for medical research in the decades that followed his work, it has become increasingly evident that the analysis of microorganisms provides only a partial knowledge of the etiology of disease. One physician, John Cassel<sup>15</sup> in the Department of Epidemiology at the University of North Carolina, has cited numerous instances in which the known characteristics of bacteria and viruses have failed to explain the onset of disease. Furthermore, Cassel cited examples where the “pure” biomedical model should have been most clearly applied as in the transmission of cholera from isolation to a raging epidemic; the waxing and waning of influenza; the inability to produce cholera in healthy, human volunteers by

feeding them the cholera vibrio; and the differential susceptibility to tuberculosis. Even when viral infection is evident, as David Mechanic has noted, the link between the actual infection and psychosocial factors is exceedingly complex and includes such possibilities as these:

- (1) that stress contributes in some fashion to the incident of infection;
- (2) that the condition, itself, is a significant source of distress and weakens the person's incentive;
- (3) that the condition serves as an excuse for the person to relieve himself of distressful obligations and helps avoid social sanctions for nonperformance of responsibilities;
- (4) that the condition allows the person to justify to himself his failure to adequately meet social responsibilities;
- (5) that the distress of the conditions becomes merged and confused with other existing feelings of distress so that the individual cannot differentiate clearly the source of his distress and attributes causality to the viral respiratory condition;
- (6) or all of them.<sup>52</sup>

In a recent interview Lewis Thomas, author of *Lives of a Cell*, was queried about the role of microorganisms in disease: "You mean to say that we ourselves cause disease not the bugs?" "That's right," he replied. "I believe that microbes are mostly amiable and useful. . . . We've only come to believe they are implacable enemies since Pasteur's time."<sup>23</sup> From observations such as these and others, Cassell has concluded, "Not only are answers . . . unlikely to come from further studies of microorganisms alone, but this model of causation gives very few useful leads as to what other factors need to be studied."<sup>15</sup> Actually the very concept of a single "cause" of a disorder needs to be carefully considered. In an excellent article entitled, "Unified Concept of Health and Disease," George L. Engel has underscored the mistaken assumption that medicine tends to see microorganisms such as the tubercle bacillus as "the cause of" rather than "the necessary condition" for a disease such as tuberculosis.<sup>24</sup> Articles by both Cassell and Engel render an extensive review of the body of medical literature that documents the inadequacy of single-cause formulations or even multicausal considerations when these are limited to physical factors with other "factors within the host often ignored or minimized."<sup>24</sup> By contrast, Engel proposes a psychosomatic approach to etiology in which both physical and psychosocial factors are considered: "We define etiologic factors as factors which either place a burden on or limit the capacity of systems

concerned with growth, development, or adaptation; or as factors which, by virtue of their physical or chemical properties, have the capacity to damage cells or parts of the body." Such an approach is of major significance since it clearly acknowledges the reality of both organic and psychosocial elements in pathology. Organic pathology is undeniable and there are many circumstances under which the primary causation is purely physical. Critiques of psychosomatic approaches to stress frequently note that such methods are purely psychological and often ignore physical influences. This is a valid criticism when the clinical implication is that a patient might futilely engage in myriads of introspective techniques when the essential problem is organic with a clearly indicated pharmaceutical or surgical resolution. Certainly it is true that there is little fruitful research or clinical practice at either extreme, and the "empirical" approach is as liable to become imperviously dogmatic as the "rationalist." Here the approach is to strike a balance, in keeping with the work of Engel and others, citing multiple psychosocial and environment factors in interaction to induce states ranging from terminal illness to optimum health.

In a multicausal framework, stress often appears to be the single most important factor predisposing an individual toward the development of disorder. Yet the stress factor has other facets as well, for when individuals perceive themselves as utilizing stress rather than being passive victims, then it is evident that these same negative stressors "may under certain circumstances be neutral or perhaps even beneficial."<sup>83</sup> Research conducted over several years by James Barrell of the University of Florida and Donald Price of the National Institutes of Health found evidence indicating that stressful events may be less significant than the individual's strategy for dealing with them. Under laboratory conditions, 22 subjects were stressed by electrical shocks given at random intervals during experimental sessions while heart rate and electromyographic (EMG) readings were recorded. From these results, Barrell and Price have differentiated two types of responses. Ten subjects were "confronters" who actively prepared for the stressor and showed significantly higher EMG activity in trapezius muscles, and 11 were "avoiders," who demonstrated lower EMGs than the confronters and were more passive according to subjective reports, "simply attempt to escape the situation through denial"; the avoiders demonstrated significantly higher heart rates than the confronters. One subject showed a mixed response. Barrell and Price suggest that the EMG response of

"confronters" is related to a normal increase in somatomotor activity whenever an individual needs to search for and cope with threatening situations. By contrast, the increased heart rate of the "avoiders" may be related either to fear or general anxiety and ultimately the elevated heart rate is more conducive to severe cardiovascular disorders. Evidence such as this, and more will be cited later, indicates that how an individual learns to manage stress is more critical to his well-being than any impossible and not necessarily desirable attempts to avoid stress.

There is no need to reiterate the complex neurophysiology, biochemistry, and immunological response to stress here since these are well covered in the numerous excellent sources that chronicle the historical development of this concept. Among these are Walter B. Cannon's classic, *This Wisdom of the Body*,<sup>14</sup> Hans Selye's pioneering insights in *The Stress of Life*,<sup>80</sup> and *Stress without Distress*,<sup>81</sup> and A. T. W. Simeons' *Man's Presumptuous Brain*,<sup>85</sup> containing his evolutionary theory of stress susceptibility. More recent data concerning psychosomatic factors in stress and stress management are discussed in my books *Mind as Healer, Mind as Slayer*<sup>60</sup> and *Holistic Medicine: From Stress to Optimum Health*.<sup>64</sup> Based upon an extensive analysis of stress research with laboratory animals and clinical trials with patients, it is increasingly evidenced that the effects of stress depend primarily upon five factors: (1) the magnitude stress reactivity during the "General Adaptation Syndrome";<sup>80</sup> (2) the duration of that reactivity, especially when the stimulus is an often repeated one; (3) whether there exists a baseline condition of long-term, undifferentiated, unabated neurophysiological reactivity predisposing to a psychosomatic disorder which is then precipitated but not caused by an aggregate of life change events as measured by the Schedule of Recent Experience;<sup>72</sup> (4) whether the stressor activates the pituitary or the adrenomedullary system more vigorously; and (5) ultimately and most importantly, the means that an individual has developed or devised to manage their own stress response. Furthermore, that all of the fundamental genetic, familial, environmental, physiological, biomedical, and psychosocial factors are involved in all states of disease or health. Whether health or disease, even the specific form of disease, as manifest in a particular individual is dependent upon the relative weight of each of these, but all are present and need to be considered. This is the key concept which defines a holistic approach to the etiology, assessment, and alleviation of stress disorders.

Also, from all the sources cited above it is abundantly clear that stress

is not inherently destructive and is, in fact, often highly beneficial. Both researchers and clinicians have misinterpreted findings and drawn the erroneous conclusion that the less stress the better. Actually, Hans Selye emphasized the variability of individual adaption in a recent interview in the *U.S. News and World Report* when he stated: "If a person is a stress seeker . . . and his body is falling apart, the last thing I would ever diagnose is that he be imprisoned on a beach for three months. He will do nothing but run up and down the beach and think about Wall Street. He might as well be on Wall Street and learn to accept the type of person he is and develop the disciplines that will help him live in harmony with the stress of his life."<sup>82</sup> In other words, quantity of stress appears to be less significant than the temperamental orientation of the individual. People who push or are forced to go against their nature, rather than any absolute amount of stress confronted, appear to be most likely to develop disorders ranging from mild disruptions such as chronic headache to more severe disorders such as cardiovascular disease and cancer.

As misconceptions regarding stress begin to be rectified, it is becoming possible to formulate methods and strategies for individual adaptation. Most research concerning stress indicates that there is no single causative, predictive connection between specific sources of stress such as marital disagreement or frustration by an employer, and specific disorders such as peptic ulcer or hypertension. Implicit in all the concepts of a multicausal context<sup>8</sup> by which a disorder becomes manifest is that particular life events or circumstances take on significance depending upon the developmental history of the organism, whether animal or man. An often quoted example of this phenomena, emphasized by René Dubos in *Mirage of Health*,<sup>21</sup> concerns cancer of the breast in mice. Although under natural conditions breast cancer occurs very rarely in this species, breeding can produce a strain of mice genetically predisposed to breast cancer. However, the actual incidence of cancer is highly variable, ranging from zero to virtually 100% depending upon: exposure to a virus from the lactating mother; the sex of the offspring with females being more susceptible; injecting estrogen into males, which increases susceptibility; placing the mice on a low calorie diet, which drastically reduces incidence in both sexes; and varying levels of environmental stressors. Numerous researchers have investigated the interactions between neurophysiology and immunology that might account for these observations.<sup>87,88</sup>

Perhaps the single most important area of experimental and clinical research concerning stress is that of psychoimmunology. In this emerging area there is a clear sequence of events whereby psychosocial factors such as emotional distress affect neurotransmitter function in the brain in concentrations of dopamine, norepinephrine, the indolamine serotonin, and acetyl choline,<sup>7</sup> with a resulting adverse influence upon the immunological functions of lymphocytes which are also directly affected by corticosteroids. Recently, George F. Solomon and his colleagues reviewed the literature in the area of psychoimmunology and concluded, "stress-related neuroendocrine shifts affect specific components of the immune response."<sup>88</sup> Although their research has focused primarily upon the psychoimmunology of cancer, their model is applicable to any state of disease or health since it elucidates the interaction of stress in the psychosocial, neuroendocrine, and psychoimmunological systems.

The psychoimmunological aspects of cancer are phenomena which have been frequently observed, but it was not until 1977 that similar phenomena concerning the circulatory disease of arteriosclerosis were reported. Edmund C. Lattime and Helen R. Strausser of Rutgers University reported in *Science* the results of their research indicating that laboratory rats, under conditions of a specific stress, multiple pregnancies, developed a type of immunological alteration conducive to arteriosclerosis. They noted one critical aspect of immunological activity, phytohemagglutinin M or PHA, was "depressed as much as 400 percent from that of the controls."<sup>44</sup> Based on their sophisticated procedures, which differentiated the activity of three basic cells of the immune system, they concluded, "We suggest that this model of arteriosclerosis might be included in the same category of disorders as some autoimmune or viral conditions that manifest immune complex deposition in tissues as well as significant immune suppression."<sup>44</sup> Data such as these are invaluable in the beginning of attempts to link stress which the specific neurophysiological and immunological mechanisms that it affects in the body. From this and subsequent research, it is clear that any single factor or subset of factors creates the necessary but not the sufficient conditions for the development of a stress related, psychosomatic disorder.

With this essential point in mind, it is possible to appreciate precisely what is common to the epidemiological studies relating life stress events and the development of subsequent disorders. Numerous research proj-

ects based primarily upon the innovative research of Richard H. Rahe and Thomas H. Holmes from the Department of Psychiatry of the Washington School of Medicine in Seattle have indicated that many, if not all, disorders have their onset in a multicausal context of increasing frequency and or magnitude of psychosocial stress. Among the findings of such projects are indications that persons suffering from bereavement<sup>57,74</sup> or facing job loss<sup>40</sup> have higher than average rates of morbidity and mortality. Also, there are both retrospective and prospective studies indicating that increased incidences of illnesses such as tuberculosis, inguinal hernia, leukemia, nonfatal coronary occlusion, and others occur among individuals reporting many life changes during the preceding months.<sup>54,71,73</sup> From all these research findings it is clear that, even though negative life events have more impact, the major factor disposing toward illness is not whether an event is commonly thought of as negative ("death of a spouse"), or positive ("job promotion"), but whether the individual is required to undergo too much adaptation in too brief a time period. The critical dimension appears to be quantity of change per unit of time. A demonstration of this factor comes from research by Brett Pesznecker and her colleagues, who obtained questionnaires from 577 patients regarding incidents prior to their development of an illness. Among all the variables that were assessed, the single best predictor of subsequent health status was "the magnitude of life change."<sup>69</sup> That common factor is highly significant, for it is hypothesized that individuals can be forewarned of such an accumulation and can learn adaptive strategies. It is clearly evident that not all people with the same profile develop disorders, although this is the most frequently overlooked aspect of stress research. An extremely important research project by Harold J. Wershaw and George Reinhart of the University of Alabama challenged the entire concept of life changes conducive to illness in a paper entitled, "Life Change and Hospitalization—A Heretical View."<sup>95</sup> Their study began as a didactic exercise to teach medical students the importance of psychosocial factors in the etiology of illness. Using the Holmes and Rahe SRE Scale with 88 patients admitted to a Veterans Administration Hospital, they were surprised to find little correlation between high "life change unit scores" and hospitalization. Some patients with no discernible changes in their lives became ill or were hospitalized. These researchers believe there is a link between stressful life events and illness but they emphasize, in concert with other researchers, that the high degree of individual

variability is obscured by averaging data. From their observations, Wershow and Reinhart drew an important conclusion, "We would suggest that, among other steps, deviant cases be sought out, those who handle life changes well and those who break down on what seems to be little provocation, to learn more about coping mechanisms. When the mechanisms of successful and unsuccessful coping are known, they can perhaps be taught and then we can really get on to some elements of primary prevention in medicine."<sup>95</sup> While scales such as the SRE are useful in a general sense, their real applicability is as an indication of tendency and not as an instrument condemning certainty. They are educational tools which enable the patient to become aware of his precarious situation in order to initiate positive adaptation. According to the observations of George L. Engel, the identification of the type and number of conflict situations "delineated individual psychological vulnerabilities and thereby defined the types of life circumstances most likely to be threatening for such persons, and hence to initiate the sequence of responses that might culminate in a final common pathway and disease onset."<sup>25</sup> It seems likely that precise and detailed knowledge of a patient's psychological strengths and vulnerabilities is an important guide for treatment and prevention in holistic medicine.

Perhaps the most striking link between stress and individual adaptation is evident in sudden death syndromes wherein a seemingly healthy individual dies within minutes or hours of a significant life event. Two of the most fundamental factors governing actual onset of an illness or even sudden death have been described as "fruitless struggling" and "giving up, each with different psychophysiological implications and biochemical concomitants."<sup>79</sup> Among animals or men, loss of the ability to predict and maintain a degree of control over their environment, or an inability to garner the necessary psychosocial resources of meeting particular life circumstances, are highly significant in swinging the balance between health and illness, life and death. Throughout history there are reports of people dying suddenly while in the throes of great fear, rage, grief, humiliation, and even joy. The noted Harvard physiologist Walter B. Cannon in 1942 considered this phenomenon and its psychophysiological mechanisms in his classic study of "voodoo death."<sup>14</sup> This subject of sudden death has intrigued clinicians over the centuries and has been recently addressed by George L. Engel. Beginning in 1965, he collected newspaper clippings of 275 cases of sudden death, including 172 men, 89 women, and 14 unidentified by gen-

der. Analyzing these reports, Engel created four categories: (1) most common (135 deaths) was a traumatic event in a close human relationship; (2) next (103 deaths), involved situations of danger, struggle, or attack; (3) then (21 deaths), loss of status, humiliation, failure, or defeat, all of which involved men only; and (4) last (16 deaths), those who died at moment of great triumph or personal joy. Among the most striking examples is Lyndon B. Johnson's fatal heart attack the day after the newly inaugurated Richard M. Nixon's announcement of a complete dismantling of the Great Society programs. Another is the case of a 59-year-old college president who was forced to retire by pressure from the Board of Trustees. As the ex-president concluded his address, he suffered a fatal heart attack. His personal friend and physician rushed to administer aid and also collapsed and died of heart failure. Equally extraordinary are the Type IV occurrences under conditions of joy, such as a 56-year-old minister who was elated to speak to President Carter and suffered a fatal heart attack.<sup>27</sup>

One common denominator emerged from all the cases, that "the victims are confronted with events that are impossible to ignore, either because of their abrupt, unexpected, or dramatic quality or because of their intensity, irreversibility, or persistence."<sup>27</sup> Most of the individuals perceived themselves as no longer in control of self or situation and entered a pronounced state of giving up, helplessness, and hopelessness. In virtually all cases, the immediate cause of death was the derangement of the cardiac rhythm. In the *New England Journal of Medicine* cardiologist Bernard Lown and his colleagues of the Harvard School of Public Health detailed a case history of a 39-year-old man who experienced episodes of such ventricular fibrillations in the absence of demonstrable cardiac disease. From this case, the literature review, and subsequent discussions, it is evident that neurophysiological processes can induce heart failure under extreme circumstances, even if there is no prior history of disease. Drawing upon the so-called "flight-fight mechanism" identified by Cannon, Engel notes that this process of mobilization is accompanied by a equally strong "conservation-withdrawal mechanism" in preparation for disengagement and inactivity. Engel postulates the psychological conflict and uncertainty may invoke both responses simultaneously. Rapid shift between one and the other may have dire effects upon the maintenance of effective functioning of the heart and circulation, particularly in the form of "lethal arrhythmias." There are immediate consequences of these observations. One is

that general physicians and other clinicians can anticipate or provide psychological intervention at periods of significant life events such as retirement, the anniversary of a close relative's death, and during general emotional upheaval, particularly with older patients. At this point is when scales such as the SRE can be employed not to predict mortality but as an indicator of the relative need to initiate actions to decrease that likelihood. Furthermore, Engel cautions physicians that some minor tranquilizers frequently prescribed during periods of emotional stress may actually increase the likelihood of arrhythmias in some people, as has been demonstrated to be the case with laboratory rats by Joseph B. Buckley of the University of Pittsburgh.<sup>92</sup> This is of particular importance since data from a major 1970 to 1971 NIMH National Drug Survey indicated that about 90% of all minor tranquilizers are prescribed by nonpsychiatrists, usually general practitioners. Excessive prescription of minor tranquilizers is a cause of great concern in and of itself, but it is also symptomatic of the increasingly pervasive incidence of stress in a wide range of presenting disorders. It would be truly ironic if relatively minor and manageable stress reactions might be actually complicated rather than alleviated by the superficial panacea of the ubiquitous Valium prescription. As alternatives to prescribing potentially lethal tranquilizers, which do not resolve the underlying situation, even when effective methods such as basic psychotherapy, relaxation training, biofeedback, and a host of others are noninvasive, considerably safer, and equally if not more effective. Such methods promote the activity of the individual's own self-regulatory systems and bear the potential not only to correct a fundamentally pathological process, but to introduce enduring adaptation strategies for the evolution of optimum health.

From this general orientation to stress as a multicausal process, it is possible to consider its more specific manifestations in the two most pervasive afflictions, cardiovascular disease and cancer. Coronary heart disease (CHD) is one instance in which psychosocial, environmental, and purely physical factors are undeniably involved. An opening editorial in *Psychosomatics* by Barney M. Dlin of Temple University stated, "We can safely say that the role of stress factors and personality, after years of study, has been accepted not only by the medical community, but even by the general public."<sup>20</sup> Dlin's editorial was part of the proceedings of the First Annual Weiss-English Symposium, which focused upon cardiovascular disease with papers ranging from a physician's per-

sonal account of his near-fatal heart attack to clinical issues in the sexual activity of heart patients. Underlying both cardiovascular disease and cancer, the first and second leading causes of disability and death, is a prolonged state of sympathetic activity mediated through cortico-hypothalamic pathways. Perfectly normal responses of brief duration constitute a Type I Stress Response<sup>60,63,64</sup> with transient occurrences such as elevated blood pressure, increased norepinephrine, epinephrine, glucose, and free fatty acids in the blood, increased cardiac output, and numerous other responses mediated by the sympathetic branch of the autonomic nervous system.<sup>80</sup> Brief reactivity such as this is normal for both man and animals and usually occurs when the source of stress is immediate, identifiable, and resolvable. When the situation is resolved there is a period of compensatory relaxation or parasympathetic rebound, popularized as the "relaxation response" by Herbert Benson.<sup>9</sup> A Type I Response is characteristic of the response elicited by exercise and not only is it perfectly tolerable but it is actually of considerable benefit in the maintenance of optimum health. Details of this positive reactivity and its deliberate induction are considered at length in both *Mind as Healer, Mind as Slayer*<sup>65</sup> and in *Holistic Medicine*.<sup>64</sup> However, very few stressors are immediate, identifiable, and resolvable, and the result is a Type II Stress Response wherein each of the above-cited normal responses remains abnormally elevated over time. Most stressors in the course of a typical day are vague and may continue unresolved for weeks or even months as unsatisfactory work conditions or interpersonal problems. It appears as though there is a biological naivete wherein the organism cannot easily differentiate between a vaguely perceived threat to its integrity and an immediately life-endangering situation. Since the anticipated actions of defense, aggression, or escape do not occur, the body remains prepared, geared up for the responses that never occur. Under these conditions the unabated stress reactivity produces a rising baseline, wherein transient blood pressure elevations lead to hypertension and increased heart rate evolves into tachycardia, since there is no adequate period of parasympathetic rebound during which many vital functions actually fall below their normal baseline. In these circumstances the sympathetic system is indifferent to the cause of stress and responds in a monotonous repetitive way to any type of stimulus to prepare for fight, flight, or aggressive activity.

Basic research concerning these mechanisms in animals has also indicated that the "nature of the stressor"<sup>70</sup> is a major significant vari-

able in whether or not a laboratory rat exhibits transient versus long-term blood pressure elevations. It appears that physical stressors such as electric shocks do not produce the long-term effects elicited by more psychosocial stressors such as a noxious environment. Autonomic responses to this latter type of stress produce an increased load on the heart for coronary blood flow, which is easily met under most circumstances. Unfortunately, multiple factors such as genetic predispositions, cardiovascular elasticity, condition of the myocardium, exercise history, dietary factors, and degree of atherosclerotic involvement usually reduce ideal conditions such that probability of heart failure is increased.

Although all of the above factors play a role, recent epidemiologic data suggest that psychosocial stress factors may actually be of greater consequence than those which are now considered the leading culprits, such as hyperlipidemia, hypertension, and cigarette smoking.<sup>78,90</sup> Data for a multimillion dollar, multidisciplinary study involving tens of thousands of people over a period of 15 years have identified common risk factors in increasing susceptibility to atherosclerotic disease. Arteriosclerosis is a general term for the condition in which the arteries thicken, harden, and lose their elasticity. Atherosclerosis is one type of arteriosclerosis involving the accumulation of plaques on arterial walls. From these data sources, the factors noted are: "a diet high in saturated fats, cholesterol, and calories; hypercholesterolemia; hypertension; and cigarette smoking. . . ."<sup>20</sup> Identification of these factors correlated with coronary heart disease does not necessarily give any indication of the etiology of the factors themselves. After reviewing this and related data, physician Barney M. Dlin notes: ". . . all of these are potentially amenable to control. All are under the influence and control of the individual's life-style, and it is a person's psyche that determines how he chooses to adapt to these potentially dangerous factors."<sup>20</sup> It is this positive note of the role of individual adaptation that can provide the basis for optimism in curbing the rising incidence of cardiovascular disease. Although all of the above factors contribute to cardiovascular disease, it is important to determine their relative weight in the multicausal matrix. Among the more sophisticated research designs in such inquiries are the studies of identical twins undertaken by Einar Kringlen of the University of Oslo in Norway. Research with identical twins is a method frequently employed to differentiate genetic and environmental or psychosocial influences. Kringlen and his co-workers screened 10,000

patients who had had heart attacks in Norway between 1971 and 1975. They were looking for identical twins who had not had heart attacks. From this large number of patients, the researchers found 78 people who met this criterion. Then they asked the patients and their twins to be interviewed in their respective homes. To date half of the pairs of twins have been investigated, and preliminary indications are that the twins who suffered heart attacks experienced more life crises and generally lived a more pressured life-style. Medical records indicated that most of the heart patients actually had only mildly elevated blood pressure and cholesterol levels prior to the heart failure and compared to the twin who did not undergo heart involvement.<sup>42</sup> Experiments such as these point the way but do not determine the process by which a pressured life-style elicits cardiovascular disease, and on this question basic research in neurophysiology looks promising. Employing an electron microscope, William H. Gutstein and his colleagues in the Department of Pathology of New York Medical College have examined the arterial system of laboratory rats subjected to electrical stimulation in the lateral hypothalamus for periods up to 62 days. That region of the hypothalamus is known to be a primary center in the regulation of affect and levels of general neurophysiological activation. All of the rats were normally fed, conscious, unrestrained, and "hypertension and hypercholesterolemia (increased concentrations of cholesterol in the blood) were not etiologic factors."<sup>35</sup> Their results indicated that electrical stimulation alone was sufficient to produce morphological changes of the aorta and major coronary arteries. These structures are involved in the early phases of both animal and human atherogenesis, which is uniformly acknowledged as a major contributing factor to coronary heart disease. Again these results are of special significance in the absence of hypercholesterolemia or hypertension, factors now widely considered to be the key etiological agents. More sophisticated research is required to weight each of these factors but it is also essential to interrelate this disparate data to a comprehensive profile of the etiology and prevention of cardiovascular disease.

Diet is a factor frequently associated with disorders of the cardiovascular system and is an important contributing factor. Despite the common citation of a high cholesterol and saturated fat diet as a direct contributor to increased serum cholesterol levels, recent evidence indicates that this formulation is inaccurate and that psychosocial stress factors may have more significance. Even in the classic Framingham study

hypertension was a better predictor of cardiovascular disorder than either cigarette smoking or serum cholesterol. Hypertension is generally defined as blood pressure greater than 160/95mm-Hg.<sup>41</sup> More recently, researchers from the Department of Epidemiology at the University of California in Berkeley undertook an ingenious study to sort out the factors of diet, hypertension, smoking, cholesterol, weight, and stressful life changes. Among the researchers were Michael G. Marmot, S. Leonard Syme, and Warren Winkelstein, Jr., who determined to study Japanese-Americans in the San Francisco Bay area in view of the lower incidence of CHD in Japan as compared to the United States.<sup>13</sup> At the outset of the project the researchers expected diet alone to account for the marked increase in heart disease among Westernized Japanese. They tended to discount stress because Japanese society seemed to be as modernized and pressured as that of the United States. For the Study, 4000 Japanese-American men in the San Francisco area were given complete physical examinations and completed a 24-page questionnaire. The questions included such as number of years spent in Japan, whether they attended Japanese or American schools, their religious practices, ethnic backgrounds of their friends, and other such queries. From their responses, the men were divided into "traditional" and "nontraditional" groups. Traditional group members were faithful to native Japanese cultural norms of remaining within a close group and living relatively quiet, noncompetitive lives. Nontraditional members seemed to have adopted the characteristic American cultural traits of being competitive, aggressive, and impatient. When the data were analyzed, the researchers were surprised to learn that diet did not prove to be the main factor nor did any one of the most frequently cited risk factors. Most evident was a clear relationship between "heart disease and the degree of change from Japanese customs to American 'lifestyles'."<sup>13</sup>

Findings such as these have also been supported by the research of two Johns Hopkins University physicians Caroline B. Thomas and Karen R. Duszynski, who collected prospective data on 1337 medical students between 1946 and 1964 at the Johns Hopkins School of Medicine. Frequently their results are cited regarding prospective aspects of the development of cancer, but there were noteworthy findings about cardiovascular disease as well. More than 100 of the students had high levels of blood cholesterol when first tested, but only 14 subsequently had coronary attacks. This does not necessarily deny the link between cholesterol and cardiovascular disease, but it does indicate that other

factors are involved. Those factors seemed to reside in the psychological domain such that the students who later developed CHD scored high in "depression, anxiety, and nervous tension . . . tended to suffer from insomnia, were often tired in the mornings, and had generally lower grades than did the other medical students."<sup>93</sup> By contrast, the high-cholesterol students who did not have heart attacks were typically calm individuals who were low in such measures as anxiety, nervous tension, and depression. Given these data it is evident that biochemical factors such as elevated serum cholesterol levels are a necessary but not sufficient condition for the development of cardiovascular disease. Far more weight resides in psychosocial and behavioral variables, which is a clear indication that preventive measures can be defined and implemented.

Whether an individual grows up habituated to high saturated fats, cholesterol, calories, sedentary behavior, or excess stress is determined largely by familial and social circumstances. These circumstances and the adaptive responses of individuals constitute a group of character traits termed "Type A" according to the San Francisco cardiologists Meyer Friedman and Ray H. Rosenman in *Type A Behavior and Your Heart*.<sup>32</sup> Fundamentally, these traits are amenable to primary prevention and the most effective means may be through the formation of optimum health patterns during childhood. Failing that, the secondary prevention means is to recognize these circumstances in order to substitute more positive aspects. It is a certainty that these stressors and an individual's faulty adaptation patterns set up the preconditions for premature cardiovascular disease months and even years before a heart attack. From research by Barney M. Dlin and his colleagues, it is clear that the coronary occlusion itself represents the climax of a long chain of events including the failure of an individual's adaptation and disturbances in the body's biochemical systems. Most coronary patients suffered from one or more of the usual medical indications of that disorder such as (1) prior treatment of heart disease; (2) elevated blood pressure; (3) ongoing medication for blood pressure or heart problems; (4) chest pain, shortness of breath, or breathing difficulty under exertion; (5) ankle, foot, or leg swelling; (6) palpitations; and (7) feelings of being dizzy or faint.<sup>76</sup> In addition to these, Dlin has added such behavioral factors as irritability, anger, indecisiveness, sexual difficulties, especially impotence, fatigue, insomnia, and especially emotional difficulties such as loss, separation, death, or serious illness involving the closest persons in their lives. Also there was an increase in such behavior for periods of

months, weeks, or days prior to the actual heart attack in the form of a "last fling" such as travel, a business gamble, or an affair.<sup>20</sup> Fortunately these characteristics can be identified early enough to initiate changes.

Most important is the characteristic of incessant, unremitting time pressure combined with "the chronic struggle to grasp vaguely defined elements from the environment in the shortest period of time."<sup>32</sup> That subjective state of being pressured to get what the person cannot even define is characteristic of severe neurotic anxiety. Through the recognition of these factors, it is possible to initiate a restructuring of these self-destructive patterns and not only reduce the risk of coronary heart disease but develop a greater sense of internal peace. It is of utmost importance to recognize that stress management techniques need to be based upon demonstrably positive methods, since it has been well-documented that psychological defenses only mask the outward manifestations of stress while actually creating increased physiological stress. An elegant series of research projects demonstrated that defenses reduced levels of an adrenal cortex secretion, 17-OHCS, which is essential to stressful conditions of short-term duration but has the effect of decreasing lymphocyte levels in the blood.<sup>50,51,67,68</sup> When Norman Cousins documented his recovery from a degenerative collagen disease, very few people knew that his prior history included a serious coronary occlusion in 1954 and a period in a tuberculosis sanitarium at age 10. He noted his reaction to the cardiovascular disease diagnosis as "looking down two roads" where one to give up his activities and the other was to increase his exercise. His decision was the second road because "it might carry me for a few months or a few weeks or a few minutes, but it was my road. . . . I didn't think there was a cardiograph in the world that was smart enough to know what made by heart tick."<sup>19</sup> Such a reaction is not in flagrant disregard of the diagnosis, for he did substantially change his life-style in a manner consistent with his active and involved character. Most of all he began to experience a "confidence and rapport with my own body" and exercised the most important faculty of all, his "will to live." As Cousins reflected on how he was able to integrate professional advice in a partnership with his doctors, he noted: "It all began when I decided that some experts don't really know enough to make a pronouncement of doom on a human being. And I said I hoped they would be careful about what they said to others; they

might be believed and that could be the beginning of the end." For doctors and laymen alike, this is sage advice.

No single area of research and clinical application deserves more qualifications, and caveats to both clinicians and laymen that the psychosomatic aspects of cancer. Although this extreme caution is frequently acknowledged, it too frequently goes unheeded, perhaps because there is so pressing a need for clarification of previous research results and their implications for practice. At this time there are far more data implicating psychosocial and neurophysiological factors in cardiovascular disease than cancer, although specific mechanisms of stress reactivity might be common to both. There are indications of potentially productive lines of inquiry concerning the psychophysiological basis of certain forms of cancer but the research is far from definitive. Unfortunately, this area of inquiry has lacked a comprehensive critique until only recently. In August of 1976, the National Cancer Institute (NCI) of the National Institutes of Health issued a call for research proposals for further exploration of the psychosomatic aspects of cancer. Along with that announcement came an excellent overview and critique of research in this area with citations to 373 publications. A major theme attempts to formulate a rational research strategy for both theory and experimental design in approaching these problematic issues. His initial observation is that there are currently two exhaustive approaches to cancer causation: (1) "carcinogenesis . . . overcoming resistance of the body, e.g., chromate exposure leading to high rates of respiratory cancer," and (2) "lowered resistance to cancer that permits a potential carcinogen normally sufficient to produce cancer to do so, e.g., after a transplant to reduce chance of tissue rejection."<sup>31</sup> Several key points emerge from this analysis. (1) Cancer is multicausal and includes factors such as physical and chemical agents in the environment, viruses, medications, genetic predisposition, dietary considerations, occupation, hormonal imbalances, and psychosocial elements; (2) types and sites of cancer are further complicating elements in defining control groups and in achieving comparability of data among studies; (3) numerous flaws of both methodology and data analysis exist throughout this body of research data although this is not unique to this area of study; (4) those studies that have linked personality factors with underlying physiological mediators appear more substantial than those depending solely on personality inventories, which do not fare very well;

and (5) stress and its manifestations in neurophysiological and immunological systems emerges as the single most potentially productive line of inquiry. Fox concludes his overview by sketching a model of how research might be conducted on a developmental basis throughout the lifetime of individuals in order to detect the stages at which interactions between these multicausal agents actually are evidenced as cancer. His overview and exploration of these etiological factors is so well-reasoned that it is both impossible and unproductive to attempt to condense his 107-page paper any further. It is required reading for anyone seriously concerned with these aspects of cancer.

Since the publication of this paper by Bernard H. Fox related research projects are proving to be highly significant. Numerous animal and human experimental studies have demonstrated that stress, psychological depression, and other psychosocial factors compromise an organism's capacity to prevent the induction of disease such as cancer or limit its spread. Both malfunctions have been attributed to the interaction between the host's neurophysiological and immunological systems. To date the most recent evidence indicates that the biochemistry of neurologic responsiveness is very similar to that of the immunologic system since both systems evolved from the same precursor cells to perform very similar functions, which generically give a specific response to a specific stimulus.<sup>37</sup> For this discussion, it is assumed that there is a substantial body of data that defines the nature of the consciousness of an individual and the underlying neurophysiological processes of brain function.<sup>22,62,66,77</sup> Emphasis here is upon the subsequent effects of psychological events in interaction with the neurologic and immunologic systems. In the neurological system the stimuli are sensory perceptions while those of the immunologic system are chemicals such as proteins, lipids, and carbohydrates. Responses in the neurologic domain depend upon which of various neurons are stimulated, while those of the immunologic system would be various lymphocytes, which are one form of antibody cell of the immune system. It is well-known that the adrenals, which are under hypothalamic control, secrete lympholytic corticosteroid (ACTH). In turn, the corticosteroids have a great deal to do with inhibiting T-cell competence. T-cells serve key functions in the immunological system in that they switch other immune responses on and off.<sup>45</sup> Indeed, recent research indicates that the relation of glial cell to neuron activity in the nervous system is similar to that seen between lymphocytes and macrophages. In sum, there is considerable scientific

evidence demonstrating the adverse effects of stress upon the immunological system, an intricate matrix of psychosocial, neurophysiological, and immunological processes. With this research and clinical base, it is possible to begin a systematic inquiry into how cellular activity can be compromised or enhanced by psychosocial factors.

From the research of Andrew A. Monjan and Michael I. Collector of the Department of Epidemiology at Johns Hopkins University come some of the first experiments to explore both the depression and optimization of immunocompetence by stress. Noting that the immunosuppressive effects of short-term exposure to stressors have been well-established, their research focuses upon the long-term stress of the Type II variant noted earlier. For their study they subjected laboratory mice to noise of about 100 db daily for five seconds every minute during a one-to three-hour period around midnight for a varying number of days. Control animals were exposed only to the normal activity of the laboratory room. When the animals were killed and their spleens removed, the researchers found that both the thymus-derived T-cells and the bone-marrow-derived B-cells were depressed in quantity by the stressful stimulation. Reporting their results in *Science*, they stated that "stress induced immunosuppression is mediated through the action of cortisone upon lymphocytes."<sup>53</sup> Going one step further, the researchers speculated about the implications of their research for "potentiation of the immune response" and noted that "the enhancement phenomenon reported herein may be due to the elevation of one or more such circulating factors which stimulate lymphocyte reactivity . . . and proliferation. . . . In summary, we have shown that environmental stressors not only can depress immune responsiveness, but can also enhance it."<sup>53</sup> Results of this experiment are in keeping with the findings of earlier research by Vernon Riley who was able to vary the incidence of mammary tumors in laboratory mice through varying the effects of stress. Mice placed under chronic stress had a tumor incidence of 92% while those in a protected environment had a 7% incidence rate.<sup>75</sup> Riley indicated that chronic stress produced an increase in certain hormones, noted also by Monjan and Collector, which appear to have inhibited the natural immune response of the body. As early as 1970, R.C. La Barba<sup>43</sup> reviewed the animal experimental work in *Psychosomatic Medicine* and concluded that environmental stress produced a linear increase in tumor growth rates in laboratory animals. Also, La Barba cited Soviet research which hypothesized that higher levels of the central system

such as the hypothalamus determined the hormonal balance and level of protective reactions of connective tissue as mediators of this tumor growth.

At this point, there is ample evidence that psychosocial and environmental stressors induce immunological compromise, which provides a means of more precise inquiry concerning the pathogenesis of tumor growth. An excellent annotated bibliography of this research up to 1976 has been compiled by Jeanne Achterberg, O. Carl Simonton, and Stephanie Matthres-Simonton in *Stress, Psychological Factors, and Cancer*.<sup>3</sup> Between the Fox report and this bibliography, there is a substantial body of significant data relating stress and emotional factors which are mediated through hormonal mechanisms to induce immunological dysfunctions. Inquiries concerning the relatively new field of immunology seem invariably to focus upon pathology rather than upon optimum states of function. The point is made most simply by Nobel Laureate Albert Szent-Gy Györgyi in his recent book *Electronic Biology and Cancer*: "Cancer research has greatly been retarded by our asking why cancer grows, instead of asking what keeps a normal cell from growing."<sup>91</sup> This book explicates a theory of cancer based upon molecular interactions prior to oxygen, an  $\alpha$  state, and with the introduction of oxygen, the  $\beta$  state. From his perspective he notes "cancer was looked upon as a hostile intruder which had to be eliminated. It might be looked upon also as a cell in trouble, which needs help to return to normal." In essence the problem resides in a "lack of oxygen" which has been found to "induce a malignant transformation in tissue cultures. It is easy to believe that a lack of  $O_2$ , which induces changes in other factors, will eventually take the cells back from the oxidative  $\beta$  state to the fermentative  $\alpha$  state" (p. 82).<sup>91</sup> When a cancer cell falls into the  $\alpha$  state, a state of high fermentation, the problem is not its rate of proliferation but that it does not stop dividing when no further replication is required. Although Szent-Györgyi's theory is complex and as yet unproven, the thrust of his perspective is to research the optimum levels of function in cells to determine the parameters which can be promoted in order for cells to maintain accurate replication. Although his approach is biochemical and molecular, it is a positive approach rather than one based primarily upon pathology, and that alone evinces innovation in this area of research. From this extended viewpoint, the same factors that are responsible for all stress disorders as well as for states of health come into play to determine the particular manifestation of this multicausal matrix for an individual patient.

Frequently the psychological factors of this matrix are overlooked, particularly with regards to the clinical management of cancer. Partially this is due to the predominantly biochemical model of cancer etiology and partly to the fact that psychological factors are not readily amenable to being quantified and replicated. Since these are the mainstays of a scientific inquiry, it has been necessary to devise an innovative approach and extend the paradigm of science. Based upon extensive research with the imagery of cancer patients during states of deep relaxation, Jeanne Achterberg and G. Frank Lawlis of the Health Sciences Center, University of Texas at Dallas, have formulated a psychological instrument which meets methodological criteria. Their test, termed IMAGE-CA, takes the subjective reports of patients and scores them in a manner which can be objectively reported and considered. Furthermore, preliminary research has indicated that the IMAGE-CA scores correlate highly with blood chemistry analyses reflecting disease status. For the study, Achterberg and Lawlis collected data from 126 cancer patients over one and one-half years and administered an extensive battery of psychodiagnostics, such as the MMPI and POMS along with the IMAGE-CA, and hematological analyses, such as CBC and LDH levels. From this research they determined: "(1) blood chemistries tend to reflect ongoing or concurrent disease state; (2) there is a statistical relationship between psychological variables and blood chemistries; and (3) psychological factors are predictive of *subsequent* disease status."<sup>2</sup> Data from follow-up studies indicated that the psychological factors were better predictors of the outcome for the patient than hematological analysis. They are not considering causation at the present time since their focus is upon developing a means by which clinicians can accurately assess the future trend of a patient's disease. Encouraged by these results, Achterberg and Lawlis developed IMAGE-CA in order to provide clinicians with a means of understanding the role that patients play in their own treatment. Patients in their research to develop IMAGE-CA were asked to go through a relaxation procedure and focus upon subjective imagery.<sup>86</sup> Then they were asked to draw the images. The researchers conducted structured interviews and began to recognize 14 scorable dimensions which were amenable to standardization and qualification. Those factors are:

Vividness, activity, and strength of the cancer cell, vividness and activity of the white blood cell, relative comparison of size and numbers of cancer and white blood cells, strength of white blood cell, viv-

idness and effectiveness of medical treatment, degree of symbolism, overall strength of imagery, regularity of imagery process, and clinical opinion, related to prognosis based on combined imagery factors.<sup>1</sup>

Results of their research are detailed in the diagnostic manual *Imagery of Cancer (IMAGE-CA): An Evaluation Tool for the Process of Disease*,<sup>1</sup> which presents a comprehensive approach to medical care. Administration of the diagnostic is relatively brief and involves listening to a relaxation and imagery recording, then drawing the visualizations, followed by a structured interview. Drawings of the imagery plus results of the interview are then scored along these 1- dimensions and appear to be an accurate assessment of a patient's prognosis.

Interpretation and scoring of these dimensions are complex but the book is quite complete with sample drawings and transcribed cases. Although the intent of the IMAGE-CA is toward prediction of individual outcome, Achterberg and Lawlis did note that there were some common elements in the imagery which were indicative of a positive prognosis. These images included "white knights," "Vikings," "large, powerful animals especially dogs and bears," which were aggressively attacking the cancer cells. Overall, the positive imagery rarely described "mechanical devices" such as "vacuum cleaners" or "automatic sprinklers." For patients who imaged "vivid, concrete white blood cells," the prognosis was more favorable than for those who saw the cancer cells being stronger or more vivid than the white blood cells. Other than these few general observations, the best predictions were obtained through individual testing and interpretation. Although Achterberg and Lawlis do not discuss the function of these images per se, it is likely that they are visual representations of various manifestations of the patient's will to live. Perhaps these positive images are one step removed from the sugar pill placebo that Norman Cousins suggests is "only a tangible object made essential in an age that feels uncomfortable with intangibles, an age that prefers to think that every inner effect must have an outer cause . . . the placebo satisfies the contemporary craving for visible mechanisms and visible answers."<sup>18</sup> Before researchers engage in a headlong plunge into minute dissection and further quantification of imagery, it is important to note that the results of the Achterberg and Lawlis research were obtained with patients treated in a holistic manner acknowledging both medical and psychosocial aspects of their disease.

Under such circumstances, various images are "placebos" in the sense that they are functionaries of an underlying dynamic between mind and body, which is reminiscent of the ancient Greek term "physis," or "healing force of the body."<sup>16</sup> Labels are unimportant, for the real significance is that individuals are not locked into fixed limitations. Again, this point is poetically stated by Cousins who notes, "The placebo then is an emissary between the will to live and the body. But the emissary is expendable.... The mind can carry out its ultimate functions and powers over body without the illusion of material intervention. . . . The placebo is the doctor who resides within."<sup>18</sup> Eliciting and sustaining that response is the essence of the healing relationship and has been the foundation upon which all systems of health are derived.

Voluntary regulation of the excessive stress reactivity of the Type III variant is the fundamental element of virtually all systems of stress alleviation. For centuries, systems of meditation and yoga have taught individuals to induce states of deep relaxation as the preliminary stages for the more subtle and profound experiences involved in the subsequent altered states of consciousness. More recently, similar systems have been developed with an orientation primarily toward stress management through clinical biofeedback and Progressive Relaxation.<sup>38</sup> Following the more classic tradition of inducing states of deep physical relaxation as a precursor of subtle experiences of the phenomenology of consciousness are systems such as Autogenic Training,<sup>47,48</sup> Transcendental Meditation,<sup>94</sup> zazen or sitting meditation, and related meditation and yoga practices. In the initial stages, all of these approaches define specific methods of obtaining a sustained period of diminished sympathetic activity with an attendant increase in some parasympathetic activity. Decreased sympathetic activity is an integrated hypothalamic response that was first described by Walter R. Hess and termed the "trophotrophic response" to distinguish it from the "ergotrophic response," which is equivalent to Cannon's fight-flight activity and characterized by increased sympathetic reactivity.<sup>36</sup> Neurophysiological observations indicate that the trophotrophic zone is located in the anterior hypothalamus and extends into the supra- and preoptic areas, septum, and inferior lateral thalamus. Generally, the response is mediated by the parasympathetic nervous system and results in relaxation of the skeletal muscles, decreased blood pressure and respiration rate, and pupil constriction. As early as 1957 Hess noted, "We are actually dealing with a protective mechanism against overstress belonging to the tro-

photrophic-endophylactic system and promoting restorative processes" (p. 40).<sup>36</sup> More recently, Herbert Benson has popularized this concept as "the relaxation response"<sup>10</sup> and noted the major physiological changes as decreases in oxygen consumption and carbon dioxide elimination, decreases in heart rate, respiratory rate, arterial blood lactate, and skeletal muscle tension, accompanied by increased alpha and occasional theta activity in the electroencephalogram. For any given system or individual, a particular change might be emphasized or be noted as absent but there is a definite tendency for these alterations to occur collectively. By this point in time, it is hoped that these neurophysiological parameters of meditation and related relaxation procedures have been adequately documented in numerous research projects and do not require further elaboration here.

Practicing a given stress management technique is ultimately more important for a patient than memorizing the neurophysiological mechanisms involved. Also, it is vitally important to recognize that none of the techniques noted above can be designated as the treatment of choice for severe psychosomatic disorders such as cardiovascular disease, cancer, and the host of the "afflictions of civilization." With this qualification in mind, these methods can be productively applied as one of a number of holistic interventions in which the patient assumes an active participation in inducing and sustaining a trophotrophic response.<sup>10</sup> There are certain characteristics that Herbert Benson and his colleagues have identified as conductive to eliciting the relaxation response.

- (1) *Mental Device.*—There should be a constant stimulus—e.g., a sound, word, or phrase repeated silently or audibly, or fixed gazing at an object. The purpose of these procedures is to shift from logical, externally oriented thought.
- (2) *Passive Attitude.*—If distracting thoughts do occur during the repetition or gazing, they should be disregarded and one's attention should be redirected to the technique. One should not worry about how well he is performing the technique.
- (3) *Decreased Muscle Tonus.*—The subject should be in a comfortable posture so that minimal muscular work is required.
- (4) *Quiet Environment.*—A quiet environment with decreased environmental stimuli should be chosen. Most techniques instruct the practitioner to close his eyes. A place of worship is often suitable, as is a quiet room.<sup>10</sup>

All of the above aspects are greatly enhanced when instruction in a given method is under supervision of a trained instructor or licensed clinician. Relaxation methods are oriented toward a restoration of "homeostatic self-regulatory mechanisms"<sup>49</sup> within the psychosomatic system but complications can arise when the techniques are undertaken improperly or without adequate supervision. Contraindications are discussed later in this chapter. Each of the relaxation procedures cited earlier does follow the basic outline of the relaxation response. In *Mind as Healer, Mind as Slayer*<sup>60</sup> basic instructions on achieving a Zen meditation posture were detailed in Chapter 6 and an outline of the stages and postures of Autogenic Training were explicated in Chapter 7. These two approaches still are the most significant examples of systems of relaxation leading into more profound experiences of meditation. Since the data to support each system and instructions on practicing the basic exercises have already been rendered in my previous work, the details are not repeated here. Both Zen meditation and Autogenic Training are excellent methods to use as a primary technique in the clinical management of specific psychosomatic disorders and are potent adjuncts with a wide range of techniques of traditional care.

Autogenic Training is an excellent system based on a well-researched method of meditation with particular emphasis upon the clinical management of psychosomatic disorders. Of all the systems noted, it is the most comprehensive and can serve as a model for all others that address themselves to clinical disorders, since its efficacy has been thoroughly researched and contraindications clearly stated. Historically, Autogenic Training developed experimentally out of the medical hypnosis work of Johannes H. Schultz, who published *Das Autogene Training* in 1932. Schultz defined autogenic training as exercises which are developed (Greek, *genos*) from within the self (Greek, *autos*). After working with Schultz, the Montreal physician Wolfgang Luthe translated the German publications and extended the theory and practice of Autogenics through the publication of six volumes ranging from *Autogenic Methods to Treatment with Autogenic Neutralization*. Despite the extensive research data and case histories, the actual application of Autogenics has been hampered by the lack of a training manual although courses leading to certification have been offered. In 1977 Luthe finally published such a training manual, *Introduction to the Methods of Autogenic Therapy*<sup>47</sup> which provides clear instructions to enable a clinician to use autogenics in practice. According to the manual, "The techniques

developed and used in Autogenic Therapy have been designed to support and facilitate the natural self-healing mechanisms that already exist. Thus, the emphasis is not on trying to control the natural system, but rather on helping natural systems use their inherent potentials of self-regulatory adjustment more fully" (p. 2). That is an apt description of all the methods of holistic medicine, which are anticipated in the development of Autogenic Training. Luthe delineates the phychosomatic disorders for which these methods are effective, used alone or as an adjunct to medical treatment. Among these conditions are cardiac arrhythmias, hypertension; respiratory disorders such as asthma and tuberculosis; gastrointestinal application to irritable colon, peptic ulcer, ulcerative colitis, and obesity; genitourinary including sexual dysfunction; musculoskeletal including rheumatoid arthritis and low back syndrome; endocrine and metabolic dysfunction such as diabetes mellitus and functional thyroid; neurological disorders such as headaches, neuralgia, epilepsy, cerebral palsy, and Parkinsonism; and many other disorders under these same categories plus special clinical applications in some instances such as improved postoperative recovery. Instructions for the application of Autogenic Therapy to each of the above conditions are clearly presented in the manual, which is invaluable in pursuing these techniques in clinical practice.

Autogenic Training and all self-regulatory methods are noninvasive and relatively safe, although as with any therapeutic intervention potentially serious complications can arise. From this perspective, Autogenics is clearly the most well-developed system and all others would do well to emulate this model. The *Manual* contains the contraindications including any conditions, especially a disease condition, which renders a particular method of treatment improper or undesirable.<sup>55</sup> Contraindications noted here are applicable to all self-regulatory therapies including clinical biofeedback and should be kept in mind at all times. Among these are: doubtful or impending myocardial infarction (MI) during or directly after MI; transient blood pressure elevations need to be monitored; diabetic conditions; hypoglycemia; glaucoma; involutional psychotic reaction, paranoia, and dissociative episodes. There are specific reasons for each of these contraindications based upon research data, and this earmarks Autogenic Training as a particularly well-suited approach for clinicians. Also included in the *Manual* is a health questionnaire, ROCOM, which was developed by the Patient Care Systems branch of the Hoffman-LaRoche Company of Vaudreuil, Que-

beck. It is an extensive data-based system that includes a patient-administered Health History Questionnaire and a Physical Examination Form that renders medical history in an extremely compact form. Whenever the self-regulatory methods are applied in a clinical context, these precautions need to be exercised. Clearly there are purely educational and nonmedical applications of these methods but when they are rendered with patients, then all of the above considerations are essential. Although the emphasis here is upon the applications of Autogenic Therapy with psychosomatic disorders, the basic relaxation postures of this method are precursors of the second stage of training, which enters into visualization and meditation. Meditation practices in Autogenics are intended to induce an "intensification of psychic experience by increasing an individual's ability to visually experience endopsychic phenomenon."<sup>33</sup> Again the precise directions for each stage of meditation are not included here since they are detailed in *Autogenic Therapy*, Wolfgang Luthe<sup>46</sup> and summarized in Chapter 7 of *Mind as Healer, Mind as Slayer*.<sup>60</sup> There are six stages of meditative exercises beginning with a positioning of the eyes involving a "voluntary rotation of the eyeballs upward and inward looking at the center of the forehead"<sup>46</sup> and culminating in vivid visualizations of significant people and events in the person's life, particularly regarding emotional relationships. In this respect, Autogenic Training represents a clearly structured, well-documented system of working with an individual from a state of psychosomatic dysfunction toward a state of optimum health.

Another self-regulatory approach to psychosomatic disorders is Progressive Relaxation, developed by Edmund Jacobson beginning in 1908 at Harvard University. His initial experiments lead to conclude that tension involved excess effort which manifested in the shortening of muscle fibers when individuals subjectively reported anxiety. To rectify this condition, Jacobson developed a program of systematically tensing and releasing various muscle groups. When a patient could learn to attend to and discriminate the resulting sensations of tension and relaxation, he could enhance the latter and achieve a state of deep relaxation. Jacobson's studies and a description of his procedures were first published in 1934 in *You Must Relax*<sup>39</sup> followed in 1938 by a more professionally oriented version entitled *Progressive Relaxation*. As of 1962, modifications of the basic approach were introduced, with the result being a relaxation procedure involving 15 muscle groups. Each group was dealt with for from one to nine hour-long daily sessions before pro-

ceeding to the next group for a total of 56 sessions of systematic training.<sup>39</sup> Significant modifications of this procedure were undertaken by Joseph Wolpe (1958) who used the same sequence but created a program that could be completed in six 20-minute sessions with two 15-minute daily home practice sessions between clinical sessions. Wolpe's major innovation was to introduce a graduated series of imagined exposures to anxiety-provoking situations while the person remained relaxed. This method of "systematic desensitization" has proven to be of significant clinical efficacy with phobias. In actual practice, the procedures are usually of much briefer duration. Recently, Douglas A. Bernstein and Thomas D. Borkovec of the University of Illinois at Urbana-Champaign have written an excellent summary of this method for clinical use in *Progressive Relaxation Training: A Manual for the Helping Professions*.<sup>12</sup> Included in the Manual is a 33-½ rpm record describing the basic procedure in order to clarify the pacing of the intervention, which is very important.

In presenting progressive relaxation to a patient, a sequence of events should occur with respect to each muscle group. That sequence is: (1) the patient's attention should be focused on the muscle group; (2) at a predetermined signal from the therapist, the muscle group is tensed; (3) tension is maintained for a period of 5–7 seconds (this duration is shorter in the case of the feet); (4) at a predetermined cue, the muscle group is released; and, (5) the patient's attention is maintained upon the muscle group as it relaxes. Generally this approach works well for general anxiety, muscular tension, and as an intervention in a wide range of neuromuscular disorders such as spasms and physical rehabilitation. Progressive Relaxation is a much more limited and specialized approach than Autogenic Training but is of considerable efficacy when applied in instances where it is clearly indicated.

Both Autogenic Training and Progressive Relaxation are useful approaches per se and excellent when applied in conjunction with clinical biofeedback. Since the publication of the first volume of *Biofeedback and Self-Control* in 1970<sup>6</sup> the field of clinical biofeedback has had a major impact in presenting psychosomatic concepts and treatment in an intelligible and effective manner. From that article and others it is clear that clinical biofeedback is an efficacious method for the treatment of neuromuscular reeducation and reduction of tension through electromyographic (EMG) biofeedback. Other applications of the EMG have been with cerebral palsy and dental disorders such as brux-

ism. Although the EMG is probably the most widely used instrument as a single approach in clinical practice, other instruments used are the electroencephalogram (EEG), the electrodermal response (EDR), electrocardiogram feedback (ECG), peripheral temperature training (TT), as well as penile erection feedback using a plethysmograph, which indicates blood flow. Each of these instruments have been used with a wide range of disorders but it is unnecessary to review that literature here since it is already covered in the above article. Each year all published papers in the field are anthologized in an annual reader entitled *Biofeedback and Self-Control* from Aldine Publishers in Chicago.

Future innovative applications of biofeedback include a clinical procedure for the normalization of thalamocortical EEG patterns in psychosomatic epilepsy,<sup>89</sup> direct blood pressure feedback, and computer-based feedback of multiple channels of information simultaneously. Clinical biofeedback is a powerful tool yielding an unprecedented, highly accurate method of monitoring the interactions upon which psychosomatic disorders develop and can be alleviated. Unfortunately, there is a tendency for individual practitioners to reify the instruments and become fixated on electronic gadgets rather than recognizing the instruments as mirrors of the patient's internal state. When that factor is recognized then a clinician can use the specific information from the instruments in a total context where the instruments are one element of a holistic therapy that considers placebo effects, medical factors, psychosocial parameters, and the active participation of the individual.

During professional conferences or in reading the literature of Autogenic Training, Progressive Relaxation, clinical biofeedback, and related approaches, it is striking how compartmentalized each of these approaches tends to be. There is little if any cross-referencing among these systems despite the fact that each has specific applications and limitations. Frequently, a shortcoming of one system is a strong attribute of another. Whereas clinical biofeedback offers an instrumentation accuracy in the clinic or hospital, it is cumbersome or prohibitively expensive for home practice where Autogenic Training or Progressive Relaxation is clearly efficacious. Perhaps the precision of specialization has become confused with being narrow-minded, but the two are hardly synonymous. A clinician can be a highly trained specialist in a given approach but when that becomes the only method, there can be a tendency to apply a given approach when it is not clearly indicated. Actually, this is a conservative approach to self-regulatory methods

since it advocates a specific intervention to be applied when clearly indicated to the best of the clinician's judgment. When this qualification is applied, then it is possible to achieve a truly comprehensive approach to the development of optimum health.

This article concerning stress in the context of holistic medicine began with microorganisms and ends on the psychophysiology of stress, for stress is the key factor underlying the psychosocial aspects responsible for altering an individual's susceptibility to disease. More than any other single contributing agent, excessive reactivity is the major influence in the "afflictions of civilization."<sup>21</sup> Fortunately, the deleterious effects of stress can be mitigated through the systematic induction of periods of parasympathetic restoration, which enables the entire psychosomatic system to undergo periods of profound restoration. Writing in *Dr. Zhivago*, Boris Pasternak acknowledged, "Your health is bound to be affected, if day after day, you say the opposite of what you feel, if you grovel before what you dislike and rejoice at what brings you nothing but misfortune. Our nervous system isn't just a fiction; it's part of our physical body, and our soul exists in space and is inside us, like the teeth in our mouth. It can't be forever violated with impunity." Underlying all the systems of deep relaxation and meditation is the common element of quiet, of providing an individual practitioner with the opportunity to listen to the body and become sensitive again to inner directives. Any approach to stress management as an effective means of curbing the rising incidence of psychosomatic disorders is a tool but it cannot substitute for the arcane dictum to know ourselves as fully as possible.

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# 3

## Sites of Nonspecificity in the Response of the Adrenocortical System to Stress

Murray Saffran and Linda A. Dokas

*Department of Biochemistry, Medical College of Ohio, Toledo, Ohio*

One of the fundamental discoveries in stress research was the nonspecific response of the pituitary-adrenocortical system to stress.<sup>28</sup> A large variety of physical, chemical, and psychological stimuli seemed to funnel signals into the activation of a single response—the accelerated production of glucocorticoids by the adrenal cortex. Few physiological systems can be stimulated by many stimuli. Most biological systems are designed to attain maximal specificity. How does this one acquire the rare property of nonspecificity?

The earliest diagrams merely depicted a cluster of arrows labeled with a variety of stresses, all aiming arrowheads at the anterior lobe of the pituitary gland, which responded to all stimuli with one response, the release of ACTH. ACTH, in turn, was shown to have one effect, the increased production of glucocorticoids by the adrenal cortex.

The first complexity to be introduced was the formulation by Harris and others of the neurosecretory neurohumoral hypothesis of control of the pituitary,<sup>10</sup> in which the secretion of ACTH and other hormones of the anterior pituitary was depicted as being controlled by chemical agents, secreted by neurons in the hypothalamus, and led to the anterior pituitary by a special network of capillaries. The theory was put on a sound basis by the work of Saffran<sup>23</sup> and Guillemin<sup>8</sup> who showed that

secretion of ACTH by anterior pituitary tissue is accelerated by preparations of hypothalamic and neurohypophysial tissue. The subsequent discovery by Guillemin and Schally of the hypothalamic hormones that control the release of pituitary TSH,<sup>2</sup> LH, and FSH,<sup>26,16</sup> and growth hormone,<sup>1</sup> strengthened the belief that pituitary secretion of ACTH is exclusively under hypothalamic control. Diagrams depicting the non-specific pituitary-adrenocortical response to stress were redrawn to show arrows leading from a variety of stimuli to the hypothalamus, which responds by secreting the corticotropin-releasing factor (CRF), which specifically releases ACTH from the pituitary. In this scheme, the common pathway in the response to stress stretched from the hypothalamus to the adrenal cortex. The hypothalamus replaced the anterior pituitary as the site of detection of the many different kinds of stressors, physical, chemical, and psychological.

### IS VASOPRESSIN THE HYPOTHALAMIC CRF?

Even though ACTH-releasing activity was detected in 1955 in the hypothalamus and the neurohypophysis, and was ascribed to a specific corticotropin-releasing factor, or CRF, such an agent remains unidentified 25 years later. The laboratories of Saffran and Guillemin both reported that the active material was distinct from vasopressin.<sup>23,8</sup> However, the candidature of vasopressin as the physiological CRF of the hypothalamus had many supporters then, and has many supporters now. There is no doubt that vasopressin does release ACTH from the pituitary. Early negative reports were probably the result of overenthusiastic use of very high doses of vasopressin, which are inactive because the dose-response curve for vasopressin, like that for many other agents, is an inverted U.<sup>7,29</sup>

Vasopressin is an attractive candidate as CRF. Vasopressin is made in the hypothalamus and stored in the neurohypophysis; it is released by stress.<sup>17</sup> However, there are several physiological conditions in which the secretion of vasopressin is shut off, yet the pituitary-adrenal response to stress persists. One of these is the water-loaded test animal (or man). A large water load shuts down the release of vasopressin to allow the kidneys to get rid of the excess water. But the imposition of a water load is a stress, causing signs of stimulation of the pituitary-adrenal system.<sup>18</sup> Other, more recent, experiments lead to the same con-

clusion. The most striking evidence for a nonvasopressin CRF comes from the Brattleboro rat, a strain with a genetic inability to make vasopressin. These rats can be "stressed" and extracts of their hypothalamic tissue release ACTH from both Brattleboro and normal pituitary glands.<sup>21</sup> Recent unpublished experiments by Simmons and Pearlmuter, in which CRF survived treatment with an enzyme that totally destroys both vasopressin and oxytocin, further strengthen the evidence for a hypothalamic CRF distinct from vasopressin.

### MULTIPLE ACTIONS OF HORMONES

Most hormones are named according to their first demonstrated activity. For example, vasopressin is named for its ability to raise the blood pressure. However, the major, and perhaps most important physiological action of vasopressin is on the kidney to cause the retention of water by shutting down the formation of urine. The synonym for vasopressin, antidiuretic hormone, or ADH, is a more appropriate name.

Vasopressin has other effects. It was recently demonstrated to facilitate long term retention of learning in rats.<sup>4</sup> With several biological activities to its credit, there is no a priori reason to reject the claim that vasopressin can release ACTH.

Another hormonelike substance with multiple actions is nerve growth factor, NGF. First isolated from the submaxillary gland of the mouse, NGF promotes development of neurons in young animals, as fits its name. NGF also has insulinlike activity; it promotes the uptake of amino acids and the synthesis of proteins. There is, in fact, a recognizable resemblance between the chemical structures of NGF and proinsulin, the form in which insulin is manufactured in the pancreas. Recently NGF was found to stimulate the pituitary-adrenal system like stress does.<sup>20</sup>

### MULTIPLE CRFS

The search for a unique hypothalamic CRF goes on. Even in the first papers on the purification of CRF, at least two active materials were found in the hypothalamus and neurohypophysis.<sup>27</sup> Subsequent investigations of CRF also turned up several active forms. But, in spite of

much effort CRF remained uncharacterized. Every laboratory that attempted to purify CRF ran into a paradox—the purer CRF became, the less active it was. By this time other hypothalamic hormones had been identified as peptides. Assuming that CRF is a peptide, the pure peptides were relatively inactive.

The paradox was resolved in 1975 by the discovery by Pearlmutter et al.<sup>22</sup> that the active material in the rat hypothalamus was composed of two substances, which were required simultaneously to release ACTH from the pituitary. Only one of the substances was unequivocally a peptide; the other may not be. Therefore, the purer the peptide, the less active it is.

The initial observation that rat hypothalamic CRF needs a cofactor has been confirmed several times.<sup>5,12,25</sup> One of the confirming laboratories claims that the cofactor also enhances the ACTH-releasing activity of vasopressin.<sup>5</sup> The cofactor has yet to be demonstrated in species other than the rat. A summary of evidence for multiple CRFs was published recently by Saffran and Schally.<sup>24</sup>

## WHAT ORGAN IS NONSPECIFIC?

In view of the many substances that can release ACTH from the pituitary, the simple diagram that shows stress stimuli striking the hypothalamus must be redrawn. In fact, the older diagram with multiple arrowheads on the pituitary may contain a kernel of truth. Vasopressin, NGF, and a tribe of CRFs all release ACTH. Perhaps, then, the nonspecificity of the nonspecific response to stress is a property of the anterior pituitary as well as the hypothalamus. The anterior pituitary responds by the release of ACTH to peptides originating not only in the hypothalamus, but also in the neurohypophysis, the brain, and perhaps the gut, where many peptides, formerly thought to be made only in nervous tissue, are found in large amounts.<sup>6</sup>

The hypothalamus contributes its share of nonspecificity by responding to neuronal input originating in every sense organ of the body, whether conscious or subconscious. The hypothalamic response may be the secretion of its own CRF, or multiple CRFs.

Other organs exposed to stress may also secrete a CRF.<sup>14</sup> In experimental animals, whose hypothalami have been destroyed, the pituitary gland still responds to tissue injury by release of ACTH.

## MULTIPLE SOURCES AND ACTIONS OF ACTH

At one time the ACTH story was simple: ACTH was a 39-amino acid peptide produced in specific cells of the anterior lobe of the pituitary gland; ACTH had as its main effect the stimulation of the synthesis of glucocorticoids by the adrenal cortex. Then ACTH was found to act on adipose tissue to release fatty acids into the blood. More recently ACTH, or portions of the ACTH molecule, were found to influence learning and behavior in rats.<sup>3</sup>

The synthesis of ACTH in pituitary cells seems to follow the pattern of synthesis of all peptide hormones. First, a very large precursor protein is made by ribosomes on the rough endoplasmic reticulum. Carbohydrate residues are added. The first product is relatively inactive biologically. The cleavage of the large molecule occurs to liberate the storage form of the hormone, which is largely the final 39-amino acid peptide that is secreted from the cell.<sup>15</sup>

The large precursor of ACTH has recently been identified by an exciting new method.<sup>19</sup> The messenger RNA (m-RNA) for ACTH was isolated from pituitary tissue and used as a template for the enzyme, reverse transcriptase, to make the corresponding DNA. The DNA was then spliced into a bacterial DNA to obtain a source of m-RNA and of ACTH precursor. The precursor not only contained the future ACTH molecule as part of its structure, but also the sequence of amino acids of the pituitary peptide known as lipotropin. Lipotropin was described by C.H. Li<sup>13</sup> as a pituitary peptide that mobilized fatty acids in rabbits, but no other species. For several years lipotropin was a hormone looking for a function. Then, a few years ago, the enkephalins were discovered.<sup>11</sup> Enkephalins are 5-amino acid peptides from the brain that have the same actions as morphine. By chance, the sequence of amino acids in one of the enkephalins was noted in lipotropin. Portions of lipotropin were then tested and found to be powerful morphinelike agents. These were named endorphins. Endorphins have now been found to be widely distributed in the brain and in the pituitary gland.<sup>30</sup> The endorphins are derived from the same precursor protein as ACTH, but from a different portion of the molecule. Theoretically, then, any tissue that is capable of producing endorphins can produce ACTH. The anterior pituitary gland apparently releases endorphins along with ACTH in severe stress.<sup>9</sup> Because endorphins are analgesics, the endorphins may act to dull the painful effects of stressors.

## CONCLUSION

The occurrence of the pituitary-adrenal system that responds to a wide variety of stimuli in an organism whose other systems tend toward specificity can be explained by the existence of two wide-band receivers in the system. The neural component, the hypothalamus, through its many neuronal connections, responds to neurogenic inputs originating from all sensory organs. The pituitary component is sensitive to the CRF or several CRFs that originate in the hypothalamus, and to agents from other sources that also have the ability to stimulate the secretion of ACTH. Among these are vasopressin from the neurohypophysis and a "tissue CRF" originating from nonneuronal tissues subjected to injury.

The existence of two points of different specificity in the pathway of the adrenocortical response to stress broadens the variety of stimuli to which the system can respond.

The recent demonstration that the ACTH precursor is made in many sites in addition to the anterior pituitary raises the possibility that under certain conditions the adrenocortical response to stress may involve ACTH from extrapituitary sources.

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# 4

## Xanthurenic Acid Excretion as a Measure of Strain

M. J. A. M. J. Hoes, M.D.,

*Lecturer for Biological Psychiatry, Department of Psychiatry,  
Radboud Hospital, University of Nijmegen, The Netherlands*

Strain and stress are well defined in the physical sciences. Strain is the change in a body caused by an external force. Stress is each force that, inflicted upon the body, distorts the internal balance of the organism.<sup>11</sup> Selye<sup>27</sup> has defined the biologic stress syndrome, or stress, as "the non-specific response of the body to any demand made upon it."

In this chapter the term "stressor" is used for "any demand." The word "strainor" would be more exact and would not give rise to casuistry, but it is a neologism. Strain is meant in this chapter to signify the changes occurring in the body under the influence of stressors. We are especially concerned here with those changes which have been described as the biologic stress syndrome.

Xanthurenic acid (XA) is a by-product in the biosynthesis of nicotinic acid (NiA), a B-vitamin. This synthesis starts from the aromatic aminoacid, L-tryptophan (Fig. 4-1).

The production of XA is measured as XA excretion in 24 hours' urine, after the patient has taken 5 g L-tryptophan at 10 p.m. The normal values under these conditions are  $68.8 \pm 19.0 \mu\text{mol}/24 \text{ h}$ .<sup>17</sup> The thus measured XA excretion can be elevated by 2 mechanisms:<sup>36</sup>

### Pyrrolase

The activity of this enzyme is subject to induction:

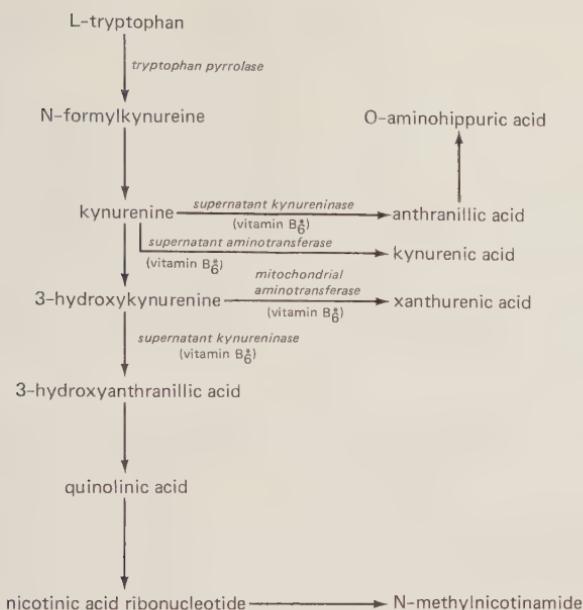


Figure 4-1. The nicotinic acid synthesis form L-tryptophan. This abbreviated version shows the branch of xanthurenic acid. The coenzymatically active form of vitamin  $B_6$  is marked with an asterisk. In this side-path a mitochondrial aminotransferase is functioning; this also contains vitamin  $B_6^*$  as cofactor, but is much less sensitive to a vitamin  $B_6$  deficiency than kynureninase.

1. Through substrate, L-Tryptophan. For a maximum induction 20 g L-tryptophan are required. This induction takes place because the apoenzyme is completely saturated by the iron-porphyrine containing coenzyme.
2. Through hormones, particularly the adrenal cortex-hormones. In man a three to six-fold increase of pyrrolase activity has been noted *in vivo* after injection of hydrocortisone. The induction occurs because more new enzyme is produced. It is also possible that the decomposition of the present enzymes is delayed by the glucocorticosteroids.

### Vitamin $B_6$

A deficiency of this substance may be absolute or relative, with regard to nutrition, such as in an decreased consumption of vitamin  $B_6$ . The kynurinase is more sensitive to a lack of vitamin  $B_6$  than the supernatant

aminotransferase, and much more sensitive than the mitochondrial aminotransferase. (Fig. 1.)

Glucocorticosteroids may promote the production of vitamin B<sub>6</sub> containing enzymes, but not of those from the NiA synthesis.<sup>15</sup> Because of the relative vitamin B<sub>6</sub> shortage the XA production will also increase via the mechanism with increasing glucocorticosteroid plasma levels. Although the XA excretion after L-tryptophan challenging was originally developed as a test for a vitamin B<sub>6</sub> deficiency,<sup>32,34</sup> it appears from the biochemical mechanisms a and b that the factor of strain is an important physiologic correlate of an elevated XA excretion. This relation is the subject of this chapter.

## THE SIGNIFICANCE OF CEREBRAL SEROTONIN IN ADAPTION PROCESSES

L-tryptophan is the starting material of NiA, but also of the neurotransmitter serotonin (Fig. 4-2). A cerebral serotonin deficiency is pathogenetically associated with the occurrence of certain depressions.<sup>1,30</sup> This allows classification in a biochemical subgroup whereas the real clinical significance of this shortage remains obscure. In man experimental administration of parachlorophenylalanine, an inhibitor of serotonin production, yields anxiety, irritability, and lethargy, but no depression.<sup>22</sup> In experimental animals too, an elevated irritability, i.e., for social stimuli, is observed after administration of parachorophenylalanine.<sup>33</sup> Cerebral serotonin also plays an important role in the control of numerous

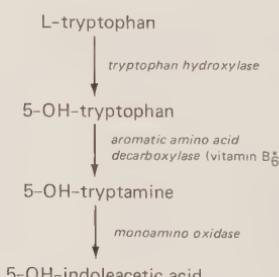


Figure 4-2. The serotonin synthesis from L-tryptophan. The aromatic amino acid decarboxylase contains vitamin B<sub>6</sub><sup>\*</sup> as cofactor; this enzyme also functions in the catecholamine synthesis in the conversion of dopa into dopamine. However, upon a vitamin B<sub>6</sub> deficiency, serotonin decreases first.

homeostatic functions such as sleeping,<sup>18</sup> body temperature,<sup>23</sup> respiration,<sup>15</sup> and the secretion of hypothalamic releasing factors; in particular it inhibits ACTH release, and serotonin as such is a link in the negative feedback of the glucocorticosteroids to ACTH secretion.<sup>19,31</sup> Hence it may be concluded that serotonin plays a clear physiologic part in adaptation processes. Decrease of the cerebral serotonergic activity therefore results in anxiety, the psychopathologic correlate of stress,<sup>28</sup> or being in strain.

### THE RELATION BETWEEN THE SYNTHESIS OF NiA AND SEROTONIN

In numerous reports (survey<sup>4,14</sup>) it has been stated that an increased pyrrolase activity would mean an increased consumption of L-tryptophan in the NiA synthesis. This has been confirmed by animal experiments.<sup>4</sup> Due to the fact that under physiologic conditions about 750 mg of a daily intake of approximately 1 g of L-tryptophan is used in the NiA synthesis, an induction of the pyrrolase would mean a decrease in the plasma levels of L-tryptophan. Because the cerebral serotonin synthesis is linearly dependent on the (free) plasma level of the (nonbound) L-tryptophan, a decrease of L-tryptophan plasma levels may reduce the cerebral serotonin synthesis immediately.<sup>8</sup> On the other hand, animal studies have shown that a blockade of pyrrolase has an increasing effect on the cerebral levels of L-tryptophan and metabolites.<sup>3</sup> Each measurable modification in the NiA synthesis may signify a changed serotonin synthesis by a change in the substrate supply. Because a disturbance in the NiA synthesis may also be based on a decreased supply of vitamin B<sub>6</sub>, and because the aromatic amino acid decarboxylase in the serotonin synthesis is very sensitive to a vitamin B<sub>6</sub> deficiency, a disturbed NiA synthesis may also indicate, via a shortage of vitamin B<sub>6</sub>, a decreased cerebral serotonin production.

### THE THEORETIC IMPORTANCE OF THE MEASUREMENT OF THE XA EXCRETION

An elevated XA excretion may be ascribed to (a) induction of the pyrrolase, and (b) vitamin B<sub>6</sub> shortage. Those disturbances may both be caused by elevated plasma levels of adrenal cortex hormones.

Mechanism (a) signifies a decreased supply of substrate, L-trypto-

phan to the cerebrum; mechanism (b) indicates a vitamin B<sub>6</sub> shortage in the cerebrum, too. Both factors may reduce the cerebral serotonin synthesis dramatically. This disturbs the negative feedback of the glucocorticosteroids to the ACTH secretion and may result in a permanent increase of the glucocorticosteroid levels. These will render disturbance mechanisms (a) and (b) permanent and thus the patient may decompensate. Measurement of the XA excretion therefore provides direct information on the condition of the mechanisms involved in the control of the adaptation processes.<sup>14</sup>

### THE CHALLENGE TEST

The procedure of the L-tryptophan challenge test is subject to extensive standardization tests.<sup>16</sup>

At 10 P.M. the patient urinates and then takes 5 g (14.500 pmol) L-tryptophan. During the following 24 hours he/she collects all urine in an opaque container. At 10 P.M. of the next evening he/she collects the last urine for the test. The XA concentration in the combined urine is determined by a colorimetric method, modified according to the original design by Wachstein and Gudaitis<sup>32</sup> and Weller and Fichtenbaum,<sup>34</sup> and expressed as  $\mu\text{mol}/24\text{ h}$ .<sup>16</sup> The variance of the measurement is lower when the test is started in the evening than when it is started in the morning. The urine should be collected over a period of 24 hours; after 12 hours half of the total excretion has been collected, whereas there is no more detectable excretion of the challenging dose after 24 hours.<sup>36</sup>

The challenge test with L-tryptophan should be performed as in the following study done at the Bethesda Hospital in Tiel.

The data have not been tested parametrically, because the distribution of the values is not normal and because the variances show great differences between the groups.<sup>29</sup> Unless otherwise mentioned, the Mann-Whitney-U-test has been used.

The reference XA excretion without L-tryptophan challenge of healthy volunteers as controls ( $48.9 \pm 19.1 \mu\text{mol}/24\text{ h}$ ; N = 17) differs significantly ( $p = 0.00029$ ) from the values measured in the same persons after L-tryptophan challenge ( $68.8 \pm 19.9 \mu\text{mol}/24\text{ h}$ ; N = 20). In depressive patients (N = 13), diagnosed as primary depression according to the Feighner criteria<sup>7</sup> reference values were determined

immediately after admission followed by a determination after L-tryptophan challenge.

In these patients, too, the reference XA excretion ( $30.5 \pm 19.2 \mu\text{mol}/24 \text{ h}$ ) differed significantly ( $p = 0.00046$ ) from the values obtained after L-tryptophan challenge ( $113.8 \pm 126.3 \mu\text{mol}/24 \text{ h}$ ). A clear correlation was found between values with and without challenge ( $p = 0.62$ ;  $p < 0.05$  Spearman-rank correlatin).

In 10 recovered depressive patients the reference XA excretion was determined after a few weeks and it appeared to be almost identical with the values determined upon admission ( $31.5 \pm 17.1 \mu\text{mol}/24 \text{ h}$ ). Upon two-tailed testing the reference XA excretion of the controls differed significantly ( $p = 0.018$ ) from that of the depressive patients ( $30.5 \pm 19.2 \mu\text{mol}/24 \text{ h}$ ).

However, the absolute values are low. Between the values determined after L-tryptophan challenge of the controls ( $68.8 \pm 19.0 \mu\text{mol}/24 \text{ h}$ ) and those of the depressive patients ( $113.8 + 126.3 \mu\text{mol}/24 \text{ h}$ ) no significant difference is found because of the high S.D. The variance of both values however differs very significantly ( $F\text{-ratio} = 44.19$ ;  $P \ll 0.001$ ). Upon L-tryptophan challenge qualitatively clear differences hence become apparent in the XA excretion of control persons and depressive patients.

In the literature<sup>36</sup> it had been reported that a dose of 2 g L-tryptophan does not overburden the capacity of the NiA synthesis. A dose of 5 g L-tryptophan, however, ensures that the capacity of the NiA synthesis is overburdened. In that way a maximum occupation of enzymes by substrate is ensured. Hence the XA excretion represents the enzyme activity more than the variations in substrate supply. And the induction of the pyrrolase as well as the inhibition of the vitamin B<sub>6</sub> containing enzymes concern enyzme activities. Determined in this way, the reference values are  $68.8 \pm 19.0 \mu\text{mol}/24 \text{ h}$ .

## **XA EXCRETION AND PSYCHOPATHOLOGY: INDICATION FOR XA DETERMINATION**

The predictability of a disordered XA excretion has been studied.<sup>13</sup> The XA excretion after challenge test in patients (classified according to DSM III) with a depressive disorder, adjustment disorder, depressive mood, adjustment disorder anxious mood, or alcoholism has been com-

pared with that of a heterogeneous group of psychiatric patients (18 diagnoses in 26 persons). Table 4-1 shows that the excretion of the group of patients with anxiety or alcoholism differs significantly ( $p < 0.05$ ) from that of both groups with depression and the control group. The latter three do not differ significantly from each other (one-way analysis of variance). According to the t-test the XA excretion of healthy controls ( $68.8 \pm 19.0 \mu\text{mol}/24 \text{ h}$ ) differs significantly from that of the patients with depressive disorder ( $p = 0.04$ ), adjustment disorder depressive mood ( $p = 0.05$ ), adjustment disorder anxious mood ( $p = 0.01$ ), and that of the group of psychiatric control patients ( $p = 0.02$ ). The difference between the XA excretion of healthy persons and that of alcoholics is not significant because the S.D. of the group of alcoholics is so large; the variations of these 2 groups, however, differ very significantly ( $p < 0.001$ ). In the patients with alcoholism an existing anxiety as well as a pure deficiency of vitamin B<sub>6</sub>—due to inadequate nutrition—may have contributed to the large deviation. In any way, this study shows that anxiety must be considered the psychopathologic

Table 4-1.

DSM-III	XANTHURENIC ACID ( $\mu\text{mol}/24 \text{ hrs}$ ) $m \pm S.D.$
Depressive disorder (296.23; 296.33)	126.1 151.8 (32)
Adjustment disorder depressive mood (300.40)	148.3 188.2 (24)
Adjustment disorder anxious mood (309.28)	309.0 554.0 (39)
Alcoholism (303.10)	488.9 923.4 (18)
Psychiatric controls	101.5 65.1 (26)
Reference Values	68.8 19.0

Table 4-1: Xanthurenic acid excretion and psychopathology. The xanthurenic acid excretion of patients with primary depression, secondary depression, anxiety, alcoholism, and a control group composed of patients with 18 different (other) psychiatric diagnoses is represented in this table. The numbers in the first column refer to the diagnosis numbers of DSM III (*Diagnostic and Statistical Manual* of the American Psychiatric Association, 3rd edition). The numbers between brackets in the second column represent the numbers of patients per group. The XA excretion of all groups differs from the reference values.<sup>13</sup>

correlate of an elevated XA excretion. On the other hand anxiety may also be considered the psychopathologic correlate of being in strain.<sup>28</sup> Other investigations<sup>5</sup> demonstrate that the L-tryptophan plasma levels after being under the influence of a stressor are reduced in patients showing agitation, irrespective of their primary psychiatric diagnosis. The agitation and the decreased plasma levels are in negative correlation with each other. Since it is assumed that an induction of the pyrrolase decreases the L-tryptophan plasma levels, and since this induction of the pyrrolase is caused by glucocorticosteroids, we may conclude from these data that agitation must also be considered a clinical correlate of a disturbed XA excretion. Therefore we may also conclude that determination of the XA excretion is indicated in patients exhibiting anxiety and/or agitation.

### TREATMENT OF A DISORDERED XA EXCRETION

A disturbed XA excretion indicates two major deviations:

1. A decreased serotonin synthesis, jeopardizing the control of the adjustment processes.
2. A decreased nicotinamide production; this substance has physiologically and pharmacologically anxiolytic properties;<sup>24</sup> a NiA deficiency always leads to a subclinical<sup>9</sup> and then to a clinical pellagra.<sup>2</sup> Because of this and because of the pathogenetic induction of the pyrrolase due to glucocorticosteroids and to a vitamin B<sub>6</sub> deficiency, a substitution therapy with pyridoxine is the most logical choice.
  - a. Animal studies have demonstrated that pyridoxine counteracts effects of stress (via glucocorticosteroids) in the organism<sup>20</sup>
  - b. Pyridoxine restores a possible disturbance of the serotonin synthesis if this is due to a vitamin B<sub>6</sub> shortage.<sup>6</sup>
  - c. Pyridoxine counteracts the effect of a vitamin B<sub>6</sub> shortage on the L-tryptophan-NiA metabolism<sup>2</sup>

Three different therapies with pyridoxine have been given to patients for a period of four weeks and the effects on the XA excretion have been compared. (Table 4-2).

Table 4-2.

XANTHURENIC ACID ( $\mu\text{mol}/24 \text{ hrs}$ )	VITAL DEPRESSIVE PATIENTS					
	PYRIDOXINE $m \pm S.D.$		PYR. + L-TRY $m \pm S.D.$		PYR. + ZNSULF $m \pm S.D.$	
I	446.3	519.3	200.4	249.4	1328.5	1020.5
II	77.1	30.4	66.0	30.1	68.9	30.7
N =	10		12		5	
Reference Values	68.8	19.0	68.8	19.0	68.8	19.0

Table 4-2: Xanthurenic acid excretion and treatment. There is no difference between the results of three orthomolecular therapies, pyridoxine 125 mg t.i.d., whether or not in combination with 2 g L-tryptophan at 10 P.M. or 50 mg zinc sulphate in capsules t.i.d. Note that the XA excretion approaches the reference values and not 0.<sup>12</sup>

1. The first therapy was vitamin B<sub>6</sub> 125 mg t.i.d. (Pyridoxine<sup>R</sup> 125 mg tab.) This loading dose is chosen because the physiologic dose of 2 mg has no effect on a disordered XA excretion; at least 50 mg a day is required for this.<sup>35</sup> Certain metabolites of pyridoxine still show increased levels 24 hours after oral intake of 10 mg by healthy volunteers<sup>37</sup> but kinetic studies demonstrate that after intake of a megadose (750 mg) there is a measurable increase of the plasma levels of pyridoxine itself for 24 hours.<sup>25</sup>
2. The second therapy was vitamin B<sub>6</sub>, 125 mg t.i.d. + 2 g L-tryptophan at 10 P.M. It was expected that the supplementary L-tryptophan would contribute to the restoration of the possibly disordered L-tryptophan metabolism. This dose may be considered a substitution therapy since the daily intake of L-tryptophan is about 1 g.<sup>2</sup>
3. The third therapy was pyridoxine 125 mg t.i.d. + zinc sulphate 50 mg in capsules t.i.d. In this dosage zinc sulphate has stress-controlling properties in psychiatric patients.<sup>26</sup>

The measurement of the XA excretion after four weeks of therapy did not differ significantly in the 3 groups.<sup>12</sup> Pyridoxine alone may have been sufficient. However after pyridoxine + L-tryptophan the excretion of the decomposition products of catecholamines showed the greatest improvement. This may be considered an improvement of adaptation parameters.<sup>12</sup> Since the patients recovered well from their depression within four weeks, their clinical condition no longer was a disturbing strain factor.

In another study the XA excretion was compared in depressive

patients who had been treated either with pyridoxine 125 mg t.i.d. + 3 g L-tryptophan at 10 P.M. or with 100 mg maprotiline at 10 P.M.<sup>17</sup> Maprotiline is a pure noradrenergic agonist<sup>21</sup> and does not interfere with the metabolism of L-tryptophan.<sup>10</sup> The XA excretion was in both groups significantly ( $p < 0.001$ ) higher than the reference values (F-ratio, 216.97 resp. 23.10).

There is no significant difference between the two therapies after two or four weeks, in the XA excretion or between the results after two weeks and the reference values. Unfortunately, no correlation between anxiety, excretion of 17-hydroxy-steroids and XA excretion was noted in this study.<sup>17</sup> Up to now it may be concluded that two weeks of therapy with pyridoxine alone are sufficient to restore a disordered XA excretion.

Since in the maprotiline group a not so favorable but still marked improvement of the XA excretion was observed, the question remains whether the improvement must be specifically ascribed to pyridoxine. This question may be answered on the basis of an investigation into the therapeutic effect of pyridoxine 125 mg t.i.d. + 2 g L-tryptophan at 10 P.M. in 13 patients with the strain disorder hyperventilation syndrome.<sup>15</sup> Eight of the 9 patients who responded favorably to the therapy, previously had a disturbed XA excretion. (Table 4-3) The XA excretion of the 4 patients who did not respond to a four-weeks therapy did not differ significantly ( $83.8 \pm 25.6 \mu\text{mol}/24 \text{ h}$ ) from that of the normal controls

**Table 4-3.**

XANTHURENIC ACID ( $\mu\text{mol}/24 \text{ hrs}$ )	HYPERVENTILATION SYNDROME PYR. + L-TRY $m \pm S.D.$	
I (N = 13)	189.2	209.2
II (N = 9)	98.4	48.2
Reference Values	68.8	19.0

Table 4-3: XA excretion and prediction of therapy. The total group of patients (n = 13) composed of well responsive and nonresponsive patients to the 125 mg pyridoxine t.i.d. + 2 g L-tryptophan at 10 P.M.

The determination of the XA excretion was only repeated in the patients who responded well. After four weeks therapy the excretion had normalized. Eight of the nine who responded, previously had disordered XA excretion. The XA excretion of the four patients who did not respond was normal before therapy.<sup>15</sup>

(t-test). Therefore it may be concluded that a treatment with pyridoxine ( $\pm$  L-tryptophan) has a specific therapeutic effect on disorders due to strain. This effect may be predicted by a disordered XA excretion.

## CONCLUSIONS

1. A disordered excretion of xanthurenic acid after an oral challenge with 5 g L-tryptophan is an adequate measure for the disturbance of the L-tryptophan metabolism.
2. On theoretical grounds the L-tryptophan metabolism must be considered important in the control of adaptation processes.
3. XA excretion measurement are indicated in anxious and/or agitated patients, i.e. when severe strain is in evidence.
4. A disturbed XA excretion may be treated favorably with pyridoxine ( $\pm$  L-tryptophan), on clinical and on biochemical parameters.
5. A two weeks' therapy with 125 mg pyridoxine t.i.d. is sufficient to correct the deviations.

## ACKNOWLEDGEMENT

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## NOTE

The procedure of the challenge test and the chemical assay for xanthurenic acid determination are described precisely in reference 16. The challenge test is not cumbersome to the patient. In a few thousand tests, occasionally a transient nausea or sleepiness, but never any serious side effect, were reported. One laboratory technician can determine the xanthurenic acid concentration in 10 urine samples during half a day. The costs for the necessary chemicals are about one dollar.

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# 5

## Occupational Stress—Implications for Hospitals

**Gary L. Calhoun**

*Assistant Hospital Director for Ancillary Services at University of Michigan Hospitals, Ann Arbor, Michigan. Consultant to the Veterans' Administration Medical Center in Ann Arbor. Developer and Facilitator for Human Resources Development programs at the University of Michigan.*

**Judith G. Calhoun, Ph.D.**

*Instructor and Director of the learning Resource Center in the Office of Educational Resources and Research, Department of Postgraduate Medicine and Health Professions Education in the Medical School at the University of Michigan. Consultant to the Veterans' Administration Medical Center in Ann Arbor and Henry Ford Hospital in Detroit.*

The effect of occupational stress in the development of physical and mental illness is well established. Investigations reveal that workers who report higher levels of perceived stress due to job dissatisfaction and personal conflict are more likely to experience somatic symptoms, are more accident-prone, and less productive.<sup>1-5</sup> What is even more significant is that studies reveal that some of the most stressful occupations are in the health care system and that the problems associated with this stress may not be dealt with appropriately for those closest to professional help.

The National Institute for Occupational Safety and Health (NIOSH) has studied the relative incidence of mental health disorders in 130 major occupational categories.<sup>6</sup> When the major occupations were rank-ordered in terms of the relative incidence of mental disorders, 7 of the top 27 occupations related to hospital/health care operations. The seven

were: health technologists, licensed practical nurses, clinical laboratory technicians, nurses aides, health aides, registered nurses, and dental assistants. If the list of hospital/health care occupations were expanded to include those not involved exclusively in hospital/health care work, but who do work in hospitals (dishwashers, warehousemen, laborers, research workers, telephone operators, chemists, social workers, and secretaries), it includes 15 of the top 27 occupations with the highest incidence of mental health disorders.

A California study found that health care workers as a group have twice the suicide rate of the general population (annual rate of 77 per 100,000 population, compared to 38 per 100,000 general population).<sup>7</sup> Suicide can be considered the ultimate act indicating failure to cope with stress or mental health problems, and this research suggests that those closest to professional help (those who are working in health care delivery) may not be finding it.

It is not surprising that occupational stress is high in hospitals as there are specific characteristics inherent in their organization which foster conflict. Among these characteristics are multiple levels of authority, heterogeneity of personnel, work interdependence, and specialization. All of these are factors that organizational studies have found to be positively related to conflict.<sup>1</sup> Hospitals are relatively large, complex organizations, and investigations reveal a direct relationship between the size of an organization and the level of role conflict and tension in the organization.<sup>2</sup>

Another factor recently documented is that responsibility for people causes more stress than responsibility for things.<sup>3</sup> Hospital employees are responsible not only to the anxious or fearful patients they serve, but must also ensure the satisfaction of a significant number of others. Stress for employees can be generated by concerned family members and friends of patients, third-party payers, accrediting bodies, and licensing authorities, all of whom have an interest in the quality, quantity, and efficiency of the provision of patient services. The health care team is also influenced by a great number and diversity of professional societies and associations which sometimes have inherent conflicts in goal orientation and purpose which can foster professional-institutional goal conflict.<sup>1</sup>

The implications for the hospital and health care industry are clear when one looks at the costs associated with failure to reduce the impact of stress on the job or due to the job. Studies indicate a higher on- and

off-the-job accident rate for those in high-stress jobs. The U.S. Department of Labor reports that the incidence of occupational injury and illness per 100 full-time employees is 58% higher among hospital employees than those employed in other service industries.<sup>8</sup> In a recent NIOSH study, only 4.8% of those in low-stress jobs reported a work injury within the past year; but twice as many (9.7%) high-stress workers reported an injury. Off-the-job figures were similar: 13.7% in the low stress group and 22.4% in the high-stress group reported injuries.<sup>9</sup> Accidents on the job or at home represent significant costs to the hospital either directly or indirectly.

In England, the National Association for Mental Health reports that working days lost through psychoneurosis increased in the health care field by 152% for men and 302% for women between 1955 and 1968.<sup>10</sup> Days lost to nervousness, debility, and headaches increased by 189% for men, 122% for women. The Association claims that mental ill-health results in more working days lost than flu and common colds combined; more than all accident losses; and 3½ times more than the loss due to strikes.

There are also losses related to the quality of patient care, as that outcome is (in part) a function of the psychological state of the employee and perhaps is as important as technical expertise. In a 1962 study of the community hospital, Georgopoulos and Mann found that quality of patient care was adversely affected by conflict.<sup>11</sup> Studies in psychiatric hospitals have also indicated that patients are adversely affected by staff conflict.<sup>12,13</sup>

Increasingly, judicial decisions have favored plaintiffs seeking compensation for heart attacks allegedly caused by stress on the job. A landmark case in 1975 involved a secretary who required psychiatric care following the discovery of her boss's body after he shot himself. The court ruled she had become ill because of her work and awarded her the equivalent of industrial injuries benefits.<sup>14</sup> Decisions such as these will increase hospital workmen's compensation costs.

In summary, current studies support the fact that the impact of dysfunctional stress is manifested as lower productivity, high absenteeism, loss of work time from disease, premature death, increased accident rates, high job turnover, increased work errors, narrowing of attention resulting in poor judgment, and problems that spill over into the home life which create a vicious circle. The problems associated with occupational stress are growing and are costly. It is incumbent upon hospital

and health care managers to be cognizant of the environment in which they and their employees work, and strive to mitigate those factors that lead to adverse effects of occupational stress.

Sometimes referred to as the by-product of the industrial age, job stress is a common malady in modern society. It is perceptual in nature and can be functional or dysfunctional depending on its magnitude, the context in which it is experienced, and the vulnerability of the individual experiencing it. As Weiman<sup>14</sup> has defined it, job stress is "the sum total of factors experienced in relation to work which affect the psychosocial and physiological homeostasis of the worker." Potential problems arise when there is a departure from optimum conditions which the worker cannot easily and quickly correct.

Certain diseases of adaptation to stress have been clearly defined.<sup>4,15-17</sup> In some cases, the relationship is scientifically proven and, in others, it is suggested and is the subject of further research. Some of the so-called "diseases of adaptation" where research has demonstrated an important relationship are:

Cardiovascular disease	Herpes Simplex
Kidney ailments	Diabetes mellitus
Pheumatism	Acute dermatitis
Arthritis	Colitis (ulcerative, mucous, spastic)
Ulcers (gastric and duodenal)	Lipid abnormalities
Allergic diseases	General anxiety
Migraine and tension headaches	Alcoholism
Asthma	Tuberculosis
Drug addiction	

Oftentimes, specific physical, behavioral or emotional, and intellectual manifestations will indicate that stress is not being coped with<sup>B20</sup> Examples of these manifestations include the following:

Physical	
Stooped posture	Trembling, tics, or twitches
Constipation	Sneezing
Diarrhea	Impaired sexual function
Dry mouth	Loss of appetite
Cool, clammy skin	Dilated pupils
Sweaty palms	Indigestion

Hyperactivity	Nausea and/or vomiting
Hyperventilation	Anorexia
Insomnia	Carpal-Pedal spasm
Itchy scalp	Disturbed motor skills
Frequent urination	Chronic fatigue

#### Behavioral/Emotional

Restlessness	Denial
Withdrawal	Irritability
Sullenness	Panic
Defensive behavior	Quarreling
Anger	Daydreaming
Complaining	Apprehension
Crying	Mood swings
Excessive drinking (alcohol)	Indecisiveness
Excessive smoking	Mistrust
Hostility	Disturbed affect
Habitual teeth gritting	Gulping meals
Nail biting	Reduced personal involvement
Lack of satisfaction from pleasant experiences	Blaming others
Critical of self to others	Diminished initiative

#### Intellectual

Diminished fantasy life	Reduced creativity
Lack of concentration	Lack of awareness to external stimuli
Lack of attention to details	Forgetfullness
Past oriented rather than future oriented	Preoccupation

Researchers have identified specific job related stressors that can result in the manifestation previously outlined.<sup>2,9,21-23</sup> Examples are:

- Work overload (physical and mental)
- Job insecurity
- Poor match between job and worker's abilities
- Role ambiguity (what is expected and by whom)
- Working in unfamiliar areas
- Too great an emphasis on perfection
- Serving a population which has anxiety or fear

Nonparticipation in planning or decision making  
Responsibility for other people  
Underutilization  
Resource inadequacy  
Unfulfilled ambitions  
Interpersonal conflict  
Rapid technological changes  
Feeling of immortality (constant exposure to death)

To avoid those costs associated with adverse stress, various coping methods are suggested. These range from the implementation and practice of rational management techniques to the use of sophisticated scientific apparatus, drugs, and psychotherapy. The effective coping techniques suggested in the literature include:

#### Management Practices<sup>24-27</sup>

- Establish hiring practices which match people with the job (ergonomics)
- Screen for psychological aptitude
- Provide proper training
- Provide clear job description and performance standards
- Use of flex-time and/or shorter work weeks
- Ensure proper resources (time, information, staff, money, education, etc.)
- Job enrichment
- Rotate employees out of high-stress areas (within and outside hospital)
- Reduce overload by redistribution and delegation
- Reduce levels of hierarchy
- Untangle lines of communication
- Give employees voice in planning and decision making (participative management)
- Provide education programs in early recognition of stress and coping techniques
- Provide structured interaction with peers who have been through similar turmoil
- Provide proper working environment (temperature, ventilation, noise, etc.)
- Hire a behavioral scientist as a member of the management team

Eliminate unnecessary interruptions

Utilize an integrated team approach for training and sharing responsibility

**Self-Renewal Activities<sup>28-30</sup>**

Get away to a private, quiet area periodically

Take periodic extended vacations

Change to nonwork or play activity during work day

Compartmentalize work from nonwork life

**General Health Practices<sup>30</sup>**

Regular physical exercise

Proper sleep and rest

Proper diet (psychodietetics)

**Body Metabolism Reduction<sup>3,31,32</sup>**

Relaxation response

Sentient Cycles (self-induced emotional states)

Progressive relaxation

Transcendental Meditation

Hypnosis

Deep muscle relaxation

Zen and yoga

Cotention (concentration or focus on a simple object of the environment)

Dhikr (exclude distraction and induce states of ecstasy)

Autogenic training

(psychophysiologic exercises to shift to a wakeful low arousal state)

**Psychological Therapy<sup>32,33</sup>**

Rational emotive therapy

Peer group meetings/discussions

Biofeedback

Sensitivity training

Availability of family counseling from staff psychiatrist, psychologist, social worker, chaplain

Drug Therapy  
Muscle relaxants  
Anxiety reducers  
Vitamins

Research has shown each of the above coping techniques to be effective in mitigating stress. Health care administrators need to utilize the expertise they have on their staff to reach their desired outcome, which is to reduce the costs of dysfunctional stress.

The industrial sector seems to have taken more of a leadership role in establishing programs in stress management than the health care sector. This may have occurred because of earlier recognition that we are in an era of corporate social responsibility and accountability to employees through union influence. Critics may picture this as just a new kind of paternalism while others agree that it is a dollars and cents realization that reducing stress lowers operating costs.

Examples of industry's leadership role are plentiful. One hundred twenty companies participate in the International Meditation Society's programs for business. Mobil, Exxon, Chase Manhatten and Time, Inc., have their own cardiovascular fitness exercise programs for employees. Equitable Life Assurance has its own biofeedback laboratory. At Bonne Bell cosmetics company, some 200 employees participate in the company-sponsored physical fitness program. Life Extension Institute, which conducts industrial health clinics, reports that of their contracts with 1600 companies, their "troubled employee programs" for singling out stress-prone executives are among their most popular.<sup>34</sup>

With few exceptions like Kahn<sup>2</sup> and Bates,<sup>24</sup> whose research on the effects of stress considered hospital personnel more generally, most stress research in the health care field has focused on nursing personnel. While there are a few studies that look at the staff nurse position,<sup>18,35-37</sup> most deal with specialty areas such as oncology,<sup>25</sup> intensive care,<sup>19,26,27,38-41</sup> and coronary care.<sup>19,42</sup>

The ICU/CCU hospital studies have identified specific stress reducing techniques that should be employed. These techniques include:

1. Utilizing an integrated team approach to share responsibility;
2. Having regular group meetings on mortality and morbidity instilling feeling of team spirit and pride;
3. Ensuring immediate physician availability;
4. Working staff not more than eight hours per shift;
5. Providing periodic rest and relaxation on other units;
6. Providing an area for staff privacy;
7. Ensuring that proper instruction has been given on electronic

**Table 5-1**

SITUATION	COPING ACTIONS
An E.R. staff nurse is confronted with multiple life or death triage decisions	A. Periodic rotation out of the department. B. Provision of E.R. staff group therapy sessions directed by staff psychiatrist or psychologist and/or minister.
A ward nurse takes the brunt of emotional outbursts from family members of a patient who has expired.	A. Formalized group support meetings. B. Provision of pastoral care support.
Installation of new Automatic Data Processing equipment is causing an employee to unnecessarily fear for his/her job.	A. Provision of instruction to the employee on what the equipment is intended to do. B. Review with the employee how the equipment will "complement" the staff.
Staff in a department undergoing reorganization are apprehensive about their future.	A. Involve the staff directly in the planning for the reorganization. B. Ensure that the staff is aware of the reasons for the reorganization.
Employees are aware of a fellow employee's incompetency and possible life threatening consequences.	A. Develop a system to ensure there is a simple course of action that any employee can initiate to make management aware of such situations. B. Early action on the part of supervisors when addressing these problems.
Intimidating of staff by a large, loud, or threatening patient.	A. Training of staff in handling the violent or assaultive patient. B. Provision of backup support by professionals (guards) to assist in controlling the potentially dangerous patient.
Promotion passover.	A. Ensure proper notification of opening is made. B. Specify criteria for selection. C. Inform those eligible of reasons for nonselection.
Home life problem unrelated to employment.	A. Availability of a quiet room. B. Counseling by professional staff psychiatrist, psychologist, social worker, or minister.
Conflicting physician orders given by attending physician and specialists.	A. Team approach to treatment plans. B. Availability of senior staff to resolve conflict.

In all of the above situations, educational programs on early recognition of stress and the use of immediate coping techniques such as relaxation response and other self-renewal activities can help mitigate the immediate dysfunctional effects of stress.

- equipment relating to the physiology and pathology it is modifying or monitoring;
8. Providing a liaison psychiatrist for staff support;
  9. Screening employees for psychological aptitude.

Table 5-1 presents some typical situations that might occur in other departments and some possible coping measures.

Stress is a part of life and clearly a highly personal phenomenon. Some studies indicate that under mild stress many individuals actually increase their performance.<sup>4,29,30</sup> Health care managers must be knowledgeable enough about its effects to use it to their advantage when they can, yet mitigate its dysfunctional manifestations. Health managers must encourage expanded research efforts to include all stressful jobs under their supervision and commit themselves to aggressive, preventive, and/or corrective action.

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# 6

## The Medial Basal Hypothalamus and Luteinizing Hormone Release

Alberto J. Carrillo

*Department of Anatomy, The University of Texas Health Science Center at  
San Antonio, San Antonio, Texas*

### INTRODUCTION

Since it was reported by Selye in 1936 that various types of stressors dramatically influence the function of the pituitary-adrenal axis there has been an extensive amount of work carried out on stress and the adrenocortical hormone secretions.<sup>30,57</sup> However, the other anterior pituitary hormones are also affected by various stress conditions,<sup>9,19,55,57,89</sup> and there is now considerable evidence that stress can result in the alteration of LH and FSH secretion in both laboratory animals and humans.<sup>4,9,55,63,67,89</sup> Very little is known concerning the site or pathways involved in the stress-mediated increase in gonadotropin secretion, although there have been great advances made in localizing the LH-RH neurons and their projections in the mammalian brain.<sup>11</sup>

### THE HYPOTHALAMUS AND LH RELEASE

The medial basal hypothalamic-medial preoptic area (MBH-MPOA) has been regarded by neuroendocrinologists as the brain region directly responsible for the regulation of luteinizing hormone (LH) secretion from the pituitary gland. The MBH has been considered the final common pathway through which the brain can influence pituitary-gonadal function. The connections with the MPOA on the other hand are nec-

essary for the maintenance of the cyclic preovulatory LH surge, which in the rat occurs every four or five days.<sup>10</sup>

Some of the first evidence that the MBH was involved with the control of gonadotropin secretion was produced by Harris<sup>42</sup> who reported that electrical stimulation of this region in rabbits resulted in ovulation. In 1958 Critchlow<sup>26</sup> repeated these studies in the rat with the same results and so have many others.<sup>31,86</sup> In agreement with the stimulation studies, destruction of the MBH was reported by many to markedly decrease gonadotropin secretion.<sup>28,29,70</sup> However, while these studies showed that the MBH played a key role in the control of gonadotropin secretion, they did not establish whether this part of the brain alone was capable of controlling pituitary function or whether it merely relayed information from other parts of the brain. In an attempt to solve this, a group of Hungarians<sup>41</sup> came up with a novel experiment in which they implanted pieces of anterior pituitary tissue throughout the basal forebrain in rats. The results showed that the MBH and no other region was capable of maintaining the normal structure and function of anterior pituitary tissue, including the gonadotropic producing cells. These findings demonstrated that the gonadotropin releasing factors, as well as other pituitary hormone releasing factors, were stored and probably produced by the MBH. As a result of these findings, the MBH was given the name of the hypophysiotropic area.<sup>41</sup>

As a follow-up to the pituitary implantation study, these investigators devised a knife that cut all the neural connections between the MBH and the rest of the forebrain (complete hypothalamic deafferentation; CHD), yet left it in continuity with the pituitary gland.<sup>40</sup> With this preparation it was therefore possible to study the role played by the MBH alone on the control of pituitary secretion. Following CHD, it was found that testicular weight and structure remained normal, but in the female rat ovulation did not occur, ovarian weight decreased, and the vaginal smears developed a pattern either of persistent diestrus or estrus.<sup>40</sup> Since the histological structure of the pituitary was normal and the target organs were not atropic, these investigators concluded that the MBH was secreting enough hormones to maintain a certain degree of pituitary structure and function.<sup>40,85</sup> In another study it was also shown that the completely deafferented MBH was able to respond to castration by stimulating the pituitary to secrete enough LH to be detected by the ovarian ascorbic acid depletion test, although the LH levels in the spayed-deafferented animals was considerably less than

that of spayed rats.<sup>39</sup> This was supported by the presence of castration cells in the pituitaries of animals bearing complete deafferentation, although, again, the number of castration cells in the deafferented castrated rats was less than that of castrated nondeafferented rats.

Since the advent of the radioimmunoassay, numerous studies have been carried out to measure plasma and pituitary gonadotropin levels following hypothalamic deafferentation in order to determine the ability of the MBH to support pituitary-ovarian function.<sup>14,16,17,18,90</sup> The results that have emerged are not in full agreement with those of Halasz and co-workers.<sup>39,40,85</sup> Thus, as with the earlier studies, testicular weight remained the same and ovarian weight was reduced following CHD, however, plasma and pituitary levels of LH and FSH were markedly reduced.<sup>14,16,17,18,90</sup> Likewise, the secretion of gonadal steroids was drastically diminished, much more so than the organ weight changes would indicate.<sup>17</sup> Four to six weeks after CHD Blake *et al.*<sup>14,18</sup> reported that plasma LH and FSH titers were significantly reduced in female rats when compared to those seen during any day of the estrous cycle. In some instances the levels were not detectable with the radioimmunoassay.<sup>18</sup> Pituitary content of LH was also markedly depressed. Continuous sampling for several hours demonstrated that the LH levels remained low and constant with very little fluctuation.<sup>90</sup> In the male rat, the results were similar. Six weeks after CHD plasma LH, FSH, and testosterone levels were markedly reduced when compared with sham controls<sup>17</sup> even though there was no significant change in testicular weight. As a result of these data, these investigators suggested that the isolated MBH was not capable of maintaining a tonic level of LH secretion from the pituitary gland.<sup>14,16</sup>

In contrast to the results obtained in the cycling rat, Blake and Sawyer<sup>15</sup> have reported that complete deafferentation of the MBH did not interfere with the high rate of LH secretion typical of long-term ovariectomized rats. Following deafferentation, 5 out of 11 of these rats had a vaginal smear pattern of persistent estrus between the time of the deafferentation and the ovariectomy (4–6 weeks). However, 6 out of 11 animals that had a persistent diestrus smear after the deafferentation failed to show the postcastration rise in plasma LH. In these animals the LH levels were lower than those measured during diestrus. Similar findings have recently been reported by Arendash and Gallo.<sup>6</sup> That the complete deafferentation resulted in two different types of vaginal smear patterns is consistent with what Halasz and Pupp<sup>40</sup> observed, but

contrasts with the previous work of Blake *et al.*<sup>18</sup> in which this type of hypothalamic isolation resulted in vaginal smears that were predominantly persistent diestrus. Neither Halasz and Pupp<sup>40</sup> nor Blake *et al.*<sup>16</sup> have been able to explain these differences in the vaginal smears following hypothalamic deafferentation. Recently, Kalra has reported that anterior hypothalamic deafferentation resulted in a partial but significant reduction of the high levels of plasma LH in long-term castrated female<sup>45</sup> and male rats.<sup>47</sup>

In summary, complete isolation of the MBH renders the rat acyclic and anovulatory, therefore, the elements responsible for the preovulatory LH surge must be housed outside the MBH. There is now convincing evidence that they are located in the medial preoptic area.<sup>10</sup> The MBH, however, is capable of some degree of tonic control over the secretion of LH, although there is disagreement in the literature as to how much, if any, control the MBH really has over pituitary-ovarian function. These discrepancies may in part result from the differences in the size of the hypothalamic island.<sup>21</sup> Recently, the concept of the hypophysiotropic area of the hypothalamus as was originally described by Halasz *et al.*<sup>41</sup> has been revised by Ambach *et al.*<sup>2</sup> and Setalo *et al.*<sup>73</sup> Based on a very detailed study of blood supply of the MBH and immunocytochemical studies of pituitary implants into the hypothalamus, these investigators have proposed that the maintenance of function of the pituitary tissue implanted in the MBH is the result of the vascularization by a unique system of capillary loops that originate in the vessels of the median eminence. These capillary loops supply only the region of the arcuate nucleus, retrochiasmatic area and median eminence, and since they originate in the median eminence the concentration of releasing factors in them should be the same as that found in the pituitary portal plexus.<sup>2</sup> This was in part confirmed by immunohistochemical staining of the implanted pituitaries and surrounding MBH for LH-RH, which failed to reveal any LH-RH elements in the vicinity of the pituitary implants.<sup>73</sup> However, while this recent data may alter the concept of the hypophysiotropic area, it does not provide any information about the location of the LH-RH producing cells.

In contrast to the rat, where disconnection of the MBH from the MPOA blocks the preovulatory LH surge, recent studies in the rhesus monkey have demonstrated that the MBH contains the necessary components to produce the preovulatory LH surge as well as maintain the

hypersecretion of LH that follows castration.<sup>33,50,75</sup> These results, however, have not been confirmed by all.<sup>65</sup> There is also recent evidence that the MBH-pituitary complex in the guinea pig is responsible for the tonic and phasic secretion of gonadotropins necessary for the maintenance of estrous cycles and ovulation.<sup>54,87</sup>

### HYPOTHALAMIC LH-RH; IMMUNOHISTOCHEMISTRY

With the elucidation of the chemical structure of the LH-RH molecule<sup>3,58</sup> and the production of antibodies to this molecule<sup>12,49</sup> investigators have set out to localize the LH-RH elements in the basal forebrain of several mammalian species. One of the more popular techniques employed has been that of immunohistochemical staining for LH-RH in brain sections.<sup>82</sup> Unfortunately, however, the results from these studies have not provided a clear picture of the localization of LH-RH in the mammalian brain. First of all, there has been a failure by many investigators to visualize this decapeptide in neuron perikarya,<sup>8,35,37,52,74</sup> and second, there is a lack of agreement by those that do stain LH-RH in cell bodies, regarding their location in the brain.<sup>11,13,61,75,94</sup> One area in which all investigators find LH-RH is in the proximity of the portal vessels in the median eminence of the hypothalamus<sup>8,13,52,69,74,79</sup> which, of course, is in agreement with the concept that the releasing factor producing cells projects to the capillary loops within the median eminence from which the releasing factors are transported to the pituitary gland via the pituitary portal plexus.<sup>43</sup> In addition to the ME, LH-RH is consistently localized in axons and terminals around the organum vasculosum of the lamina terminalis (OVLT).<sup>8,11,38,59,94</sup> The significance of finding this hypothalamic hormone associated with the OVLT has yet to be determined.

As a result of the work of Halasz and co-workers<sup>39,40,41,85</sup> the isolated MBH is considered by many to be capable of maintaining a tonic level of LH secretion;<sup>10</sup> therefore, LH-RH producing cells would be expected to be localized within the MBH and project to the ME. Indeed, some of the immunohistochemical data support this, thus LH-RH immunoreactive perikarya have been localized in the MBH of the mouse,<sup>88,94</sup> rat,<sup>27,32,48</sup> guinea pig,<sup>77</sup> and rhesus monkey.<sup>78,93</sup> Along with the MBH, LH-RH cell bodies have also been found in the preoptic, septal, and suprachiasmatic regions. These neurons not only give rise to the fibers

in the ME, but also to the fibers in such areas as the OVLT, MPOA, and thalamus. In contrast to these, there are several studies that have failed to localize LH-RH perikarya in the MBH, although have found them in preoptic-septal region, diagonal band of Broca, paraolfactory region and the region anterior to the anterior commissure.<sup>11,12,13,75</sup> As with those localized in the MBH, these neurons project to the ME, OVLT, paraolfactory region, amygdala, and thalamus. In the rat, a species where many of the hypothalamic deafferentation studies have been carried out, Setalo *et al.*<sup>75</sup> observed that two weeks after CHD the MBH was completely devoid of immunoreactive LH-RH. This was not the case following anterior hypothalamic deafferentation. This suggested that the LH-RH producing cells were located outside the MBH and the only way to eliminate their projections to the ARC-ME was by a complete, not anterior, deafferentation. In the guinea pig, however, Silverman<sup>79</sup> reported that the content of immunoreactive LH-RH was not altered after complete hypothalamic deafferentation. Furthermore, only lesions in the arcuate nucleus resulted in the complete absence of immunoreactive LH-RH terminals in the median eminence as well as in the reduction of plasma LH levels in castrated male guinea pigs.<sup>54</sup>

In reviewing the literature it becomes obvious that a considerable controversy has developed concerning the localization of LH-RH producing neurons and their projections. These differences could in part be the result of several variables including experimental protocol, fixation and treatment of the tissue, the specificity of the antibody and species differences.<sup>23,83</sup> Since LH-RH is such a small molecule, developing an antibody requires conjugation of this molecule to a large protein, such as bovine serum albumin. This can result in the masking of one or more amino acids of the decapeptide, therefore the antibody could be formed against parts of the LH-RH molecule and such an antibody would be necessarily recognized as the free decapeptide.<sup>83</sup> It is also possible that the LH-RH in the perikarya is present in the form of a prohormone which would not be recognizable by the antibody. It has been suggested that the LH-RH in the cell body is in a concentration too low for detection.<sup>8</sup> Evidence for this comes from studies in which the axoplasmic flow supposedly has been reduced by the administration of nembutal or colchicine resulting in an increase in the concentration of the decapeptide inside the neuronal cell body to a level that is then detectable by the antibody.<sup>13,75</sup> Finally, there is the potential variation brought on by the use of different species.

## HYPOTHALAMIC LH-RH; RADIOIMMUNOASSAY

With the use of bioassays investigators originally demonstrated the existence of an LH-releasing compound in the MBH and in the suprachiasmatic region.<sup>60,71</sup> Since then, the production of an antiserum to synthetic LH-RH has made possible the development of a sensitive radioimmunoassay (RIA) for the direct measurement of this hypothalamic hormone.<sup>7</sup> Using this RIA, considerable research has been directed toward the localization and quantitation of LH-RH in the basal forebrain and for the most part, the data support that previously obtained with the bioassay. One of the first to use the LH-RH RIA was Palkovits *et al.*<sup>68</sup> who found the majority of the LH-RH to be in the ARC-ME with only trace amounts in the suprachiasmatic and ventromedial nuclei and posterior hypothalamic area. In the same manner other investigators have found the MBH to contain the majority of the brain LH-RH.<sup>5,20,47,48,51,76,81,84,91,92</sup> In addition, a significant amount of LH-RH has been found by some in the OVLT<sup>51,91,92</sup> preoptic area<sup>5,45,81</sup> retrochiasmatic area<sup>51</sup> and pineal gland.<sup>62</sup> The LH-RH content of the MPOA and MBH fluctuate with a circadian periodicity<sup>47,81</sup> as well as throughout the estrous cycle.<sup>5</sup> There is also evidence that the hypothalamic LH-RH is sensitive to the circulating levels of gonadal steroids, because following castration there is a significant reduction in the content of the neurohormone in the MBH<sup>5,45,47,51,76</sup> and this reduction can be partially reversed by the administration of the appropriate gonadal hormone.

Several investigators have reported a reduction in the LH-RH content of the MBH following hypothalamic deafferentation. Three and 11 days after CHD Weiner *et al.*<sup>91</sup> observed a significant decrease in the LH-RH content in the ME, but not in the OVLT. These findings were supported the following year by Brownstein *et al.*<sup>60</sup> who reported a marked drop in the LH-RH content in the MBH 10 days after CHD. In contrast, Morris *et al.*<sup>62</sup> found the amount of LH-RH in the MBH to be the same as in the sham operated rats two weeks after the cut, although plasma LH levels were significantly reduced in the experimental animals. After anterior hypothalamic deafferentation Kalra<sup>45</sup> reported a significant decrease in the concentration of LH-RH in the MBH and a significant increase in the POA in long-term ovariectomized rats. Treatment with estradiol benzoate significantly increased LH-RH content in the MBH but not in the POA. In long-term cas-

trated males anterior hypothalamic deafferentation also resulted in a significant reduction in LH-RH in the MBH and an increase in the POA. Kalra interprets these data to mean that a substantial portion of the LH-RH in the MBH originated rostral to the cut. The data from Weiner *et al.*<sup>91</sup> and Brownstein *et al.*<sup>20</sup> would support this interpretation; however, the fact that hypothalamic isolation did not result in the complete elimination of LH-RH suggests the presence of LH-RH producing neurons in the MBH. In agreement with these latter investigators, there has been some recent indirect evidence for the presence of LH-RH neurons in the MBH. This is based on the marked effects that androgen implants in the MBH, but not POA, have on the LH-RH content in the MBH<sup>46</sup> and on the rapid changes in LH-RH content that are observed in the MBH, but not POA, during the time of the LH surge.<sup>80</sup>

In order to determine if the LH-RH cell bodies were located in the ARC, this decapeptide has been quantitated in the MBH of rats and mice that have been neonatally treated with monosodium glutamate, a compound that selectively destroys the neurons in the POA, ARC, and retina.<sup>66</sup> However, in spite of the destruction of 80–90% of the cell bodies in the ARC, LH-RH in the MBH and plasma levels of LH were unchanged, suggesting that the LH-RH originated somewhere other than in the ARC.<sup>56,64</sup> In contrast to this, monosodium-glutamate induced lesions of the ARC have been shown to reduce basal serum levels of LH in some instances.<sup>24</sup> Furthermore, after ovariectomy, serum LH levels were lower and the LH surge seen after estrogen treatment was greatly attenuated in the glutamate treated rats.<sup>24</sup>

These studies support the immunohistochemical data showing that LH-RH is present in the MBH and in the POA. However, the determination of radioimmunoassayable LH-RH involves extraction of the hormone from the brain tissue, therefore it cannot provide direct information about the location of the decapeptide within the cell.

#### **STIMULATION OF THE COMPLETELY DEAFFERENTED MEDIAL BASAL HYPOTHALAMUS AND LH RELEASE IN THE RAT**

As a way of determining whether there are LH-RH neurons in the rat MBH, we have carried out an experiment where the MBH was completely deafferented and then the arcuate-median eminence region was electrochemically stimulated (ECS) five days later and plasma LH lev-

els determined as an index of LH-RH activity.<sup>22</sup> To render the MBH more sensitive to ECS<sup>44</sup> the rats were injected with 5 $\mu$ g of estradiol benzoate every day between the deafferentation and ECS. The results from these experiments showed that stimulation of the completely deafferented MBH resulted in a significant rise in plasma LH levels suggesting that the isolated MBH is capable of supporting LH secretion and must therefore contain LH-RH neurons. This LH-RH must have been produced inside the MBH because five days after the deafferentation all the LH-RH that originated outside the MBH would have been metabolized by the hypothalamic peptidases.<sup>36</sup> In those animals where the deafferentation was incomplete, ECS resulted in a much greater LH rise which suggests, as has been reported by others that some of the LH-RH in the MBH originates outside, probably in the preoptic-supra-chiasmatic region.<sup>61</sup> This could also suggest that the MBH has been altered by the deafferentation and therefore cannot respond as well to ECS. Numerous studies have demonstrated that denervated neurons are altered, both morphologically and functionally;<sup>25</sup> yet very little of this work has been done in the hypothalamus, and this concept has seldom been entertained during interpretation of hypothalamic deafferentation studies. There is some evidence that following hypothalamic deafferentation there is an increase in the incorporation of nucleotides in the arcuate nucleus<sup>1</sup> although there is disagreement as to whether there is an increase<sup>34</sup> or decrease<sup>1</sup> in the incorporation of amino acids in the same nucleus.

Although the data presented here suggests that there are LH-RH neurons in the MBH, it is nevertheless indirect. More experiments need to be carried out where LH-RH is determined directly.

## CONCLUDING REMARKS

Review of the literature points out a disagreement about the capacity of the isolated MBH to maintain pituitary-ovarian function in the rat. Halasz and co-workers<sup>39,40,85</sup> on the one hand proposed that the deafferented MBH could support a tonic level of gonadotropin secretion. On the other hand, Blake and co-workers found that plasma LH levels were greatly reduced, and in some cases undetectable, following complete hypothalamic deafferentation.<sup>14,16</sup> Equivocal findings have also been reported following hypothalamic isolation in the ovariectomized rats.<sup>6,15</sup> The search for the LH-RH producing perikarya and the quantitation

of brain radioimmunoassayable LH-RH following MBH deafferentation has also resulted in some controversy although there are some very elegant studies that suggest that the decapeptide producing neurons are in the preoptic-suprachiasmatic region;<sup>11,61</sup> however, there are other studies where there is evidence for the presence of some of these neurons in the MBH.<sup>27,32</sup> Brownstein *et al.*<sup>20</sup> have speculated that the reduction in the concentration of LH-RH in the MBH after deafferentation was not necessarily because LH-RH originated outside the MBH, but that in the absence of facilitatory inputs, the LH-RH cells underwent a transformation resulting in a cessation of releasing hormone synthesis. Studies in this area must be interpreted with caution due to the problems associated with the technique of hypothalamic deafferentation, among them the possibility of greatly altering the function of deafferented neurons in the hypothalamus. Presently there appear to be three ways in which the releasing hormone neurons are distributed through the basal forebrain. First, there is the concept put forth by Halasz and co-workers suggesting that the isolated MBH contains the releasing hormone cells (neuron #1) which are responsible for a tonic level of hormone secretion from the adenohypophysis, while the connections with the areas rostral to the MBH (neuron #2) are necessary for the signals that are responsible for such events as the timing of the circadian oscillations in hormone secretion and the preovulatory surge of gonadotropins. Second, recent evidence suggests that the releasing hormone perikarya (neuron #3) are located outside the MBH and they project to the arcuate-median eminence region. These neurons may then be responsible for both tonic and phasic modes of hormone secretion. Finally, the hypothalamic control of gonadotropin secretion may involve all three neuronal systems.

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# 7

## Renal Failure and Stress

**Sally K. Severino, M.D.**

*Clinical Instructor in Psychiatry, Cornell University College of Medicine;*

*Clinical Affiliate in Psychiatry, The New York Hospital; Collaborating  
Psychoanalyst, Columbia University Center for Psychoanalytic Training and  
Research.*

Over the past decade chronic renal hemodialysis and renal transplantation have fostered much interest in the stress experienced by patients undergoing these procedures. Stress is generated by the renal failure itself which can produce numerous dysphoric symptoms: chronic fatigue, difficulty concentrating, loss of libido, and irritability, to name only a few. Stress is also generated by the reality changes wrought by a catastrophic illness, such as the economic burden of maintenance hemodialysis. Equally great may be the stress engendered by shifts in significant object relationships necessary to accommodate the ill person. If the ill person is the breadwinner, for example, he/she may no longer be able to assume that role, and adjustments must be made. In addition, there are psychological stresses: stress secondary to living with imminent death, stress secondary to attachment to a machine, and stress secondary to living with a renal homograft.

### **COPING WITH STRESS—HISTORICAL VIEW**

Many aspects of patients' coping with the stress of hemodialysis have been investigated. Influences on coping have been found in the areas of background variables, interpersonal relationships, affects, intrapsychic conflict, defense mechanisms, and intrapsychic processes.

Of the background variables, there was found to be no correlation of adjustment with age, civil status, I.Q.,<sup>24</sup> or previous medical history.<sup>23</sup>

One author did find that women coped better than men with the stress of chronic hemodialysis.<sup>22</sup> When coping was assessed by compliance with diet and rehabilitation, education was found to affect adjustment.<sup>18</sup> Three independent investigators found that patients who have a stable relationship to a significant person do better on dialysis than those who do not.<sup>6,13,14</sup> Depression was negatively correlated with adjustment in one study<sup>13</sup> and had no effect on adjustment in another population.<sup>18</sup>

The stress of hemodialysis may stir up intrapsychic conflicts in patients, especially dependence-independence conflicts. Unresolved dependency conflicts have been described as negatively affecting patients' adjustments.<sup>1,14,23,25,31</sup> Anderson<sup>4</sup> described two patient populations. One patient population, the independent patient, copes less well with stress in the initial stages of dialysis because of this group's difficulty depending on the machine. This patient population copes better in the later stages of professional rehabilitation. The other patient population, the dependent patient, does well initially, but copes with stress less well in the later stages.

Denial is considered the most common defense mechanism of dialysis patients. Its adaptive value has been debated.<sup>14,17,20,25,28,29</sup> Some investigators state that denial creates problems in patient management whereas others find that denial serves an adaptive function in coping with the stress of a chronically unsatisfactory situation. Isolation as a defense has been said to be negatively correlated with adjustment.<sup>15,16</sup>

With respect to the intrapsychic processes set into motion by the stress of hemodialysis and transplantation, much investigation has focused on body image changes secondary to these experiences. It is generally believed that patients try to change their body images to include the dialyzer or the homograft. One investigator has noted, "The patients have seemingly incorporated into their body images the machines upon which they are so dependent for life. They likewise unconsciously think of themselves as not entirely human and therefore freakish."<sup>2</sup> He has also noted that serial figure drawings by hemodialysis patients show that the dialyzer becomes a part of the body.<sup>3</sup> Attempts have been made to understand how these foreign objects are integrated into the patient's body image. Castelnovo-Tedesco<sup>9</sup> has conceptualized the process of integrating something foreign into the ego as a recreation of the symbiotic phase of development (that phase of development which encompasses the three-to five month age) where the boundaries between self and object representations are not distinct.

Others have confirmed that they too see patients coping with the stress of dialysis by regression to an infantile dependent state during which they experience the machine as mother or as representing a threatening inanimate object of infancy.<sup>30</sup>

The complex process of internalization of a renal homograft into a patient's body image has been described by many.<sup>5,7,8,19,21,27</sup> "Accorporation"<sup>11</sup> has been introduced as a term to designate the process of internalization of the transplanted organ—a process involving incorporation, introjection, and identification along with progressive obliteration of the distinction between the organ as object versus part of the body image.<sup>26</sup> It has been observed that it is not only an organ that is being transplanted, but also a mental representation of the donor. Further, a partial object may stand for a whole object,<sup>12</sup> i.e., a kidney may stand for the donor. In those instances where the mental representations of the donor or the organ reflect previously established identifications, very little stress is experienced, and very little modification of self-concept is required in the process of accepting the homograft.<sup>31</sup> To illustrate, if the patient is a man and his mental representation of his donor fits his mental representation of his father with whom he is identified, he can accept the donor's kidney without have to greatly modify his established image of himself. Where the mental representations of the donor or organ does not reflect previously established identifications, much stress is experienced. For example, where there is a graft from a donor of the opposite sex, a threat to sexual identity may be experienced.<sup>10</sup>

## COPING WITH STRESS—AUTHOR'S OBSERVATIONS

Over a period of two years (185 sessions) I interviewed one patient who was in her sixth to twentieth months on hemodialysis followed by six months postrenal transplantation. This patient did not initiate interest in the psychiatric aspects of her illness nor did anyone recommend that she seek psychiatric help. Rather, I sought her out. The structure of the interviews was based on the psychoanalytic psychotherapy model which I used with this patient as an investigative tool rather than as a treatment modality.

The patient was an attractive thirty-three-year-old mother of three daughters who clearly seemed to take the dialysis machine into her body image. She described feeling nonhuman. She felt she had become some-

thing mechanical, a monster with a battery. The battery she referred to was her conceptualization of her A-V fistula. In her own words she said, "The only time I feel nonhuman is when I hear this running. I said, 'Is this some monster or something?' I watch T.V. and see them putting things in people, things that tick. . . . It's a type of battery because it runs. . . . The vein is hooked to this thing and it's running in my arm. . . . It's like a battery. Sometimes it's frightening when it runs so hard."

In addition to feeling nonhuman like the dialyzer, this patient experienced the machine as human. She anthropomorphized the machine. In other words, she invested it with human attributes: a personality, a voice, a vulnerability to corruption, and an ability to do a good or bad job. She would claim that she didn't like a particular machine or its looks and would ascribe distinct personalities to the various models of dialysis machines. She interacted with the machines by accusing them of hollering when the monitor alarms would ring, or expressing disappointment in them if they failed her. Whenever a coil ruptured, she consistently maintained that the coil was "corrupted" and couldn't be trusted. In addition to anthropomorphizing the machine, this patient experienced the dialyzer as her uterus. Menstruation she felt had cleansed her body. Now she was amenorrheic but the machine was cleansing her body as her uterus once had. As further confirmation of her fantasy of the machine as her uterus, this patient on her sixty-third interview drew for me a person with a protruberant abdomen as though the machine actually existed inside the abdomen.

There was one model dialyzer with which this patient has happiest. To this machine she attributed a personality which she recognized was similar to her experience of her mother's personality. Her mother, she felt, was selfish and uninterested in her. At the age of six, when her parents divorced, her mother sent her away permanently to be reared by her maternal grandparents. (Her father disappeared.) On one occasion, when she visited her mother at age eleven, she overheard her mother telling her new husband that she had no daughter. The dialyzer seemed to this patient very much like her inadequate mother on whom she had depended but who had deserted her and left her feeling guilty and unaccepting of herself as a woman.

She went on to identify with the machine, however. It seemed an easy identification perhaps because the machine represented an object representation consistent with her concept of her own mother with whom

she identified strongly. Thus, in relation to the dialysis machine, she could daily reexperience herself as damaged and attempt to prove, as she had throughout her life, that she was good enough to be her mother's daughter. Both the experience of herself in relation to the machine as her mother, and the experience of herself in relation to the machine as her uterus, utilized self and object representations consistent with previously established identifications and caused her little stress.

Her experience of renal transplantation, on the other hand, caused her great stress. The kidney for her represented a fetus and she experienced transplantation as impregnation. Shortly after transplantation she said, "My stomach is a little puffy, but that's natural . . . I was so hungry. My stomach was growling like I got two babies in it. Seems like I was carrying to term." She felt fat and unattractive, but this homograft also represented her second life, her promise of forgiveness. She felt like the Virgin Mary, the perfect mother. But, she experienced this as something which made her feel self-conscious and under much strain. The self representations of goodness and forgiveness were inconsistent with her previously established self-representations of feeling bad and unwanted.

Of importance to her feelings about the renal homograft was the fact that during the six months preceding her renal transplant, this patient's cousin, sister, and mother died. None had kidneys suitable for transplantation. She received a cadaver kidney which had to be removed six months later because of autoimmune rejection of the renal graft. The patient felt that she contributed to the kidney rejection in that she felt so guilty that someone died so she could live. In her words, "I've always had a thing with guilt. I think it had to do with Mother's saying I wasn't her daughter. I was trying to prove I was good enough to be her daughter."

One wonders whether the stress of trying to make this good object part of her self-representations contributed to this renal homograft rejection. The process was complicated by the death of this patient's mother one month to the day prior to her graft, and her resultant depression which perhaps imposed feelings of guilt and thoughts of unworthiness which further contributed to her stress and inability to accept the graft.

It did seem that this patient treated both foreign objects, the dialyzer and the cadaver kidney, similarly by anthropomorphizing them and

identifying with them in her attempt to integrate them into her self-representations. She succeeded in accepting the dialysis machine which for her was an object representation consistent with her mental representation of her mother. She rejected the allograft which was an object representation inconsistent with her mental representation of her mother.

## SUMMARY

Living with a dialysis machine or kidney transplant seems to demand modification of the patient's body image. If the modification of body image can be made so that the machine or homograft becomes an integral part of the patient's body image, the stresses of dialysis or transplantation are manageable and the machine or homograft is accepted by the patient. The question arises, if the stress of modifying the patient's body image is too great, does this in part contribute to maladaptation on dialysis or to allograft rejection? This in turn raises the question of what effect the stress of intrapsychic change has on autoimmune mechanisms.

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# 8

## Stress in Childhood

**James H. Humphrey, Ed. D.**

*Professor, Division of Human and Community Resources,  
University of Maryland*

**Joy N. Humphrey, B.S., A.P.C.**

*Education and Lifestyle Change Consultant, Control Data Corporation*

### **STRESS IN CHILDHOOD**

Although we tend to think of stress as being predominantly a concern of the adult population, it can also have a devastating effect on growing children. Therefore, it is the intent of this chapter to explore some of the various aspects of stress as it pertains specifically to childhood. If valid information can be provided for adults who deal with children—particularly teachers and parents—perhaps they will not only be better prepared to deal with undesirable childhood stress, but they will be able to take measures to prevent it as well.

Obviously, there are many approaches that could be taken in considering stress in childhood. However, for purposes of this particular discussion we will focus on five major aspects: (1) childhood emotions; (2) factors which induce stress in children; (3) helping children understand the stress concept; (4) child stress reduction techniques; and (5) principles to apply in helping children deal with stress.

### **CHILDHOOD EMOTIONS**

Dealing with childhood emotions should imply that sympathetic guidance should be provided in meeting anxieties, joys, and sorrows, and

help given in developing aspirations and security. In order to attempt to meet this objective we might well consider emotions from a standpoint of the growing child maturing emotionally.

For purposes of this discussion we will consider *maturity* as being concerned with a state of *readiness* on the part of the organism. The term is most frequently used in connection with age relationships. For example, it may be said that "Johnny is mature for six years of age." Simply, *emotional maturity* might be considered as the process of acting one's age.

Generally speaking, emotional maturity will be achieved through a gradual accumulation of mild and pleasant emotions. On the contrary, emotional *immaturity* indicates that unpleasant emotions have accumulated too rapidly for the individual to absorb. One of the important factors in this regard is the process of *adjustment* which can be described as the process of finding and adopting modes of behavior suitable to the environment, or to changes in the environment.

The child's world involves a sequence of experiences which are characterized by the necessity for him to adjust. Consequently, it may be said that "normal" behavior is the result of successful adjustment, and abnormal behavior results from unsuccessful adjustment. The degree of adjustment that the child achieves depends upon how adequately he is able to satisfy his basic needs and to fulfill his desires within the framework of his environment, and the pattern of ways dictated by the society.

When stress is induced as a result of the child's not being able to meet his needs (basic demands) and satisfy his desires (wants or wishes), *frustration* or *conflict* results. Frustration occurs when a need is not met, and conflict results when, (1) choices must be made between nearly equally attractive alternatives, or (2) when basic emotional forces oppose one another. In the emotionally healthy person, the degree of frustration is ordinarily in proportion to the intensity of the need or desire. That is, he will objectively observe and evaluate the situation to ascertain whether a solution is possible, and if so, what solution would best enable him to achieve the fulfillment of his needs or his desires. However, every person has a *zone of tolerance* or limits for emotional stress within which he normally operates. If the stress becomes considerably greater than the tolerance level, or if the individual has not learned to cope with his problems and objectively and intelligently solve them, some degree of maladjustment can possibly result.

In order to counteract some of the above problems and to be able to pursue a sensible course in helping the child become more emotionally mature, there are certain factors concerned with the emotional development of children that need to be taken into account. Two of these factors discussed here are (1) characteristics of childhood emotionality, and (2) emotional arousals and reactions.

## CHARACTERISTICS OF CHILDHOOD EMOTIONALITY

**Ordinarily, the Emotions of Children are not Long Lasting.** A child's emotions may last for a few minutes or less and then terminate rather abruptly. The child gets it "out of his system" so to speak by expressing it outwardly. In contrast, some adult emotions may be long and drawn out. As children get older, expressing the emotions by overt action is encumbered by certain social restraints. This is to say that what might be socially acceptable at one age level is not necessarily so at another. This may be a reason for some children developing *moods*, which in a sense are states of emotion drawn out over a period of time and expressed slowly. Typical moods of childhood may be those of *sulking* due to social restraint, and being *jumpy* from repressed fear.

**The Emotions of Children are Likely to be Intense.** This might be confusing to some adults who do not understand child behavior; that is, they may not be able to see why a child would react rather violently to a situation that to them might appear insignificant.

**The Emotions of Children are Subject to Rapid Change.** A child is capable of shifting rapidly from laughing to crying, or from anger to joy. Although the reason for this is not definitely known, it might be that there is not as much depth of feeling among children as there is among adults. In addition, it could be due to the lack of experiences that children have had, as well as their state of intellectual development. We do know that young children have a short attention span which could cause them to change rapidly from one kind of emotion to another.

**The Emotions of Children can Appear with a High Degree of Frequency** As children get older they manage to develop the ability to adjust to situations that previously would have caused an emotional

reaction. This is probably due to the child's acquiring more experience with various kinds of emotional situations. Perhaps a child learns through experience what is socially acceptable and what is socially unacceptable. This is particularly true if the child is reprimanded in some way following a violent emotional reaction. For this reason the child may try to confront situations in ways that do not involve an emotional response.

**Children Differ in Their Emotional Responses.** One child confronted with a situation that instills fear may run away from the immediate environment. Another may hide behind his mother. Still another might just stand there and cry. Different reactions of children to emotional situations are probably due to a host of factors. Included among these may be past experience with a certain kind of emotional situation, willingness of parents and other adults to help children become independent, and family relationships in general.

**Strength of Children's Emotions are Subject to Change.** At some age levels certain kinds of emotions may be weak and later become stronger. Conversely, with some children emotions which were strong may tend to decline. For example, some very young children may be timid among strangers, but later when they see there is nothing to fear the timidity is likely to wane.

### EMOTIONAL AROUSALS AND REACTIONS

If we are to understand the emotions of children we need to take into account those factors of emotional arousal and how children might be expected to react to them. Many different kinds of emotional patterns have been identified. For purposes here we have arbitrarily selected for discussion the emotional patterns of fear, worry, anger, jealousy, and joy.

**Fear** It is possible that it is not necessarily the arousal itself but rather the way something is presented that determines whether there will be a fear reaction. For example, if a child is trying to perform a stunt and is told that if he does it a certain way he will break his arm, it is possible that a fear response will occur. This is one of the many reasons for using a positive approach in dealing with children.

A child may react to fear by withdrawing. With very young children

this may be in the form of crying or breath holding. With a child under three years of age and in some older children as well, the "ostrich" approach may be used; that is, he may hide his face in order to get away from it. As children get older these forms of reaction may decrease or cease altogether because of social pressures. For instance, it may be considered "sissy" to cry, especially among boys. Of course, the validity of this kind of thinking is open to question. In fact, some scientists have recently observed that suppression of tears by males could contribute to the reason why they have a higher incidence than females do of many stress-related disorders.<sup>22</sup>

**Worry** This might be considered an imaginary form of fear, and it can be a fear not aroused directly from the child's environment. Worry can be aroused by imagining a situation that could possibly arise; that is, a child could worry about not being able to perform well in a certain activity. Since worries are likely to be caused by imaginary rather than real conditions, they are not likely to be found in abundance among very young children. Perhaps the reason for this is that they have not reached a stage of intellectual development where they might imagine certain things that could cause worry. While children will respond to worry in different ways, certain manifestations such as nail biting may be symptomatic of this condition.

**Anger** This emotional response tends to occur more frequently than that of fear. This is probably due to the fact that there are more conditions that incite anger. In addition, some children quickly learn that anger may get attention that otherwise would not be forthcoming. It is likely that as children get older they may show more anger responses than fear responses because they soon see that there is not too much to fear.

Anger is caused by many factors, one of which is interference with movements the child wants to execute. This interference can come from others or by the child's own limitations in ability and physical development.

Because of individual differences in children there is a wide variation in anger responses. In general, these responses are either *impulsive* or *inhibited*. In impulsive responses the child manifests an overt action either toward another person or an object which caused the anger. For instance, a child who collides with a door might take it out on the door

by kicking it. (This form of child behavior is also sometimes manifested by some "adults.") Inhibited responses are likely to be kept under control, and as children mature emotionally they acquire more ability to control their anger.

**Jealousy** This response usually occurs when a child feels a threat of loss of affection. Many psychologists believe that jealousy is closely related to anger. Because of this the child may build up resentment against another person. Jealousy can be very devastating in childhood and every effort should be made to avoid it.

Jealousy is concerned with social interaction which involves persons the child likes. These individuals can be parents, siblings, teachers, and peers. There are various ways in which children may respond. These include (1) being aggressive toward the one he is jealous of, or possibly toward others as well, (2) withdrawing from the person whose affections he thinks have been lost, and (3) possible development of an "I don't care" attitude.

In some cases children will not respond in any of the above ways. They might try to excel over the person of whom they are jealous. In other words, they might tend to do things to impress the person whose affections they thought had been lost.

**Joy** This pleasant emotion is one that we strive for because it is so important in maintaining emotional stability. Causes of joy differ from one age level to another, and from one child to another at the same age level. This is to say that what might be a joyful situation for one child might not necessarily be so for another.

Joy is expressed in various ways, but the most common are laughing and smiling, the latter being a restrained form of laughter. Some children respond to joy with a state of body relaxation. This is difficult to detect because it has little or no overt manifestation. However, it may be noticed when one compares it with body tension caused by unpleasant emotions.

## SOME GUIDELINES FOR EMOTIONAL DEVELOPMENT OF CHILDREN

It is imperative to set forth some guidelines for emotional development if we are to meet with any degree of success in our attempts to provide

for the emotional maturity of children. The reason for this is to assure, at least to some extent, that our efforts in attaining optimum emotional development will be based upon a scientific approach. These guidelines might well take the form of *valid concepts* of emotional development. This approach enables us to give more serious consideration to what is known about children as they grow and develop. The following concepts of emotional development with certain implications for the school and/or home environment are submitted with this general idea in mind.

**An Emotional Response May be Brought About By a Goal's Being Furthered or Thwarted.** The teacher or parent should make a very serious effort to assure successful experiences in the school or home for every child. In the school setting this can be accomplished in part by attempting to provide for individual differences within given school experiences. The school or home setting should be such that each child derives a feeling of personal worth through making some sort of positive contribution.

**Self-Realization Experiences Should be Constructive.** The opportunity for creative experiences that afford the child a chance for self-realization should be inherent in both home and school. Teachers might well consider planning with the children themselves to see that all school activities are meeting their needs, and as a result involve constructive experience.

**Emotional Responses Increase as the Development of the Child Brings Greater Awareness, the Ability to Remember the Past and to Anticipate the Future.** In the school setting the teacher can remind the children of some of their past emotional responses with words of praise. This could encourage children to repeat such responses in future similar situations and thus make for a better learning situation.

**Emotional Reactions Tend to Increase Beyond Normal Expectancy Toward the Constructive or Destructive on the Balance of Furthering or Hindering Experiences of the Child.** For some children the confidence they need to be able to face the problems of life may come through physical expression. Therefore, such experiences as active play in the home surroundings and good physical education programs in the

schools have tremendous potential to help contribute toward a solid base of total development.

**Depending on Certain Factors, a Child's own Feelings may be Accepted or Rejected by the Individual.** Children's home and school experiences should make them feel good and have confidence in themselves. Satisfactory self-concept is closely related to body control; physical activity oriented experiences might be considered as one of the best ways of contributing to it. Therefore, it is important to consider those kinds of experiences for young children that will provide them with the opportunity for a certain degree of freedom of movement.

## **FACTORS WHICH INDUCE STRESS IN CHILDREN**

Most children encounter a considerable amount of stress in our complex modern society. One of the objectives of those adults who deal with children should be to help them to reduce stress by making a change in the environment and/or making a change about the children themselves. We have already stated that each person has a zone of tolerance level as far as stress is concerned. And if the stress becomes considerably greater than the tolerance, a person will suffer from emotional distress and its consequent unhappy circumstances.

The average child's environment abounds with many stress-inducing factors, such as society in general, the home, and the school. Such things as various kinds of teacher and parent behaviors can have frustrating influences on children. A major function of the following discussion is to identify and elaborate on some of the factors which induce stress in children. As teachers and parents become more aware of some of these factors, perhaps they can try to alleviate some of them and also try to help children deal with those situations that are difficult to eliminate.

### **Self-Concerns of Children Which Can Induce Stress**

One of the important classifications of stress-inducing factors in children is that which involves *personal* or *self* concerns. The following discussion takes some of these concerns into account.

**Self-Concerns Associated With the Meeting of Personal Goals.** Stress is likely to result if adults set goals that are too difficult

for children to accomplish. For example, goals may be much higher than a particular school or home environment will permit children to achieve. On the contrary, when goals are set too low children may develop the feeling that they are not doing as much for themselves as they should. This aspect of stress is also concerned with the fear that some children have that they will not reach their goals in life. It is interesting to note that this can sometimes happen early in the lives of some children.

**Self-Concerns Which Involve Self-Esteem.** This involves the way a child feels about himself, and his self-esteem can often be highly related to the fulfillment of certain *ego needs*. Some children may feel that there are not enough opportunities offered in modern society for them to succeed. This is perhaps more true of those children who are in a low socioeconomic environment. It bothers some children too that adults do not praise them for what they consider to be a job well done.

**Self-Concerns Related to Changing Values.** It is frustrating to some children if they do not understand the value system imposed upon them in a given school or home environment. They may develop the feeling that adults are not inclined to place a value on those factors that children feel are important to them personally at their various stages of growth and development.

**Self-Concerns Which Center Around Social Standards.** In some cases children get confused with the differences in social standards required at the different levels of their development. It is sometimes difficult for them to understand that what was socially acceptable at one age level is not necessarily so at another.

**Self-Concerns Involving Personal Competence and Ability.** This is probably the self-concern that frustrates children the most. Certainly, lack of confidence in one's ability can be devastating to the morale of a child. Many children are becoming increasingly concerned with their ability, or lack thereof, to cope with such problems as expectations of parents and keeping up with schoolwork.

**Self-Concerns About Their Own Traits and Characteristics.** Not the least of the concerns among children are those factors which are likely

to make them different from the so called average or normal child. This is concerned with the social need for *matuity* which means their wanting to be like their peers. When children deviate from others in certain characteristics it can be a serious stress inducing factor. A specific example concerns children who are overweight. Some child psychiatrists feel that such children are likely to mature into overweight adults and are more vulnerable to the emotional stress of being fat than adults. In fact, some overweight children may get lower grades in school. In addition, in some cases they may be discriminated against by teachers, and often have poor social skills as well.

It should be mentioned that all of these self-concerns are not characteristic of all children, particularly because of the individual differences among them. That is, what may be a serious self-concern for one child may be a minimal concern for another.

### **Home Conditions Which Can Induce Stress**

Changes in society with consequent changes in conditions in some homes are likely to make child adjustment a difficult matter. Such factors as larger percentages of both parents working, economic conditions, and mass media such as television can complicate the life of the modern-day child.

Some child psychiatrists are convinced that certain home conditions can have an extremely negative influence on the personality and mental health of some children. In fact, studies show that the interaction of stress factors is especially important. Most of these studies tend to identify the following factors to be strongly associated with childhood psychiatric disorders: (1) severe marital discord, (2) low social status, (3) overcrowding or large family size, (4) paternal criminality, (5) maternal psychiatric disorder, and (6) admission into the care of local authorities. It is estimated that with only one of the above conditions present, a child is no more likely to develop psychiatric problems than any other child. However, when two of the conditions occur the child's psychiatric risk increases fourfold.<sup>23</sup>

In our own studies we found that there were certain actions of parents that induced stress in teachers, and according to the teachers, these parental attitudes might well be considered as stress-inducing factors for their students.<sup>10</sup>

Actions of parents which induce stress in teachers can be classified

into three areas: (1) lack of concern of parents for their children, (2) parental interference, and (3) lack of parental support for teachers.

In 45% of the cases *lack of parental concern for children* was stressful for teachers. They cited such things as parents not caring when a student did poorly, parents not being willing to help their children with school work, a lack of home discipline, and stress placed on teachers by the difficult time they had in getting parents to conferences.

Thirty two percent of the teachers saw *parental interference* as a stressor for them. Such interference was often a result of parents having expectations too high for their children. This in turn resulted in parental pressure on children, particularly for grades, which may be one of the most serious conditions in the schools today. Incidentally, in this general connection it is interesting to note that one authoritative source suggests that attitudes acquired during youth can affect the way an individual reacts to stress as an adult. This may be significant in the case of persons whose family has emphasized performance and achievement to the exclusion of all other characteristics.<sup>21</sup>

In this particular regard it should be noted that some authorities are studying the possibility that the phenomenon of *Type A Behavior* in adults could possibly have its origination in children. Chief among these investigators is Dr. Carl Thoresen, the distinguished Stanford University psychologist who has pointed out that much of socialization in modern American society fosters Type A behavior in children.<sup>1</sup> (A person with Type A behavior tends to be aggressive, ambitious, competitive, and puts pressure on himself in getting things done. An individual with Type B behavior is more easy going, relaxed, and tends not to put pressure on himself.)<sup>6</sup>

It has been suggested that pressure exerted by parents for grades could be a contributing cause of the increase in the suicide rate among students. Moreover, there are some who believe that parents are literally "driving their children to drink" because of an increase in alcohol consumption by children, possibly due to the "grade pressure syndrome."

The third classification of parental actions causing stress for teachers was that of *lack of parental support*, and 23% identified stress-inducing factors here. They were stressed by such factors as not being backed by parents and a generally poor attitude of parents toward teachers.

Another, and very important home condition which can induce stress in children is when a family itself is under stress. Parenting itself is an

extremely difficult task and the demands of this task are becoming more and more complicated. Consequently, many of the pressures that modern parents are called upon to endure cannot only cause stress for them but can also cause them to induce stress upon their children as well.

It is estimated that 1 million or more children are abused or neglected by their parents or other "overseers" in the United States annually, and that as many as 2000 die as a result of maltreatment. Authorities suggest that most of this is not caused by inhuman, hateful intent on the part of parents; but rather are the result of a combination of factors including both the accumulation of stresses on families and unmet needs of parents for support in coping with their child-rearing responsibilities.<sup>14</sup>

### School Conditions Which Can Induce Stress

There are a number of conditions existing in most schools which can raise stress levels in children. Several of these are considered in the ensuing discussion.

**Stress and the Child in the Educative Process** School anxiety as a child stressor is a phenomenon with which educators, particularly counselors and teachers, frequently find themselves confronted in dealing with children. Various theories have been advanced to explain this phenomenon and relate it to other character traits and emotional dispositions. Literature on the subject reveals the following characteristics of anxiety as a stress-inducing factor in the educative process.

1. Anxiety is considered a learnable reaction which has the properties of a response, a cue of danger, and a drive.
2. Anxiety is internalized fear aroused by the memory of a painful past experience associated with punishment for the gratification of an impulse.
3. Anxiety in the classroom interferes with learning, and whatever can be done to reduce it should serve as a spur to learning.
4. Test anxiety is a near universal experience.
5. Evidence from clinical studies points clearly and consistently to the disruptive and distracting power of anxiety effects over most kinds of thinking.

It appears that causes of anxiety change with age as do perceptions of stressful situations. Care should be taken in assessing the total life space of the child—his or her background, home life, school life, age, and sex—so as to minimize the anxiety experienced in the school. It seems obvious that school anxiety, although manifested in the school environment, may often be caused by unrelated factors outside the school.

**Test Anxiety as a Stress Inducing Factor** A few years ago The Society for Research in Child Development released a monograph which was the summation of a longitudinal study concerned with defensiveness to intelligence and achievement-test performance and school progress over the elementary school years.<sup>8</sup> Some of the major findings indicated that:

1. There was an increasingly negative relationship between anxiety and test performance over the entire elementary school experience.
2. Anxiety was greater on verbal than on nonverbal tests.
3. Unfamiliar tests aroused much anxiety.

In addition to the above report a great deal of research has appeared on test anxiety in various sources over the years. One literature review on the subject suggests the following generalizations.<sup>18</sup>

1. A critical factor is what the test situation means to a particular individual in terms of his learned patterns of response to anxiety. If the test is considered important to the individual and if he/she is anxious when taking tests, he/she is more likely to perform poorly on tests than one who is less anxious.
2. There is a negative relationship between level of ability and level of anxiety. Poorer students tend to be most anxious when facing a test.
3. There is a positive correlation between level of anxiety and level of aspiration. Those who are least anxious when facing a test tend to be those who have the least need or desire to do well in it.
4. Extreme degrees of anxiety are likely to interfere with test performance; on the other hand, mild degrees of anxiety facilitate test performance.

5. The more familiar a student is with tests of a particular type, the less likely he/she is to suffer extreme anxiety.
6. Test anxiety can enhance learning if it is distributed at a relatively low level throughout a course of instruction rather than being concentrated at a relatively high level just prior to and during a test.
7. There are low to moderate negative relationships between measures of anxiety and performance on very complex tasks. This negative relationship tends to increase as the task becomes more testlike.
8. Test anxiety increases with grade level and appears to be long range rather than transitory.

What then does the nature of test anxiety imply for educational goals and practice? Perhaps there should be a continuing opportunity for all school personnel and parents to report on their experiences with the tests that have been used. This feedback should also place a great deal of emphasis on students' reactions to their testing experience. It is essential that the reactions of children which give evidence of emotional disturbances in relation to tests be carefully noted and considered, especially when test results are interpreted and used for instructional, guidance, and administrative purposes.

**Teacher Behaviors Which Induce Stress in Students** In the literature much emphasis has been placed on those factors which induce stress in teachers. It is certainly appropriate to examine behaviors of teachers which tend to induce stress in children. The major reason for this is that teacher behaviors could possibly have a serious negative effect on those they teach. This is not a recent concern because over two decades ago, on the basis of minimum incidence statistics and pupil-teacher ratios it was estimated that anxiety may affect as many as 200,000 teachers and through them 5 million students may be effected.<sup>16</sup>

Equally important is the fact that if teachers induce stress in students, the students in turn are likely to manifest behaviors which become stress-inducing factors for teachers, and thus the "vicious circle" is allowed to perpetuate.

Perhaps one of the most satisfactory ways of identifying teacher behaviors that are likely to cause stress among students is to simply ask the students themselves. In this regard we recently conducted a study

with fifth- and sixth-grade children.<sup>11</sup> A question raised with over 200 boys and girls was "What is the one thing that worries you most in school?" As might be expected there was a wide variety of responses. However, the one general characteristic which tended to emerge was the emphasis that teachers place on *competition* in so many school situations. Although the children did not state this specifically, the nature of their responses clearly seemed to be along these lines.

Certainly there are many conditions in the school situation which, is not carefully controlled, can cause *competitive stress*. This condition has been described as occurring when a child feels (perceives) that he will not be able to respond adequately to the performance demands of competition. When the child feels this way he experiences considerable threat to self-esteem which results in stress. Moreover, competitive stress is a negative emotion that a child experiences when he perceives the competition to be personally threatening.<sup>24</sup>

Whenever possible teachers might try to guard against those conditions which may result in competitive stress, and at the same time emphasize those kinds of conditions which will more likely promote *cooperation*. In this regard, it is interesting to note that the terms *cooperation* and *competition* are antonymous; therefore, the reconciliation of children's competitive needs and cooperative needs is not an easy matter. In a sense, we are confronted with an ambivalent situation which, if not handled carefully, could place children in a state of conflict. Modern society not only rewards one kind of behavior (*cooperation*) but its direct opposite (*competition*). Perhaps more often than not our cultural demands sanction these rewards without provision of clear-cut standards of value with regard to specific conditions under which these forms of behavior might well be practiced. Thus, the child is placed in somewhat of a quandary as to when to compete and when to cooperate.

## HELPING CHILDREN UNDERSTAND THE STRESS CONCEPT

The stress concept is complicated and complex. How then, does one attempt to develop such a complex concept with young children? At first glance this might appear to be almost impossible. However, an extensive project by the present authors has resulted in the production of learning materials designed to help children understand, at least in

an elementary way, the concept of stress. The development of this project is reported in detail in the following discussion.

Dr. Hans Selye, one of the most notable scientists of modern times, who is often referred to as the "father of stress," has long been an advocate of stress education for children as well as for adults. It would appear natural then, as has been the case with so many stress-related innovations, that the germ of the idea for the project reported here originated with him. It came about during some correspondence we were having with him about how teachers can cope with stress. This correspondence revealed that one of his major interests was in the area of developing informational materials which would bring the stress concept down to the level of understanding of young children.

Since the present authors had published a number of children's books, and since we had also published materials about stress-related matters, it seemed feasible to explore the possibility of preparing materials about stress for young children. Consequently, we met with Dr. Selye at the International Institute of Stress in Montreal and formulated plans to proceed with the project. At this conference it was decided that the material would be based on the principal behavioral implications of the code of behavior set forth in Dr. Selye's best-selling book, *Stress Without Distress*.<sup>26</sup> This seemed to be a very logical approach because this book is devoted to how to achieve a rewarding life style, in harmony with the laws of nature, by using stress as a positive force for personal achievement and happiness. We proceeded in the following manner.

One of our first concerns was to determine how broad the concepts of stress would need to be for satisfactory internalization. We saw a need for collection of data on children about stress-related experiences; that is, we wanted to find out how definitive children themselves would be when considering stressful situations as well as their level of comprehension about stress. This was accomplished by developing an inquiry instrument that involved a combination of free-response and projective type items. Following are some of the examples of the items along with some representative responses of children.<sup>19</sup>

1. How do you feel when you do something nice for someone?

"I feel nice myself and I feel happy."

"I feel good and glad I did it."

"A good feeling comes over my body."

"I feel good and will do it again."

"I feel happy and proud."

2. How do you feel before you take a test in school?

"I get a funny feeling in my stomach."

"I feel shaky or something scary."

"I feel nervous and afraid I am going to fail."

"I feel shaky, nervous, and sick."

"I feel like I might sweat or something."

3. How do you feel when you can't do something you want to do?

"I get mad and I don't like it."

"I feel like killing the person who said I couldn't do it."

"I feel like screaming and throwing a fit."

"I feel awful and if I can't do something I want to try to forget about it."

"I feel let down."

4. I feel best when \_\_\_\_\_.

"I do something right."

"I do something I always wanted to do."

"I do something good and make somebody happy."

"Someone cares about me."

"When I'm with my friends."

5. I feel worst when \_\_\_\_\_.

"I'm told I did bad."

"Report cards come out."

"I've done something wrong."

"I fail."

"I work to do something and don't make it."

6. Sadness is \_\_\_\_\_.

"Not feeling good."

"Being left out."

"Losing your best friend."

"Not being able to do what I want to do."

"Getting something you like taken away."

7. Happiness is \_\_\_\_\_.

"Being loved."

"When I learn something new."

"When school is out."

"When I get things my way."

"Getting all my work done."

We collected data on over 100 children through this process, and as a result sufficient information was provided to help us determine the extent of the breadth of stress concepts as well as possibilities of internalization of concepts. This information was also used in discussions with children to help them understand how and why their bodies responded in various ways during pleasant and unpleasant situations.

The next step was the identification of the concepts of stress and the code of behavior in *Stress Without Distress* which would be suitable for development with children, and which could also be placed in a frame of reference to which they could relate.

With the above information at hand, the next procedure was the development of a thematic scenario to provide a central theme to which children could relate. It was decided that this could best be accomplished by taking a central character (child) through an entire day with supporting characters in the form of parents, peers, a sibling, and a teacher. The environment included the home, school, and play-time experiences. A story of approximately 1500 words was developed in line with this scenario. The application of a standard readability formula placed the reading level of the story at seven years eight months with a two-month measurement error. (A total of 27 picture clues and illustrations which accompany the text tend to reduce the readability level appreciably.)

The next undertaking was to try the material out with a large number of children in the age range from six to nine years. Because the reading level was too high for the children in the lower age range, the story was *read to* them. The purpose of the try-out was to determine the extent to which the children could understand the concepts as well as to evaluate their interest in the content.

The try-out was deemed successful since teachers who observed the children indicated that they displayed considerable interest in the content as compared to other listening and reading materials. Some typical responses of teachers were:

1. "I feel that the story was well written; however, primary children's interest will always dwindle when there are no accompanying

illustrations." (As mentioned previously, the story in final form is accompanied by 27 picture clues and illustrations.)

2. "The children maintained an interest throughout the entire story and participated actively in the discussion that followed."
3. "The children seemed to understand and remember the events in the story."

The final step of the project was to have the material reproduced in a form to be used for widespread distribution to individuals who might wish to try to provide information for young children to help them have a better understanding about stress. (*Note:* The project was produced by *Kimbo Educational* of Long Branch, New Jersey in 1980 under the title of *Helping Children Understand About Stress*. It consists of a long-play recording (listening experience), ten books of the story, *Ted Learns About Stress* (reading experience), and a teacher's manual with an introduction by Dr. Hans Selye.)

Because the material for this stress-related story for children was scientifically selected, prepared, and tested, it might well be considered unique in the area of children's listening and reading material. To date the outcomes have been most satisfactory in terms of children's interest in the listening and reading content as well as their understanding of certain broad concepts of stress.

## CHILD STRESS REDUCTION TECHNIQUES

As far back as the early 19th century attempts were being made to provide for some sort of relief from the stress and tension of the school day. Perhaps the pioneer in this effort was the famous Swiss educator, Johann Henrich Pestalozzi (1746–1827).<sup>12</sup> While observing his own child, Pestalozzi noticed that after playing for a time the boy tended to concentrate on his studies for an unusually long period. Later, in 1895 Marion Holmes,<sup>9</sup> influenced by the previous fatigue studies of Dr. Leo Burgerstein,<sup>5</sup> submitted research that indicated that the interjection of a short period of physical activity served to stimulate the mental performance that followed. These discoveries no doubt led to the innovation of "recess"—a 10 to 20-minute respite in the school day—which has been a tradition in most schools for many decades.

Although this practice is not ordinarily thought of as a stress-reduction technique for children, it has been postulated that it has satisfac-

torily served the purpose of mental diversion from prolonged "mental fatigue." In recent years more sophisticated approaches have been undertaken to provide for stress reduction in children, and some of these are considered in the following discussions.

### Using Relaxation with Children

Until relatively recent years the use of relaxation as a means of stress reduction appears to have been reserved only for adults. However, in more modern times relaxation procedures have been found to be very effective with children. Moreover, there is some objective evidence to support the idea that the practice of relaxation with children can be beneficial for them in various ways. For example, one study found that there could be significant changes in attentiveness of school children when relaxation training was used.<sup>2</sup> Various other studies have shown that certain measures of anxiety can be lowered as a result of the use of relaxation procedures.<sup>13,17</sup> It has also been found that there is improvement in self-help skills of retarded children after relaxation exercises.<sup>3</sup>

The relaxation techniques used with children follow the same theory of relaxation used with adults; that is, the purpose is to experience tension in a muscle or group of muscles and then "let go." This practice is often referred to as "tensing-releasing." As we shall see later, some practices with children differ from those used with adults since an effort is usually made to make it more of a "fun" experience for children. In addition, some form of *imagery* is almost always used with children while this practice is more or less optional with adults.

A number of researchers report success in using imagery as a dimension of relaxation with children. Kanfer and Goldstein<sup>15</sup> used imagery to advantage in their work on self-instructional training with hyperactive and impulsive children. Schneider and Robin<sup>25</sup> had success with imagery in the development of a self-control program. They developed the technique of training disruptive children to have impulse control by pairing imagery and relaxation.

In what he terms the "release only" phase of relaxation training, McBrien<sup>20</sup> used instructions involving imagery as follows:

Just imagine you are lying on your back on soft green grass . . . you are so comfortable as you look up through the branches and leaves of

a shade tree at the deep blue sky . . . you can see soft white puffy clouds floating by. (Further instructions to focus on the pleasant feelings of relaxation would then follow.)

Another way imagery can be used to promote a relaxed state is by making short descriptive statements to children such as "float like a feather," or "melt like ice." The creative adult and children themselves will be able to think of many such descriptive statements to assist in producing a relaxed state.

### Creative Relaxation

We are well aware of the fine work being done by various persons in the area of stress reduction in children through relaxation. However, space limitations do not permit us to go into detail on all of these techniques. We will, however, use as an example our own approach which we call *creative relaxation*. (To the best of our present knowledge this term originated with the present authors.)

Creative relaxation combines a form of imagery and tensing and releasing. A child, or group of children with various degrees of adult guidance creates a movement(s) designed to tense and relax individual muscles, groups of muscles, or the entire body. Creative relaxation simply means that there are contrasting creative movements that give the effects of tensing and letting go. The following example shows the contrast (tensing and letting go) of the muscles of the arm. (*Note:* A large number of such activities appear in our recent book, *Reducing Stress in Children Through Creative Relaxation*, Charles C. Thomas Publisher, Springfield, Illinois, 1981.)

The teacher or parent could start by raising a question such as the following:

"What would you say is the main difference between a baseball bat and a jump rope?"

This question is then discussed with the children and will no doubt lead to the major differences being that a ball bat is hard and stiff and that a jump rope is soft and limp. The teacher or parent might then proceed as follows:

"Let's see if we can all make one of our arms be like a ball bat." (children create this movement) "Now quickly, can you make your arm be like a jump rope?" (children create the movement by releasing the tensed arm.)

The experience can then be evaluated by using such questions as:

"How did your arm feel when you made it like a bat?"

"How did your arm feel when you made it like a jump rope?"

The creative adult along with the children can produce a discussion that will increase an understanding of the relaxation phenomenon. This is but one approach and adults are limited only by their own creativity and imagination as well as that which they can inspire in children.

### **Systematic Desensitization**

A form of behavior modification known as systematic desensitization is described by one source as "the process of systematically lessening a specific, learned fear in an individual."<sup>28</sup> It is purported to provide one means of controlling anxiety. Credit for the development of the technique as a clinical procedure is ordinarily given to Dr. Joseph Wolpe, a psychiatrist, who is said to have introduced it for the purpose of reducing anxiety reactions.<sup>29</sup>

From a point of view of a clinical psychotherapeutic procedure, Wolpe's desensitization method consists of presenting to the imagination of the deeply relaxed patient the feeblest item in a list of anxiety-evoking stimuli repeatedly, until no more anxiety is evoked. The next item on the list is presented, and so on, until eventually, even the strongest of the anxiety-evoking stimuli fails to evoke any stir of anxiety in the patient. Wolpe's process of systematic desensitization involved three phases as follows: (1) training the subject in deep muscle relaxation, (2) constructing an anxiety-evoking hierarchy of stimuli, and (3) counterposing relaxation and the anxiety-evoking stimuli.

Systematic desensitization has been used with success in terms of lessening anxieties among children. An example of such an experiment is one in which a six and one-half-year-old boy was unsuccessful in classroom verbalization.<sup>19</sup> Medical and psychiatric reports did not show

any known reason for his unwillingness to talk in the classroom. Although the child's test results revealed that he had ability above average, his school progress failed to reach his level of potential. A six-week desensitization program of two sessions per week was developed to try to reduce or eliminate his fear of verbalizing in class. The following hierarchy of anxiety-evoking stimuli was used in the experiment:

1. Reading alone to investigator
2. Reading alone to roommate
3. Reading to two classroom aides
4. Reading to teacher and classroom aides
5. Reading to teacher, classroom aides, and small group of class peers
6. Reading to entire class
7. Asking questions or making comments at weekly meetings when all patients, teachers, and staff were present.

This program of desensitization met with success in alleviating the child's fear of verbalization in the classroom. Other programs of this same general nature have been used to advantage in reducing test-taking anxiety in children and in helping to conquer the phobia of school attendance.<sup>4,7</sup>

In this particular connection one prominent child psychologist, Dr. C. Eugene Walker, Chief, Pediatric Psychology at the University of Oklahoma Medical School, has found that many school children who are not reading and writing as well as they should are just too frightened to do any better.<sup>27</sup> Otherwise "normal" children have phobias of the disciplines, as other people irrationally fear heights or the sight of blood.

Many of the phobias connected with reading and writing result from conditioned reactions. After a time the original problem may be resolved, but the barrier to learning which was removed has been replaced by another one, the phobia. Since the child could not read or write well, he was probably a failure in school. Children may associate reading and writing with failure and most of them are afraid of failing. In time, the fear can grow and the child really needs help. According to Dr. Walker this help almost always comes by systematically desensitizing the fear. The approach has been shown to work repeatedly in research laboratories and in practice.

### Tiger Juice

This interesting approach to child stress reduction combines relaxation and desensitization. It has been developed by Dr. Stewart Bedford the well-known California Clinical Psychologist. The technique derives its name from materials prepared for the purpose by Dr. Bedford—*Tiger Juice, A Book About Stress for Kids (of all ages)*.

The approach takes into account the purpose of our natural stress reactions and relates it to survival in more primitive times when our ancestors had to fight or run from saber-toothed tigers; i.e., the well-known *fight or flight* response.

Specific procedures for use of parents and teachers have been developed to help them use deep muscle relaxation, along with shorter breathing exercises with children. Also considered is the use of guided imagery and how, by combining relaxation with imagery, children can be desensitized to some of the irrational ideas we have about stress in our society.

This technique has met with great success in its use in schools with children at the third- and fourth-grade levels. It has also been of value with early adolescent "slow readers." In addition, in the case of younger children, the technique has been very successful when the prepared material is presented (read to) children by parents. (*Note:* Detailed information regarding this technique can be obtained by contacting Dr. Stewart Bedford, Clinical Psychologist, Route 4, 525-Z, Chico, California).

### Kiddie QR

A relatively recent innovative child stress reduction technique is a process known as the *Quieting Reflex* (QR). The technique was originated by Dr. Charles F. Stroebel, Director of the Hartford, Connecticut Institute of Living, and at the outset it was used exclusively with adults. Dr. Stroebel credits his associates Elizabeth Stroebel and Margaret Holland with modifying the technique for use with young children, i.e., *Kiddie QR: A Choice for Children and QR for Young People*.

Based on a solid foundation of objective evidence, Kiddie QR emphasizes the concept of the goodness of the body and "making friends with one's body." Essentially, it is considered an educational preventative health care program for helping children in the four to nine-year age

range deal with stress. The program is divided into 16 *experiential elements* on tapes of three to seven minutes in length. The tapes are accompanied by several booklets which explain in detail how to use the material. As an example, *Element Number 16*, "My very good feeling self." is designed to help a child understand that homeostasis is a state of physiological and psychological equilibrium. It reinforces the concept that the body is inherently good and that with care and the built-in body safety mechanisms each child can expect a healthy happy life. (*Note:* Detailed information regarding this technique can be obtained from the QR Institute, 119 Forest Drive, Wethersfield, Connecticut).

## PRINCIPLES TO APPLY IN HELPING CHILDREN DEAL WITH STRESS

In closing this chapter it seems appropriate to set forth some general principles which teachers and/or parents might apply in their efforts to help children deal with stress. We interpret the term *principle* to mean *guide to action*. Thus, the following general principles for dealing with stress should be considered as guidelines. Moreover, it should be recognized that each principle is not a separate entity unto itself. This means that all of the principles are in some way interrelated to and/or interdependent upon each other.

1. *Personal health practices should be carefully observed.* This is an easy principle to accept but sometimes it is a difficult one to implement. No one is against health, but not everyone abides by those practices which can help to maintain a suitable level of health. Disregard for such important needs as proper diet, adequate sleep and rest, sufficient physical activity, and balancing work with play can reduce children's ability to cope with the stressful conditions inherent in their daily lives.

Parents should accept the major share of the responsibility for health practices of their children. Teachers are also in a position to provide desirable health learning experiences for their students. Accepting this responsibility can at least partially eliminate unacceptable health behaviors which would be stress inducing for children.

2. *There should be continuous self-evaluation.* The practice of constantly taking stock of one's activities can help to minimize problems encountered in the daily environment. This can be accomplished in part by taking a little time with children at the end of each day for an eval-

uation of the events that occurred during the day and reactions to those events.

3. *Learn to take one thing at a time.* This is concerned with time budgeting and procrastination. Teachers, parents, and children as well are sometimes likely to put things off and as a consequence frustrations can build up as tasks pile up. There is a need to sort out those tasks in order of importance and attack them one at a time. Proper budgeting of time can help to alleviate procrastination which in itself can be a stress inducing factor. Budgeting of time can help to eliminate worries of time urgency and the feeling of "too much to do in too short a time." Teachers and parents should make a serious effort to help children develop these skills.

4. *Learn to take things less seriously.* This should not be interpreted to mean that teaching and parenting should not be taken seriously. It does mean that there can be a fine line between what is actually serious and what is not. Sometimes when people look back at a particular event, they may wonder how they could have become so excited about it. Those teachers who are able to see the humorous side in the classroom tend to look at a potentially stressful situation more objectively, and this can assist in keeping stress levels low. This idea can be instilled in children, particularly those who tend to take life too seriously at an early age.

5. *Do things for others.* Teachers and parents can sometimes take their mind off their own stressful conditions by offering to do something for other persons. Children should be taught to develop this concept early in life. When individuals are helpful to others in attempting to relieve them of stress they in turn will tend to be relieved of stress themselves. Research consistently tends to show that those persons who volunteer to help others oftentimes get as much benefit from this practice as those they volunteer to help. In this regard, it has been clearly demonstrated that older children who have reading problems improve in their own reading ability when they assist younger children with these same problems.

6. *Talk things over with others.* Teachers, parents, and children as well sometimes tend to keep things to themselves and hence they may not be aware that others may be disturbed by the same things. Sometimes discussing something with a parent, teacher, or playmate can help a child see things in a much different light. Therefore, adults should encourage children to engage in this practice.

7. *Stress should not be confused with challenge.* Constructive stress in the right amounts can be challenging and promote motivation, thinking and task completion. Thus, recognizing stress as a natural phenomenon of life is no doubt one of the first and most important steps in dealing with it. This is a concept that adults should make every effort to develop with children at an early age.

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# 9

## Stress-Coping Strategies: The Role of Meditation\*

by A. S. Sethi, Ph.D.

*Associate Professor, Master of Health Administration Programme,  
Faculty of Administration, University of Ottawa.*

This chapter will examine four key variables in stress perception and its management in modern organizations:

- I—Demands made by the complex environment
- II—Perceptions of organizational members
- III—Effects or results which are crucial to the individual's health as well as that of the organization for which he or she works
- IV—Coping mechanisms used, both at work and off work, for effective stress management.

The role of meditation as a stress-coping device is crucial, and this article will outline the general characteristics of the meditational process and how it can be used by administrators and other workers in the management of stress.

In modern organizational life stress has become a subject of increasing importance, and meditation as a coping device has received attention in the West in the last decade. Stress is recognized as a primary or

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secondary cause of morbidity and mortality in the population at large. Coronary heart disease and mental ill-health are particularly stress-related diseases, and the role of stress becomes evident when it is realized that more than 50% of all deaths in advanced societies are estimated to occur due to CHD, and that in the United States alone more than 100 million Americans have some degree of CHD.

Organizations must face the challenge of developing new structures and policies to meet changing constraints and opportunities in the complex living environment. This urgency to adapt on the part of workers signifies stress, and managers and professionals must learn to utilize stress in a constructive manner to increase their personal efficiency and maintain organizational productivity and effectiveness. We intend to explore ways in which meditation can play an effective role in this stress management process.

Stress, in the words of its foremost researcher, Hans Selye<sup>30</sup> is the ("non-specific response of the body to any demand made upon it.") In the face of a stressor, signaled by the brain, ACTH, cortisone, and cortisol are produced by the pituitary and adrenal glands. The response goes through three stages: the initial alarm followed by the stage of resistance, "a chemical rallying of the body's defences." If the stressor is continued, an exhaustion of resources sets in, as the defense system gradually wears down.

Recent researchers have modified Selye's definition, Lazarus,<sup>22</sup> Coffer and Appley,<sup>10</sup> McGrath,<sup>23</sup> Beehr and Newman,<sup>2</sup> Brown,<sup>6</sup> McLean,<sup>24</sup> and Schuler<sup>29</sup> by emphasizing that stress results from three interrelated parameters: (1) response, (2) stimulus, and (3) a combination of stimulus-response reactions. The individual's appraisal system plays a great role in stress management. Stress is thus a "state of an organism where he perceives that this well-being or integrity is endangered and that he must divert all his energies to its protection."<sup>10</sup> Stress is "unfavorable perception of the social environment and its dynamics."<sup>6,7</sup> "Stress involves an interaction of person and environment."<sup>23</sup> Or in Beehr and Newman's words, stress disrupts or enhances the individual's "psychological or physiological condition such that the person (mind and/or body) is forced to deviate from normal functioning." Schuler<sup>29</sup> regards stress as a dynamic condition in which an individual is confronted with an opportunity, constraint, or demand, the resolution of which "is perceived to have uncertainty but which will lead (upon resolution) to important outcomes."

## DEMANDS MADE BY THE ENVIRONMENT

A number of factors are at work which should be considered in assessing the distressing nature and effect of stress. Cooper and Marshall<sup>11</sup> suggest that multiple factors "at work" cause stress, leading into symptoms of occupational ill-health, that may eventually lead into coronary heart disease, mental ill-health, and other psychosomatic diseases. According to Cooper and Marshall the following are the major sources of stress at work:<sup>11</sup>

**A—Intrinsic to job:**

- a—Poor physical working conditions
- b—Work overload
- c—Time pressures
- d—Physical danger, etc.

**B—Role in Organization**

- a—Role ambiguity
- b—Role conflict
- c—Responsibility for staffs
- d—Conflicts occurring due to ill-defined organizational boundaries,  
both internal and external

**C—Career Development:**

- a—Overpromotion
- b—Underpromotion
- c—Lack of job security
- d—Thwarted ambition, etc.

**D—Relationship at Work:**

- a—Poor relations with boss, board, subordinates, or colleagues
- b—Difficulties in delegation
- c—Responsibility problems, etc.

**E—Organizational Structure and Climate:**

- a—Little or no participation
- b—Subsidiary role in major decision making
- c—Restriction on behavior (budgets, cost containment, etc.)
- d—Organizational political, political climate
- e—Lack of effective consultation, etc.

Most of these variables appear at first glance outside the influence of meditation, but on closer examination it would appear that organizational members can improve their role understanding through self-

understanding and an improved processing of perceptual data. I will argue that such a self-awareness by the individual organizational member can be helped by meditation, through a transformation of his or her consciousness.<sup>1</sup>

One of the key questions on stress is: Is all stress bad? Hans Selye points out that all stress is not bad and that as a professional he must learn how to live with stress by using his or her adaptational energy productively.

One must therefore distinguish between bad stress (distress) and good stress (eustress). Selye<sup>31</sup> depicts this relationship as follows:

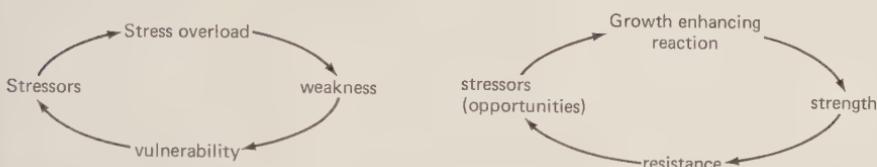


Figure 9-1 The two stress reactions: Distress and eustress. (H. Selye, *Stress without Distress*, 1974).

## PERCEPTIONS OF ORGANIZATIONAL MEMBERS

The response to stress and stressors depends on the mediation of some appraising, perceiving, or interpreting mechanism on part of the individual staff and his level of awareness. I will return to awareness in a later part of this paper. At this point I will discuss certain individual characteristics which are more stress prone:

Friedman and Rosenman<sup>13</sup> have shown that individuals with aggressive and competitive personality profiles (Type A) are more than twice as prone to coronary disease than those who are not so preoccupied with achievement and are less competitive (Type B). These findings have been supported in Canada by studies conducted by Howard, Cunningham, and Rechnitzer.<sup>17</sup> The A-Type person has an awareness pattern which has the following characteristics, as summarized by H. Von Digl:<sup>39</sup>

- (a) An intense sustained achievement orientation to self-directed but usually ill-defined objectives. The person is involved in a "chronic, incessant struggle to achieve more and more in less and less time,"

- (b) Strong tendency to compete,
- (c) Continuous desire for recognition and status enhancement,
- (d) Persistent involvement in multiple and diverse functions, following her "polyphasic thinking,"
- (e) Tendency to think and work at diverse physical and mental functions,
- (f) A tendency to focus on awareness employed to meet the goals of achievement rather than enjoying in the bliss of "being."

The individual's perceptual apparatus will be affected by his/her level of anxiety, and tolerance for ambiguity, his/her level of expectation, and the gap between expectation and perception. Dr. Barbara Brown states:

The two most obvious and crucial intellectual operations occurring in any situation involving interactions among human beings (or their surrogates, such as groups, organizations, or corporations) are perceptions of situations (or conditions) and expectations. Significant differences between these intellectual activities are generally recognized as the basis of psychological conflicts. I propose that the state of interaction between perceptions and expectations comprises the fundamental operational mechanism underlying both states of well-being and states of stress.<sup>7</sup>

## EFFECTS OF STRESS

If stress is left unmanaged, it will lead to symptoms of occupational ill-health. This means that a combination of factors (i.e., stressors) interact with the individual to disrupt his or her psychophysiological homeostasis and may lead to psychosomatic disorders.<sup>2</sup> For the individual it may result in increased diastolic blood pressure and cholesterol level, heart rate, smoking, depressive mood, escapist drinking, job dissatisfaction and reduced aspiration. The sum total of these symptoms may result in coronary heart disease and mental ill-health. Kets de Vries<sup>19</sup> points out that cardiovascular reactions generally include high blood pressure, hypertension, elevated serum cholesterol, rapid heart beat, and coronaries. The gastrointestinal reactions will include ulcers and colitis. Allergy-respiratory reactions will include asthma and skin disorders.

Oral reactions will include alcoholism, obesity, pillpopping, (excessive smoking, excessive coffee drinking). Emotional distress reactions will result in depression, suicide, agitation, insomnia, job tension, etc.). For the organization, results may be mirrored in high turnover, absenteeism, strikes, accidents, and qualitative and quantitative output problems.

## COPING MECHANISMS USED AT WORK AND OFF WORK

In a strategy of stress-coping, as McLean<sup>19</sup> has recommended three key concepts should be covered: stress, stressor, and stress reaction. Kets de Vries<sup>19</sup> recommends multifactorial approach to stress coping: including sociocultural environment effect, nonwork environment effect, personality effect, and organization effect. Kets de Vries states:

The data needed for the stress audit can be collected with the aid of questionnaires, clinical-diagnostic interviews, and if possible, physiological examination. A typical questionnaire should include a stress symptom survey, an organizational survey (including questions about job demands, task characteristics, career, performance variables and characteristics of the organization's environment), questions dealing with extraorganizational variables (i.e., the social readjustment rating scale (Holmes and Rahe, 1967) and questions dealing with personality (Friedman and Rosenman 1974).

Through factor analysis and multiple regression, stress reaction patterns can be identified, and relationships will be established between causal, mediating, and end result variables. Occupational, departmental, divisional, and geographical differences will be highlighted. Stress peaks will be located which warrant special attention in the organization. Moreover, if the stress audit becomes a more accepted procedure in organizations a data bank will be developed allowing comparisons between different types of organizations and different industries.<sup>19</sup>

In my coping framework I divide coping strategies into two categories: personal coping strategies and organizational coping strategies. My argument is that a combined strategy will be more effective in stress reduction and effective stress management in modern organizations. In this paper I will deal with personal coping strategy, and I have selected

meditation as a mode of response to stress management. Meditation works effectively when it is combined with other personal strategies such as fitness, diet, and life-style changes, biofeedback, gestalt therapy, and transactional analysis.

## PERSONAL COPING STRATEGIES

### Meditation\*

Meditation can be used as a coping strategy by the staff.<sup>9,25,40</sup> Meditation helps toward increasing the individual's awareness of his or her streams of consciousness. The stream of consciousness may include any of the following as explained by Strange.<sup>37</sup>

1. A complex of mental activities changing and flowing in time.
2. A succession of states, each real, yet different in quality and kind from each other, not just different combinations of mental activities.
3. A personal participation in universal (cosmic) consciousness.
4. A flow of personal experience.
5. An epiphenomenal by-product of continuous brain functioning.
6. A matter of schedules of reinforcement provided by our social environment.
7. Subjective awareness correlated with brain functioning.
8. A set of emergent properties or characteristics.

Basically meditation implies clarifying one's perceptions about one's stream of consciousness so that the individual tackles his or her problems in a renewed and clearer perspective.

The key processes in a meditation strategy would be the following:

**Meditation on Inner Power** In order to solve problems creatively one must tap one's inner resources. The implication of this approach is that

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\*This meditational exercise is based on the author's personal experience. The process is simple and has been distilled from sources as Zen Buddhism, Sufism, Sikhism, Transcendental Meditation, Yoga, Meister Eckhart, Biofeedback, Relaxation Response, Clinically Standardized Meditation, Krishnamurti, and Alan Watts.<sup>3,5,9,12,15,20,21,36,42,44</sup>

one must learn to appreciate the value of the present moment and its reality because it is during these moments that a new source of intelligence and inner power is experienced in the stream of consciousness.<sup>27</sup> In other words, the source of internal freedom occurs when the staff member comes to grip with his/her present reality as it is. This is not a strategy of withdrawal, of not facing the problems, or not knowing where one is going; rather it is a strategy of using one's creative self for effective problem solving.

**Meditation on Problems** For all ideas of problem solving relate solely to our perception of the problem and its relation to various goals. The way the problem is defined is significant; but what is not defined as a problem is equally important. Another way of stating this point is that problems should be related to goals, because failure to relate problems to goals usually results in greater complexity and stress, not to mention our failure to be aware of what our goals are, and what our priorities are among competing goals. Meditation creates a method (*upaya*) of "direct perception or seeing" in order to bridge the gap between the present situation and the future goal. When solving a difficult problem it is of help to relate the problem to goals but it is of no help if the individual cannot directly perceive the gap that exists between "what is" and "what should be."

For the individual must himself become problem-free by emptying his mind of all types of corrupting data. We agree with Battista<sup>1</sup> that consciousness is information, and the processing of this information is important in solving logical and emotional problems. However, it should be emphasized that one must transcend one's own level of cognition in order to become content, free, or empty. The emptiness of consciousness does not imply that there are no thoughts, but that there is an "overabundance" of mental activity, made possible by emptying the mind of all sorts of data.<sup>38</sup> The tape in the individual's mind stifles his initiative to leap into freedom, which is a contemplative state—a state of consciousness in which he is reconnected to his source of freedom. For without being equipped with this internal transformation of consciousness, approach to problem-solving remains at best a ritual. We cannot find any innovation, spark, or creativity because we try to grasp the problem without grasping ourselves. Our paralyzed approach to problem-solving results from not using our real self—the strength that resides within us.

We approach problems with old ways—we have no basis for freshness, no time for spontaneity, are too systematized for creativity. Friedman and Rosenman report their experience: "It has been distressing for us to observe the severely afflicted Type A subject when he is confronted with new challenges. Desperate, he tries to run faster in his old ways to overcome a problem whose solution cannot be achieved by stereotyped and hasty thinking, but only by creative, *time-free contemplation* (underlines mine) and deliberation."<sup>13</sup>

**Meditation on Decisions** Decision making is central to stress-coping. In order to make a decision, thinking and action must be reconciled, for decisions are distorted when the decision-maker acts with a split mind—one part thinking and standing aside too far away from the other, to act, to move, to be practical. The illusion of the split comes from the individual's attempt to be overpragmatic. To decide effectively he must refine his pragmatism by integrating thought and actions, through using the "cybernetic" of his mind, as Alan Watts states: "It is . . . part of the very genius of the human mind that it can, as it were, stand aside from life and reflect upon problems it faces."<sup>42,44</sup> Improvement in the quality of the decision-making process results from deep reflection in a detached way. Selye has also recommended that a major coping approach is relaxation or "diversion from the demand."<sup>32</sup>

**Meditation on Self** It takes time to diagnose yourself; one must therefore be patient. It may take several months or even years to arrive at an adequate and positive level of stress-coping. The process must be followed systematically, objectively, and precisely; therefore it is essential to understand this process clearly. This is a process in which the individual can carry out analysis of his own behavior to determine stress and coping. This diagnostic approach to self-analysis should be modified to suit the individual's needs, strengths, and his goals.

In this self-analysis one should be objective. We realize that this process cannot be completely objective because it involves the individual world view, his perception of his conscious and subconscious levels; although he may not be aware of his unconscious at a given time, it may be affected by general norms or the values of a given culture that may reside in his "collective unconscious."<sup>18</sup>

Moreover, the objectivity of the individual will be subject to the goals

that he seeks in analysis. If analysis is a stress-coping tool, then it will achieve just that, and no more. In case the individual wishes to proceed further and gain some spiritual insights, then meditation may become a bit more objective, because in the higher stages of contemplation one must become completely relaxed, neutral, and empty of all goals.

To make self-analysis an effective coping strategy, the individual must precisely perceive his or her worth and state of mind with respect to relationships with other people. It is essential to be aware of all the defense mechanisms, one's desires and cravings and instincts. Meditation is a good strategy for the staff member to prevent stress. "Meditation is a 'centering' technique by which the staff can get out stereotyped responses, and substitute repetitive urgency for creative energy."<sup>13</sup>

### A Method of Meditation\*

I will describe briefly how the staff members can meditate. The first step is to sit cross-legged on the floor. (The yogi lotus-positure is ideal, but if you are not accustomed to it, then simple sitting will do). I prefer to sit on the floor as it helps to keep my back straight. Close your eyes, but not tightly, and look upwards in the center of your eyes. Next you should use a biofeedback technique to let go to your patterns and muscle tensions by repeating numbers. Number 4 lets go of bodily tension, and go through in your visualization each part of your body, and let it go. Number 3 lets go of your emotional tensions, and go through the ones that come to your mind, and let them go. Number 2 lets go of your conceptual ruminations arising either out of past events or future anticipations. Number 1 lets go of your goals or purposes of life. Number 2 and Number 1 will require some training in order to be able to accomplish the "letting go." It should be repeated that all purposes, goals, etc., are abandoned, even the goal of doing this meditation for avoiding stress. You are entering into Friedman and Rosenman's Type B pattern when you do not feel any sense of time urgency or goal achievement. You are doing this meditation for fun and relaxation, and you are not even bothered about the superiority of your technique. Number 0 relaxes you without guilt, purposes, or any agitation. You are no longer impatient and are at peace with yourself.

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\*The method of meditation is described in a later part of this article.

In order to assist you to attain the zero stage, you will rely on a *mantra*, a word that you will repeat to yourself, first loudly as a chant and then slowly within your mind. I repeat the word, "Wahguru" drawn from the Sikh scripture *Guru Granth*, literally meaning wonderful light. A substitute is the word *Om* (drawn from Upanisads) or "one" (recommended by Dr. Benson). There are, of course, a variety of *mantras* given by the TM teachers and other gurus, and the choice is left to the practitioner. What is important is to use the *mantra* as a technique to alter your consciousness from a tense, hurried, goal-oriented state to a relaxed, goalless, playful, energetic, blissful, and peaceful state, or what we have called a zero state. Initially one's attention is focused on the meaning of the *mantra*, but gradually it shifts to the sound and the vibration it creates for the meditator. When you come to a zero state, you should enjoy that warm cozy feeling, which comes when all thoughts have been emptied.

Another technique that can be used to arrive at a zero state is watching your breath. Breathe naturally and watch the inflow and outflow of breath. Deep breathing is helpful but is not required.

It should take about 30 minutes for you to complete the above meditation, and it can be done by yourself at any time at any place. (It can be done while walking as well, so it is not essential to sit). Gradually you will be able to reach the zero state via a minimeditation (lasting one to five minutes) right in the middle of a board meeting or while visiting the washroom. With training and practice you will understand the state of your unconsciousness, and will be able to realize the egoless (zero) state in no time.

One philosophical assumption should be mentioned. You should not try to meditate (just as one cannot try to sleep), but let it become a happening of which you are a part. In other words, meditation will help you to realize the metaphysical truth that you, as an administrator, do not exist as a separate entity, but are one pattern in the whole scheme of things. You will realize the vision of wholeness and comprehend the foundation of the "systems philosophy" in your experience in meditation.

### How Meditation Can Help in Gestalt Approach

The individual must be prepared in his self-diagnosis to face all the positive and negative aspects of one's feelings and thoughts. In this respect,

this process comes close to a gestalt approach, in which both negative and positive feelings are expressed, say by a manager to his subordinates telling them about his feelings of support as well as authoritarian-directive impulses as well. "With their full expression his subordinates can more completely experience totality of the manager's reality. Then they (i.e., subordinates) can accept or contest it (and him) as they see fit. From his interchange of all expression and full reaction both the manager and his subordinates can grow in a more meaningful way."<sup>16</sup>

In coping with staff job stress one should not only self-diagnose but also make other members of one's role set more aware of the problems. Organizational membership should give everyone the right to bring together those in his role set with a goal of reaching agreement concerning each member's individual duties and performance. The gestalt approach, like meditation, stresses that each staff member should explore both "good" and "bad" feelings about other people as well as about him or herself. In the gestalt framework, one does not "back away from impulsive behavior," but "goes further into it" "until it reaches its natural conclusion." In meditation also one goes into instincts and impulses, and recognizes the true nature of one's being and behavior.

The gestalt approach is different from that of a "participative manager" or MacGregor's "Theory Y" manager in which one tends to show the better side of one's personality, but suppresses the so-called "bad" feelings within oneself which, of course, burst up at some point. As Herman explains, in gestalt approach, one can be a victim of the "myth of (one's) total helplessness," which is shown by the individual becoming an almost "intolerable tyrant," as this approach allows him to express all of his feelings including the most negative ones. (The opposite side of this would be the myth of omnipotence, in which the manager believes too much in his power, i.e., he has this "awesome force" or power over other people). Both the myths, whether of omnipotence or helplessness, may be examples of wrong perceptions. In meditation and gestalt, as soon as one recognizes the important place of these myths in oneself, they begin to disappear.

In order that managers and subordinates in an organization are able to fully "express themselves," (as in a gestalt approach), it is helpful if they are guided into a process of understanding, via meditative approaches, to know and experience "where they are." How else would one know "where one is," if not through meditation or somewhat similar process!

The gestalt mode encourages "stronger, deeper, and more concrete (as contrasted to abstract or generalized) interactions." One does not jump into solutions without first understanding where one stands in relation to one's positive and negative feelings. The individuals are encouraged to "dramatize and even exaggerate their behaviors to become fully aware of what they are doing and how they are doing it (not why)." The manager who does not listen is encouraged to go further into his non-listening mode, to discover and be explicit about what he is doing, and how he keeps himself from listening . . . "Our view is that contemplation can assist in this process of listening or paying attention to variables which prevent listening in this example. Although gestalt recognizes the importance of the process of increasing awareness and provides "techniques of awareness,"<sup>26</sup> meditation can be used as a supportive technology in the experience of consciousness which can assist the individual to uncover his conscious. This can be done through meditation.

Gestalt and meditation both recognize the existence of polarities within the individual's self. (These polarities refer to extremes within each of us, i.e., weakness-strength, or as is popularly known in gestalt "dog/underdog" conflict). A part of us tells "what we should do" and the other part resists the "business of top dog" and attempts to divert or delay his directives. In gestalt, the individual increases his "awarenesss of both forces within himself; especially, he becomes aware of the power inherent in his underdog position." As this new awareness grows, the administrator can use the energy to integrate the two conflicting parts. As Herman says, "Later, when he has . . . experienced his own extremes he may move naturally to an 'integration' i.e., he is able to regain his access to those parts of himself he has submerged or renounced and so eventually he becomes able to utilize as the situation requires, as a more complete spectrum of his behavioral potential." What is, however, missed in this approach is the precise need of the individual to establish this integration which takes place after some effort on the part of the individual him/herself, or guided by someone (whether a therapist or a consultant in the case of meditation). Meditation can be of great assistance in integrating and unifying the various split portions of ourselves.

The basic coping questions in stress, are "what I feel" and "how I feel." The "why" is accepted as a given. In this process of finding out the "reality" about oneself, and how one perceives this reality, one is

then prepared to face the problem in a more objective, fresh, and creative way. In a stress-coping process then, one first withdraws from the problem in order to devote one's energy toward clarifying the underlying forces that have caused the problem, which may be the conflicting patterns of perceptions within the individual, in others, or in the environment.

"Taking things as they are" and "letting go" are relaxation processes which take time, but above all require the individual to repress nothing and become open to both negative and positive sides, and in such recognition discover a new source of power which lies deep within. As a result, release of this power can be utilized rather than either being allowed to waste away or lie dormant.

The contemplative stress-coping process is interactive for the conscious and the unconscious parts of oneself, and the analytical task is to undertake a precise, systematic, and objective examination: to be systematic does not imply the following of "how-to" step-by-step methodology, but rather a wholistic (or holistic) approach of recognizing a perspective on things; objectivity is required to gain authenticity and reality as it is, and precision is required to be able to sort out the positive and negative sides of our feelings and thoughts in relation to ourselves and others in this complex game of living, albeit organizational living.

### **How Meditation Can Help in Transactional Analysis (TA)**

Transactional Analysis (TA) has gained some popularity in recent years as a stress-coping tool. According to Eric Berne, who founded the discipline, the transaction—a unit of social intercourse—is defined as follows:

If two or more people encounter each other . . . sooner or later one of them will speak, or give some other indication of acknowledging the presence of the others. This is called the *transactional stimulus*. Another person will then say or do something which is in some way related to the stimulus, and that is called the *transactional response*.<sup>4</sup>

The role of TA is to provide a "method of systematizing the information derived from analyzing these transactions."<sup>14</sup>

Rush and McGrath make a case for TA's applicability to interpersonal relations as a tool of personnel development, when they state:

"Transactional analysis—a system of psychotherapy based on the examination of a single unit of social interaction (a transaction) or on chains of transactions . . .—is . . . still another instance of business adopting a technique originally designed for use in group therapy . . ."<sup>28</sup> The planned applications of TA in the business sector has been continuously increasing since 1969, and there is evidence that it is gaining in popularity.

### **How Meditation Can Help in Biofeedback as a Coping Strategy**

An effective strategy that can be combined with meditation is biofeedback. It is an effective stress-reduction technique and one can learn to control certain physiologic functions and regulate the flow of nerve impulses. There occurs in one's brain a shift from beta to alpha waves and sometimes to theta. When the brain responds under pressure it signals beta frequencies; alpha reflects a more relaxed and contemplative mood, theta is associated with creative thinking, and delta, the lowest frequency with sleep. An EEG is used to monitor the activity within the brain, or an EMG is used in muscle control.

### **CONCLUSION**

My hypothesis is that stress coping is more effective when we employ a combination of contemplative strategies. A combination of self-analysis, gestalt, meditation, and biofeedback may be the best mix.<sup>34</sup> In effect, meditation can be profitably used for coping in conjunction with organizational coping strategies. The coping is a dynamic one, and will change with each staff member's ability and his/her perception of his/her social well-being, as well as the adequacy of training in the meditative technique.

To permit staffs to cope with stress, as well as release their creative potential to adapt to change, meditation has a crucial part to play. The suggestion advanced in this paper is that without an effective diagnostic approach to coping, the worker may fail to realize some of the goals of his/her development because at some point he/she must come to grips with his/her conflicting selves,—a task that can be handled in meditative coping, in conjunction with other organizational and personal strat-

egies of adaptation to stress. The staff member should moderate his/her Type A propensities, and pay attention to the joys of *being* (which is a contemplative mode). He/she should balance the competitive mode (stemming from the cultural values of ambition, acquiring things, and "other-directedness") with the contemplative mode (resulting from self-training in meditation).

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# 10

## Delaying Deterioration by Improving Homeostatic Mechanisms in Body-Mind Organism\*

**Daniel G. Lipman, M.D.**

*Consultant in Psychiatry and Internal Medicine to Bureau of Hearings and Appeals, Social Security Administration, Department of Health and Human Services; Assistant Clinical Professor, Department of Psychiatry and Behavioral Sciences, The George Washington University School of Medicine, Washington, D.C.; Assistant Clinical Professor, Department of Psychiatry, Howard University College of Medicine, Washington, D.C.; Director of Research, Creative Research Institutes, Inc., Caithesburg, Maryland, and Jerusalem, Israel.*

The body-mind organism, as an open system, depends upon the external environment for input of air, food, and water, and upon the internal environment for utilization and incorporation of critical ingredients and elimination of nonessentials as well as harmful by-products of metabolism, foreign bodies, etc. The body-mind organism depends on both the external and internal environments for acceptable biofeedback, biorhythmic, and behavioral mechanisms conducive to the maintenance of homeostatic equilibrium. Education, ecology, and economy, which are

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\*A first version was presented at The Fifth World Congress of the International College of Psychosomatic Medicine, Jerusalem, Israel, September 10, 1979 describing these data.

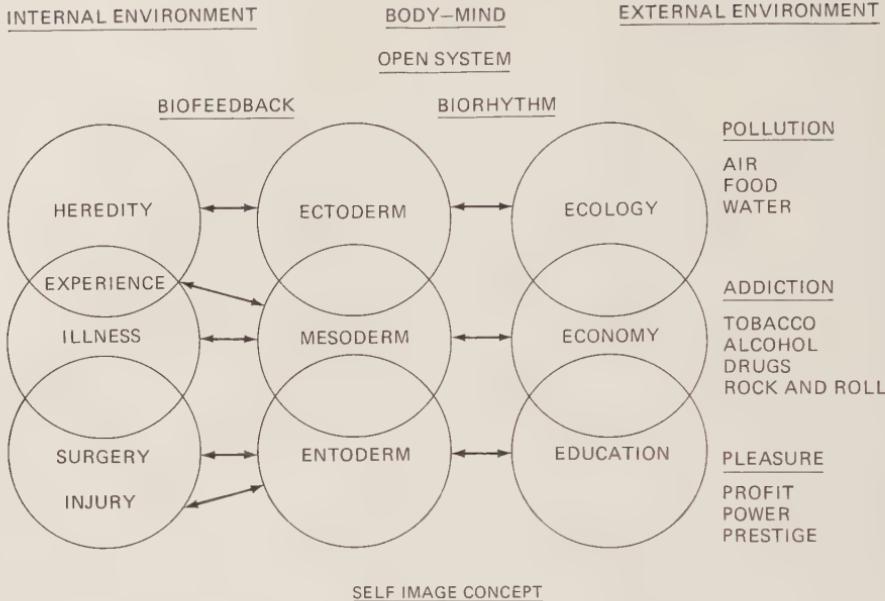
interdependent in our society, vitally influence the input, incorporation, and output of the Body-Mind organism.

Each body-mind individual develops a self-image concept which is either positive or negative depending on either successful (positive), or unsuccessful (negative), past experiences. (See Figure 10-1) Biorhythmic and biofeedback mechanisms play a vital role in the positive or negative conditioning that contributes to homeostatic equilibrium or disequilibrium in the body-mind organism. Genetic defects, previous illness, injury, surgery, etc., tend to predispose the individual to negative input from the internal environment whereas polluted air, polluted water, and food adulterated by additives, preservatives, artificial colorings and other foreign substances, together with the discordant biorhythms produced by tobacco, alcohol abuse, and drug abuse, contribute to the negative conditioning input from the external environment. Frequently, the resultant negative self-image has a core of self-hatred which is projected outward as antisocial behavior and/or hatred of others. (See Figure 10-1)

Fortunate is that rare individual who has a positive self-image. He or she is truly proud of being alive and enjoys being of service to others, i.e., self-love projected universally. Selye calls this "Altruistic Egoism" in his book '*Stress Without Distress*.' (See Figure 10-1)

What is stress? In physiology, according to the concept of Hans Selye, stress is defined as "the state manifested by a specific syndrome which consists of all the nonspecifically-induced changes within a biologic system," or put more simply, "Stress is the nonspecific response of the body to any demand."<sup>13</sup>

Homo sapien's response to stress depends to a great extent on conditioning factors, which can be classified as internal conditioning (our hereditary predispositions and previous experiences), and external conditioning (variables which exert their influences simultaneously with an outside agent). Although Claude Bernard was one of the first to discuss "the constancy of the internal environment,"<sup>2</sup> and Cannon is credited with coining the term "homeostasis,"<sup>3</sup> it remained for Hans Selye to research and describe the "General Adaptation Syndrome or G.A.S.," which brings disease into focus as a product of Stress and Adaptation. Selye states that "the General Adaptation Syndrome or G.A.S. represents the manifestations of stress in the whole body, as they develop in time."<sup>14</sup> Thus, the General Adaptation Syndrome evolves in three stages:



CONDITIONING → NEGATIVE → SELF HATRED → DESTRUCTIVE PROJECTION

CONDITIONING → POSITIVE → SELF LOVE → CONDUCTIVE PROJECTION

STRESS: — Nonspecific response of Body-Mind to any demand upon it. (Selye)

ANXIETY = STRESS X FRUSTRATION TENDENCY A=SF (constant) A=STRAIN (Lipman)

STRESS WITHOUT DISTRESS: → ALTRUISTIC EGOTISM (Selye)

GENERAL ADAPTATION SYNDROME (G.A.S.)

- I) ALARM REACTION: BODY MIND ALERT → FIGHT OR FLIGHT
  - II) STAGE OF RESISTANCE: OPTIMUM ADAPTATION → OPTIMUM HEALTH
  - III) STAGE OF EXHAUSTION: ALL ADAPTATIONAL RESOURCES EXHAUSTED → ILLNESS → DEATH
- DELAYING DETERIORATION BY IMPROVING HOMEOSTATIC MECHANISMS

IN BODY-MIND ORGANISM

Presented at Fifth World Congress of International College of Psychosomatic Medicine. Jerusalem, Israel. September 10, 1979

Figure 10-1

1. Alarm Reaction (A.R.) in which the physiological processes are alerted to fight or flight, but in which adaptation has not yet occurred.
2. Stage of Resistance (S.R.) in which adaptation becomes optimal.
3. Stage of Exhaustion (S.E.) in which all the adaptation resources have become exhausted and the body deteriorates into illness

(maladaptation), and death ensues if the stress persists to a prevailing degree.

In each of the states of the general adaptation syndrome there are psychic and somatic components which exert their optimum influence during the stage of resistance and will help determine the onset and progress or delay of disease. If the somatic defense mechanisms are inadequate or distorted the resulting illness will be manifested primarily in physical disturbances such as hypertension, arthritis, arteriosclerosis, colitis, asthma, cancer, etc. On the other hand, if the psychic or emotional defense mechanisms are inadequate, the resulting illness will manifest itself primarily as a neuropsychiatric disorder such as neurosis, character disorder, or as a psychotic break with reality. Accordingly any attempt at prevention or treatment of any illness should aim at fortifying the stage of resistance of the general adaptation syndrome with due regard to both the somatic and psychic components.

In physics stress refers to the "internal forces that are created within a material as a result of forces applied to it," and "strain is a measure of the amount a body is deformed by a stress." According to Hooke's Law of Elasticity, "the deformation of a solid body is proportional to the force acting on it," or it can be said that "Stress is proportional to Strain."<sup>7</sup>

Theoretically, the strain an inanimate object undergoes varies directly with the stress applied, multiplied by the proportionality constant Y, otherwise known as Young's Modulus of the material, i.e.,  $\text{Strain} = Y \times (\text{Stress})$ . Although this formula is constant in inanimate objects, in living body-mind organisms we must recognize certain variables for an adequate understanding of external and internal forces producing similar stress and strain to which we can apply a similar formula. For purposes of this discussion we will use the term living energy as referring to those forces that are created within the living body as a result of internal and external influences. Living energy is ordinarily utilized in a creative manner in repair and replacement of tissues, growth, metabolism, and all the biological and psychological mechanisms utilized in maintaining biopsychosocial homeostatic equilibrium. Thus we see the vital role of living energy in the maintenance of the integrity of the soma and as socially adaptive behavior in the psyche, in the continuous struggle against disease, whether psychosomatic or somatopsychic.

The psychic portion of living energy not being utilized for adaptive or conceptual creative purposes can be conceived as accumulating in a pool in the subconscious as what is frequently alluded to as "nervous energy." A more appropriate term is "frustration energy," which manifests itself in symptoms of anxiety, having both biological and psychological components, and varying in degree depending on an individual's frustration tendency.

Now we can apply Young's formula to the living human. If A (strain) represents anxiety (subconscious frustration energy), S represents stress, and F stands for frustration tendency, then  $A = F(S)$ . Thus if either S (stress) or F (frustration tendency) are low in intensity then it follows that A (anxiety) will also be tolerably low, and the individual can be symptom free and functioning in a socially acceptable manner. However, when either S or F are increased, then it follows that the anxiety level may rise above the individual's tolerance and produce symptoms of either somatopsychic or psychosomatic illness. If neither the stress nor the frustration tendency are lowered, then the individual will eventually pass into the stage of exhaustion with subsequent deterioration and death.

A review of neurotic reactions to severe combat stress, especially among aviators in World War II, revealed many instances where the initial intense response (alarm reaction) was followed by acquired intense resistance (stage of resistance) to emotional stress. However, depending on the individual's tolerance or limitation to the amount of stress he could withstand, sooner or later exhaustion set in. This was referred to by Grinker and Spiegel as "operational fatigue."<sup>9</sup> Here we see evidence of delay in onset of the stage of exhaustion by the prolongation of the stage of resistance.

Freud has frequently alluded to denial, avoidance, repression, and amnesia of patients as adaptive mechanisms for reducing anxiety due to external pressures.<sup>4,5,6</sup> These "defense mechanisms" all serve to prolong the stage of resistance thereby delaying the onset of the stage of exhaustion of the general adaptation syndrome.

In independent research the author has utilized the principle of fortifying and prolonging the stage of resistance via attempts at somatic conditioning and modification of the patient's self-image towards a positive conceptual orientation. Somatic conditioning consisted of stimulating and relaxing coordinated body systems by utilizing bioenergetic exercises, acupressure, selective fasting, antistress diet including a high-

potency vitamin-mineral formula, with special attention to essential minerals such as zinc, calcium, magnesium, and manganese, as indicated. Education of the patient as to the relationship of the body-mind organism with its external and internal environments as per Figure 10-1 enhances the treatment program.

Patients with a reactive depression respond more favorably and accept more readily a course of electroconvulsive therapy if they understand that such "shock" treatments act as a series of alarm reactions which mobilize the nervous, hormonal, and other conditioning components of the stage of resistance of the general adaptation syndrome thereby "lifting" the patient out of the depths of depression.

Severely hypertensive patients, who had previously been poorly responsive to conventional therapy, were successfully treated by the author utilizing continuous antihistamine therapy, an antistress diet, and supportive psychotherapy.<sup>10</sup> Patients who had, prior to onset of this form of body-mind therapy, been disabled in various degrees of stage of exhaustion, were enabled to return to full work status for up to thirty months of follow-up study.

By using combinations of different antioxidants such as vitamins E and C, sulfur aminoacids, and selenium compounds, R. Passwater prevented free radical damage in experimental animals resulting in life extensions of up to 167% (prolonged S.R.).<sup>12</sup> R. J. Shamburger demonstrated that reduction of stomach cancer rates in the United States were related to use of antioxidants in foods, and in another series of experiments found that vitamin E and C could reduce chromosome breakage.<sup>15,16</sup> R. Mumma was able to demonstrate that vitamin C can dissolve cholesterol out of arteries, and E. Ginter showed that vitamin C can control cholesterol levels by converting cholesterol into bile acid.<sup>8,11</sup> Thus we see that the antioxidant vitamins C and E can be used to prolong the stage of resistance delaying the onset of the stage of exhaustion of the general adaptation syndrome and thereby prolonging life. R. Walford and W. Adler<sup>1,17</sup> are two of many researchers who have demonstrated that a well-functioning immune system can delay aging and prevent illness caused by virus and other microorganisms.

In his own practice, as both internist and neuropsychiatrist, the author has successfully used histamine desensitization not only for histamine cephalgias but for other allegedly intractable allergies in patients who were histamine sensitive by intracutaneous testing. In two patients who had very unusual allergies and were considered "hopeless"

regarding conventional therapy, very dramatic favorable responses occurred when patients were given intramuscular inoculations of their own whole blood. One of these patients was an RH negative female with a history of repeated miscarriages of erythroblastotic fetuses after three normal births. She developed status asthmaticus before each menstrual period requiring heroic measures to save her life. She responded favorably to a series of small gradually increased doses of her own blood given daily intramuscularly the week before her anticipated menstrual period. The other patient was an adolescent boy whose mother was RH negative but who himself was Coombs positive. When he developed nonspecific pleurisy with effusion, and when for three weeks he was unresponsive to conventional therapy, with temperatures ranging from 104 to 106 degrees Fahrenheit, requiring continuous oxygen and developing allergic reactions to all antibiotic and chemotherapeutic interventions, we resorted to autoinoculation of his own blood parenterally. Within twelve hours after the first of two injections of two cubic centimeters of his own blood intramuscularly, his persistently high fever dropped, and he began a remarkable recovery from what was deemed a fatal illness by the staff of one of the most prestigious children's hospitals in the United States.

## SUMMARY

All illnesses have involvement of psychic and somatic components in varying degrees. Whether an illness is psychosomatic or somatopsychic is determined by whether the psychic or somatic distortions play the dominant role in the stage of resistance of the general adaptation syndrome. In attempting to treat any illness the focus should be directed at fortifying the stage of resistance where somatic conditioning as well as modification of self-image concept take place.

By applying physical principles (Hooke's Law of Elasticity and Young's Formula) to living energy the author arrived at the formula  $A = F(S)$  where A represents psychobiologic anxiety, F refers to frustration tendency (inversely proportional to frustration tolerance), and S stands for stress. Assuming that a negative or poor self-image concept is associated with an elevated frustration tendency (low frustration tolerance), then by a positive modification of the self-image concept it is possible to lower the frustration tendency (raising frustration tolerance) thereby reducing the individual's anxiety. Similarly through somatic

conditioning it may be possible to neutralize internal stress, thereby again reducing anxiety, thus conserving living energy for prolongation of the stage of resistance, postponing the onset of the stage of exhaustion of the general adaptation syndrome, thereby prolonging healthy functioning life. Practical applications of this concept are discussed with references to the literature as well as the author's own clinical experience and observations.

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# Epilogue

The principal objective of the present volume is to document the points of view which researchers of today are observing in the field. The motto which I have composed and had inscribed in the entrance hall of the International Institute of Stress reads as follows:

Neither the prestige of your subject and  
The power of your instruments  
Nor the extent of your learnedness and  
The precision of your planning  
Can substitute for  
The originality of your approach and  
The keenness of your observation

It is wrong to assume that a researcher is doing important work because his subject is important, in other words, prestigious. Someone working on cancer considers himself superior to another who is working on the pigments of butterflies, simply because cancer is more important. But he needs intuition, too! Working on cancer as such is no augur of success. People must learn not to rely too heavily on the power of their instruments, nor to consider it absolutely indispensable today to work with ultra centrifuges and the most powerful electron microscopes. Discoveries can still be made by simply using the eyes, by palpating, by having direct contact with Nature.

Speaking of my own work on stress and the general adaptation syndrome, there once was a time when you could still browse through all the current medical journals without encountering the terms: "nonspecific stress," "corticoids," "general adaptation syndrome," "diseases of adaptation"—or even "Selye," as far as that goes.

I am often asked just what made me think of the adaptation syndrome in the first place. In retrospect, after nearly sixty years, it is rather difficult to single out precisely the beginning of a long trend of

thoughts; however, I am convinced that I would never have discovered the stress syndrome if I had had more knowledge. Because it inhibits you. Classical medicine taught doctors of my generation that all our efforts should be directed to discovering the cause of an illness, so that we could find the proper remedy. Anything therefore that did not lead to the cause was disregarded, deliberately eliminated. Knowledge is useful in developing a discovery, but I maintain that to make the discovery in the first place, one must have an open mind.

The unforeseen cannot be planned. The unexpected is the big thing. Development can be planned: Once penicillin was discovered, a way was found to synthesize it, purify it, produce it at less cost, and so forth. But how do you plan the discovery of something totally unexpected?

I tried to ascertain how many times antibiotics had been observed before Fleming's time without actually being discovered. I found eight references, and one of my colleagues, Professor Waksman who discovered streptomycin, found nine, only one of which was identical to one of mine. Together, we found sixteen references to antibiotics before Fleming. Thus, these researchers proved that they could never have discovered penicillin. They had seen it, but never mentioned it in parentheses or in footnotes, declaring openly that they had spoiled several cultures because mold had somehow crept in and killed all the microbes. They had seen antibiotics but had not understood their importance!

What is really important is original thinking. To quote Szent-Györgyi: "The important thing is to see what everyone else sees and to think what no one else thinks." That is the basis of genius in research.

H.S.



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#### About the Editor

Without question one of the great pioneers of modern medicine, Dr. Hans Selye has opened up countless avenues of research with his discovery that stress participates in the development of numerous degenerative diseases. From 1945 to 1976 he was Professor and Director of the Institute of Experimental Medicine and Surgery at the University of Montreal and is currently President of the International Institute of Stress. A prolific writer, Dr. Selye has 38 volumes and more than 1700 technical articles to his credit. He holds 22 honorary degrees from universities around the world, and is a Fellow of the Royal Society of Canada and an Honorary Fellow of 68 other scientific societies. In addition to numerous medals and awards for his achievements in medical research, Dr. Selye has been made a Companion of the Order of Canada (the highest decoration awarded by his country).

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### THE STRESS OF MY LIFE

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By Hans Selye, 290 pp., 6 x 9, illus.

In this new edition, internationally known scientist Hans Selye recounts more of his private life and brings the story of his life's work up to date. Work with biological stress has dominated the career of this medical pioneer. He explores the early influence on his scientific spirit, his student years in Prague, Paris and Rome, the bitter attacks when his work first received public notice, and the inspiring friendships he has had with his employees. He unfolds the joys, struggles and tragedies of his 73 years — his childhood in war-torn Europe, his fight against cancer and crippling osteoarthritis, and his recent marriage to the woman who has worked for him for over 18 years. Here he reveals the formation of his ideas on stress and shows how he developed the code of behavior which has been of great help in his own life. He discusses his experiments on stress, defining *eustress* (the positive stress of fulfilling accomplishments) and *distress* (the debilitating stress of unsolved problems). *The Stress of My Life* offers medical professionals insights into the mechanisms and manifestations of stress, as well as practical advice for coping with the stress of life today.

### LIFE STRESS

Volume III of a Companion to the Life Sciences

Edited by Stacey B. Day, M.D., Ph.D., D.Sc., 416 pp., 6 x 9

An invaluable aid to professionals in the medical field who treat stress and stress-related disorders! This handy source of facts and theories on life stresses provides quick, easy access to vital data on all forms of stress and its effects on man. The author offers up-to-the-minute research findings on stress as a factor in human evolution . . . stress and animal models of disease . . . activation, emotion, and stress . . . basic concepts in psychophysiological personality research . . . psychosocial stress and illness . . . biopsychosocial stress . . . the community and stress . . . and many other relevant subjects.

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