

THE TRAIL OF STRESS

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ABSTRACT/RESUME

The author surveyed a significant number of native university students, some from southern Canada, others from isolated northern communities, to define stress among the students. They discuss the results in several terms, including the two-response theory and suggest new questions for further research.

Dans cette étude du stress parmi un nombre significatif d'étudiants (de niveau universitaire) d'origine indigène, les auteurs ont recensé des individus provenant tant du sud du Canada que des communautés isolées du nord. Les résultats de leur enquête suscitent divers commentaires, entre autres celui fondé sur la théorie dite des deux réponses ("activation-déactivation"), et suggèrent en même temps de futurs sujets de recherche dans le même domaine.

Introduction

Stress has been historically distinguished into three basic types: systemic or physiological, psychological, and social (Monet and Lazarus, 1977). Systemic stress refers to disturbances of tissue systems (Selye, 1956). Psychological stress is concerned with cognitive factors involved in the evaluation of threat (Lazarus, 1966); and social stress refers to problems arising from the disruption of social units (Smelzer, 1963).

Cultural stress is a relatively new area of investigation within the field. Work completed by Berry (1974, 1975) indicates that it is capable of yielding interesting and important information on the process. Cultural stress has traditionally been examined by anthropologists, psychologists and to some extent by sociologists. However, there has been no major attempt to evaluate the total complexity, i.e., physiological, psychological and social.

A number of theorists (e.g., Guthrie, 1965) propose that psychological stress can be usefully explained in terms of cultural differences. Arguing from this point of view, Singer (1965) states that individual patterns of behavior are based upon habitual modes of perceiving the environment, which are learned from one's cultural experience. Hallowell (1955) postulates that cultural values influence the need pattern of the individual and the character of his psychological reality; so that cultural norms and values thus become internalized and incorporated into the motivational system of the individual. It would then appear that acculturation involves the movement from a situation in which one is a member of a group with its own well internalized culture, to a situation in which the individual is a non-member of a different identity group. In a condition such as this, the person is deprived of cues that guide one's behavior, and more over experiences a lack of common basis for social interaction. It is thus argued that a situation of cross-cultural transition is associated with psychological stress.

The proposition that cultural migration is associated with stress has found support in the work of Blue (1979) and Sikand and Blue (1979). Sikand found

"(an) association between stress and acculturation showing continuing increases in stress with acculturation." (1978 iii).

The North American Indian in the process of acculturation - movement from an Indian cultural community to the Euro-Canadian cultural area - is associated with stress.

Stages of Stress

During the period 1970-1980 the Canadian government has made a major effort to involve Indians in post-secondary education. The Department of Indian Affairs has contracted with a variety of universities to offer a series of special courses in Indian Teacher Education Programs (ITEP), an Indian Law course, and special mature entry programs. These courses have attracted a large number of native students from northern isolated communities to attend southern Euro-Canadian universities.

In general these native students undergo sudden and severe stress reactions in this movement, from a relatively homogeneous Indian community which speaks a native language, maintains native cultural occupations and is located in a northern isolated area. Consequently, starting in 1975, stress level was monitored at monthly intervals during the academic year (September-April). The psychosomatic checklist prepared by Cawte et al., (1968) from the Longer Cornell Medical Index (Brodman et al., 1952) was employed for the stress measurements. The results of these measurements can be seen in Figure 1. They follow the findings as outlined in the studies of Morriss (1967), during the initial phase. The stress does not recede during the second month which probably indicates that the stressors are continuing to affect the students.

Figure 1 shows the average for the academic years 1976-1977, 1977-1978, and 1978-1979. Students utilized in the study ranged from 57 in 1976-1977 to 114 in 1978-1979. The mean stress level upon entry (September) was 6.42 (SD=2.10) as compared to the general student population mean of 3.80 (SD=1.45) (Berry, 1975).

The data presented in Figure 1 indicates a development of stress response which increases from the time classes commence to the completion of the semester in December or April. The level of stress at the onset of the semester is higher in September than in January probably indicating that the initial adjustment in September is associated with a number of stressors i.e., finding lodging, getting to know the community, etc. There is little doubt that the Christmas

holiday (usually two weeks) when the students return to their home communities, relieve many of the pressures of the university. The mean stress level upon return in January was 5.12 (SD=4.32) which is significantly lower than that in September. Further it should be noted that the standard deviation has increased from 2.10 to 4.32; $Z=4.23$ ($P<.01$).

Upon inspection of the data it is apparent that we are not dealing with a homogeneous group. Some of the students enter university with high stress levels and the work at the university further increases the stress levels while others adjust and learn to manage the stress. Separation of these groups was accomplished by subtracting the September stress level from the December stress level. In the case that this resulted in a negative number the individual was classified as an adjuster, in the cases when the resultant number was positive the individual was classified as stress prone. Figure i indicates that the separation of the two groups continued throughout the year. During the school year 1977-1978 modified clinical interviews were conducted with the stress prone group to determine the problems associated with the high stress levels.

The data obtained from the stress scale together with the interviews indicate that there is an isolation process involved with the increase in stress. Four stages of stress have been identified within the acute stress level. These stages are associated with the isolation process; 1) a segment of the environment, 2) a major area of the environment, 3) a segment of the self and, 4) a major area of the self.

In stage one the creation of stress seems to be associated with a segment of the environment. This segment is isolated and by that isolation is allowed to continue as a threat to the individual. Statements of the students include: "I'm having trouble with history" or "I just can't seem to complete a term paper" and in another case, "My wife and I don't seem to ever get along any more." Statements such as these coupled with a resignation of an acceptance of such a condition qualify as stage one stress.

In our second level we find the individual has generalized the threat to include a large portion of his environment, that is to say he has become alienated from his environment. In such cases the individual becomes less aware of the stimuli available to him. Examples of such a level are demonstrated in the following excerpts:

"I just don't seem to be able to concentrate on my work any more", "I haven't talked to my professors but I can't get the work done on time" and "Mary (his wife) wants to go back to the reserve." In these cases we find that the individual has generalized the threat from a specific aspect of his environment to encompass large areas i.e., university and/or home.

Stage three maintains the continued threat of the environment and further involves the individual in an aspect of himself. Isolation of an aspect of the self increases the limitations the individual places on himself. In such cases the student isolates a portion of his own behavior and views it as a threat to his survival. The distinction between a threat of the environment as opposed to a threat within one's self is extremely important for the clinician and the form of therapy that can be offered. Examples of statements made by students in stage three stress include: "I'll never be a good student", "I can't speak in front of groups", and "I'm sick but the doctors can't find anything wrong with me." Stage three stress is indicated when the individual isolates himself from a part of himself which he considers threatening.

Alienation of self is the central theme of stage four stress. As the individual moves into this stage we find that he has generalized the feelings of threat from a specific aspect of himself to his total being, he rejects himself and in so doing operates as a third party in both social and academic endeavors. The student will say: "Ruth (the student) doesn't have any problems any more" or "I don't know why anyone bothers with me." This third person referral system is not as complex in the Cree language as in English; however it seems significant when used as an indicator of stage four stress. This stage involves the alienation of self and appears highly resistant to change.

The Response to Stress

The intrapsychic response to stress has been outlined in the preceding section which outlined the four stages. In this section we will examine the behavioral responses to the threat created by stress. The evidence (Blue, 1980) seems to suggest that there are two major modes: 1) withdrawal and 2) increased activity. When the response mode is coupled with the stages it increases the complexity and at the same time simplifies the awareness of the behavior demonstrated.

The evidence that supports the two-response theory is cumulative ranging over years of anthropologist's field studies (Cole, 1979) educational observations (Blue, 1976), and research related to stress (Wallen, 1969; Vollmer, 1978). Cole noted that Indian children in the classroom often escape the stress of participation by daydreaming or disassociating themselves from the matter under consideration. The task force on the education needs of native people commissioned by the Government of Ontario noted that the behavior level of native students varied in relation to the activity. In the classroom the student remains quiet, reserved and withdrawn while on the playground or in the community they become active and involved (Blue, 1979). That these responses are associated with stress seems reasonable when one considers that the stress level of the native student is twice as high as the non-native student (Sikand, 1980).

The relationship of stress to activation has further been explored by Vollmer who found:

Relationships between motivation (desire to act) and epinephrine/norepinephrine (adrenaline/noradrenaline) varied over different levels of previous performance... the slope of the regression line for Y (arousal) on B (motivation) was found to be steeper at high and low levels of A (previous performance) than at the intermediate level. For low levels of previous performance negative slopes were found, and for high levels positive slopes occurred (1978:193).

This finding seems to indicate that when the activating agent norepinephrine (norepinephrine) is dominant, stress increases activity and when it is low or not present then increased stress inhibits activity.

Wallen (1969), examined psychiatric casualties of the Viet Nam conflict. He reports that the psychiatric casualty

Has a high degree of self dissatisfaction, limitations in personality adjustment, and limited inner personality strengths. He is less objective and significantly unrealistic in meeting basic crucial life demands (1969:185).

If one accepts the general conclusion that increased activity is not detrimental to combat effectiveness then likely the casualties examined by Wallen are the deactivators. If this assumption is correct then they demonstrate the characteristics that would be predicted in the two-response theory.

A test of the two-response theory was undertaken at the University of Montana in 1979. The deactivation response was conceived as a CNS serotonin-like behavior pattern, while the activation response was attributed to a predominance of CNS noradrenaline. Behaviors attributable to noradrenaline as neural mediator are as follows:

Increased psychomotor activity and performance, self-stimulation, avoidance learning, and stereo-typed behavior; restlessness, agitation; paranoia, wakefulness; euphoria, triggering of REM sleep (Jouvet, M. 1969).

Behaviors attributable to serotonin as neural mediator are as follows:

Decreased sensitivity to altered environmental input, decreased acquisition of active avoidance responses for reward during CS-paired punishment learning, decreased sensitivity to noxious stimulus (Nusacchio, M.F., Julou, L., Kety, S.S., and Glowinski, J.) increased emotionality, passive avoidance; freezing or immobility reflex, habituation, (Conner, R.L., Stolk, J.M., Barchas, J.D., and Levine, S.) inhibition of discrimination learning; onset of sleep, slow wave sleep, priming of noradrenaline trigger mechanisms for REM sleep (Jouvet, M. 1969).

The discreteness of the deactivation-activation (Serotonin-noradrenaline) behavioral counterparts was demonstrated as different factors on a behavioral scale of stress reactions. These factors correlated higher with general stress serotonin with general stress, ($R = .483$, $P < .01$); noradrenaline with general stress, ($R = .246$, $P < .01$); serotonin with noradrenaline, ($R = .079$, $P < .05$) than with each other; i.e., the serotonin behavioral complex was related to general stress reactions but not to the noradrenaline behavioral complex.

Transition From Acute to Chronic Stress

The foregoing material has dealt mainly with acute stress. The stages indicate the psycho-dynamics underlying the development of the stress reaction, while the two-response theory delineates the observable stress reaction. The treatment of preference for acute stress reaction is simply the withdrawal of the stressor. In such cases the individual appears to revert to normal. The basic homeostasis of the individual is not disrupted and when the stressor is removed or alleviated the physiological homeostasis is retained.

The differentiation between acute and chronic stress deals with this principle. In chronic stress the basic homeostasis is not maintained. The physiology attempts to develop a new homeostasis based on the disruption introduced by the stress.

Clinical observations have indicated that this juncture between acute and chronic stress coincides with a variety of thrill-seeking behaviors. From an observational point of view it appears as if the individual is attempting to break out of or interrupt the stress response cycle.

The data from Brandon University's Native Studies Department indicates that a series of behaviors are related to high scores on the stress scale.

1. 80% of all attempted suicide (12 of the 15)
2. 83% of alcoholic binges (54 of the 65)
3. 67% of fights (police involvement); (16 of the 24)
4. 76% of speeding (ticketed over 80 mph): (26 of the 34)
5. 100% of hospitalized psychotic episodes

The time factor between the onset of an inescapable stress and the transition from acute to chronic stress reactions seems to relate to the school year, i.e., for the fall entry semester examinations occur in December. This period of four months has been found by Morriss (1967) in combat personnel and Wallen (1969) in his observations of Air Force psychiatric casualties. It appears from the research and the present data that indeed continuous stress for a period of approximately four months is sufficient to move an otherwise normal individual to a level of transition to chronic stress.

In summary it should be noted that the transition from acute

to chronic stress creates the most distressing period for the individual. This period appears to be time-linked, i.e., approximately four months following the onset of inescapable stress. Further the transition period is marked with a variety of risk-taking episodes.

Chronic Stress

The examination of chronic stress was undertaken in an experiment with Albino rats and inescapable shock. The experiment paired the animals for control and experimental groups. The control group had control over termination of shock. Recordings of cardiac rate were made during the entire sessions and notes on the behavior of the animals were made during each session.

The results of this study indicated that 1) following two weeks of experimental sessions, the animals with control ceased to manipulate the lever that ended the shock. 2) The control, as well as the experimental animals developed cardiac arrhythmias, and 3) the abnormality persisted after the end of the experiment. Notes on the behavior showed that the animals exhibited changes in handling characteristics at the end of the first week of experimental sessions. Some of the animals became more aggressive while others became passive.

Neurophysiology and Stress

It is general knowledge that during acute stress certain "psychoendocrine" and neurochemical responses occur. Stress-labile hormones are adrenocortical stimulating hormone with subsequent changes in serum glucocorticoids and mineralocorticoids; prolactin, growth hormone, testosterone and vasopressin. These changes are superimposed upon or independent of the regular circadian rhythm. Beta-lipotropin is known to be secreted simultaneously with ACTH. Neurochemically, CNS levels of noradrenaline and serotonin change with acute stress, as do peripheral levels of adrenaline and noradrenaline from the sympathetic component of the autonomic nervous system. ACTH, vasopressin and serotonin may stimulate the adrenal medulla directly. The mechanisms immediately responsible for at least circadian stimulation of the releasing factors of ACTH and growth hormone seem to be serotonergic although an abundance of

dopamine and histamine are present in this area (median eminence of the hypothalamus and pituitary) as well. Growth hormone has been reported to be released by a noradrenergic-dopaminergic pathway.

It has been noted that as well as cortical serotonin and noradrenaline varying with acute stress, cortical acetylcholine varies. In the midbrain, dopamine may play an intermediary role connecting centres from the spinal cord and medulla and reticular activating system (also cholinergic) to the neocortex.

If we look at the process of continuing stress to the chronic level, physiologic studies are not abundant. We do know that in unipolar depression hypercortisolemia unresponsive to ACTH feedback exists, (Unresponsive Dexamethasone Suppression Test). Some who are under chronic stress however have cortisol levels below their own baselines and seem therefore to have suppressed their adrenal cortices.

Centrally the neurotransmitter involved in immobilization (restraint stress, helplessness or inescapable shock) is serotonin. The neurotransmitter noradrenaline, in prolonged stress, has been reported to increase both peripherally (Rose, 1980) and centrally (Bliss, 1966). Peripherally, in human studies, adrenal noradrenaline is correlated with mastery of the situation and seems to replace the CRF, ACTH, serum cortisol response, allowing these to return to baseline - that is, it reflects successful adaptation to stress. With prolonged stress Bliss (1966) in rat studies, has found that along with the increase in brain noradrenaline there is also an increased catabolism of noradrenaline, resulting in a drop in absolute levels in all parts of the brain, the heart and the spleen.

It is also known that central noradrenaline (but not peripheral noradrenaline) inhibits the stress induced rise in ACTH (in anaesthetized dogs) probably via the CRF secreting cells in the hypothalamus (Ganong, 1976).

Suicide in the depressed has been shown to be followed by reduced levels of serotonin in CNS.

It has been postulated that dopamine overactivity is the basis of schizoid and schizophrenic states. This is as a result of an understanding of the mechanism of actions of the antipsychotic drugs (Lewis, 1980). There may be an overabundance of dopamine in the mesencephalon or a hypersensitivity of the post-synaptic dopamine receptors in the cerebral cortex. Some conditions which bring about

the latter are opiates, endogenous opioids and REM deep deprivation. Antipsychotic drugs also block the actions of acetylcholine in the cortex, their actions being reversibly by anti-cholinesterases.

Jouvet (1969) stated "Sleep is a biologic constant., slow wave and paradoxical sleep being quantitative indices of the innermost mechanisms of the brain." Not only are the quantities of REMS (paradoxical sleep) and NREMS (slow wave sleep, delta sleep, stages 3 and 4) changed by stress but also the total deep, number of awakenings, sleep latency and REMS latency change. Excessive strenuous exercise, starvation, and surgery decrease REMS and increase NREMS. Acute emotional trauma and severe depression decrease REMS, REMS latency, NREMS, and total sleep but increase the number of awakenings. Training, or intellectual activity of a stimulating but not excessive nature increases REMS. Anxiety in some brings about a decreased REMS, decreased total deep, delay sleep onset, and trouble staying asleep in others there is increased REMS and decreased REMS latency. In some depressives, it seems that there may be an increased REMS, decreased REMS latency, long early REMS, hypersomnia, and a need for more REMS than is being obtained (Hartmann, 1975). REMS may serve as a reprogrammer to sort and fit novel information into already existing files; while (because growth hormone is secreted in late stage 3 and 4) NREMS may serve an anabolic restorative function. New RNA's and even changes in DNA may be made during sleep, (Jouvet, 1972, Hartmann, 1973).

Summary

The concept of stress can be examined either utilizing a set of stimuli (shock, physical insult, or threat) or response mode (endocrine change implies stress). This work has chosen to use the stimulus model, defining the stressful stimulus as a situation of threat in which the individual loses his ability to predict or understand his physical or psychological environment.

The cross-cultural paradigm offers many advantages to the researcher in the area of stress. Culture can be defined as a system of meanings where a given culture can be differentiated from another by observation of structural differences in values, (Blue, 1972). Structural differences have been shown to exist between Northern

Cree and Euro-Canadians in a factor analytic study (Scott and Blue 1971).

The programs for university training of Indian students which recruit Northern Cree to attend Southern Canadian universities create a situation of stress for those students. Observations of the response to stress could be expected to identify factors related to a 1) general and 2) culturally specific response to stress.

The process of stress, identified as stages appears to be general across cultures. Isolation can be understood as a method of freeing the individual from the stressor. The process of isolation and alienation is interesting and of significance to the therapist so far as it acts as a blueprint for him to diagnose and treat acute stress.

The behavioral response mode (activation - deactivation) is not a new observation, it was reported by Ax, (1953) and Funkenstein, (1955) who, when examining adrenaline - noradrenaline responders, suggested the classification of anger in - anger out. The data reported in this paper strongly suggests that deactivation is a response mode to stress. Further we have suggested that it is associated with CNS serotonin.

Tests of the relationship of culture to response mode have been undertaken with students in the Mature Students Centre. The results proved to be not significant between the Indian and Euro-Canadian students. Further analysis of place-of-origin (north of 51st parallel) indicates significance ($N=16$, $P<.01$); suggesting that more traditional (northern isolated communities) Indians tend to respond by deactivation.

Within the Indian culture the deactivation response is an appropriate strategy for dealing with stress. The Indian culture places importance on "living with" the environment by expecting that the environment will offer solutions to the problems that exist for the Indians. Thus the individual passively waits. Support for such contentions exists in research (Berry, 1967) which found Natives to be field dependent as compared to non-Natives who are comparatively more field independent, in this situation passivity is not hopelessness but hopefulness.

In the urban society the expectation of the non-Native is that the environment is aggressive and harmful. The strategy employed is activation and by activity to change the environment and the threat.

As the hyperactivity results in a surge of noradrenaline it perpetuates itself and is its own reward or reinforcer much as in a self-stimulation experiment.

An interpretation of the bimodal response in acute stress is suggested by the data; deactivation is CNS serotonin related and activation is associated with CNS noradrenaline. The psychoendocrine hormones also vary, and there are consequential (and differential) behavioural changes including sleep. As chronic stress approaches with time and continuing acute stress, the noradrenaline response depletes itself, thus serotonin, ACTH, and cortisol predominate. Thrill seeking behaviours with an accompanying rise in noradrenaline temporarily disrupt the serotonin and ACTH response bringing sporadic relief.

With the onset of chronic stress there appears to be a distinct change in the behavior pattern and neurophysiology. Clinical observations portray an individual unresponsive to external and internal stimuli, demonstrating anhedonia and pseudo-retardation. Physiologically, the rats subjected to inescapable chronic shock developed cardiac arrhythmias of a supraventricular origin, bradycardias, and hypersomnia which persisted after shock termination.

Culture, neurophysiology, psychopathology, and learning theory are interrelated in the study of stress. To understand the reactions to stress is to conceive of hyperactivity and passivity as a conditioned reinforcement associated with stress reduction. The concomitance of the various fields requires a holistic approach to the Gestalt - a Gestalt that may well include the function of sleep and the creation of new genetic messages.

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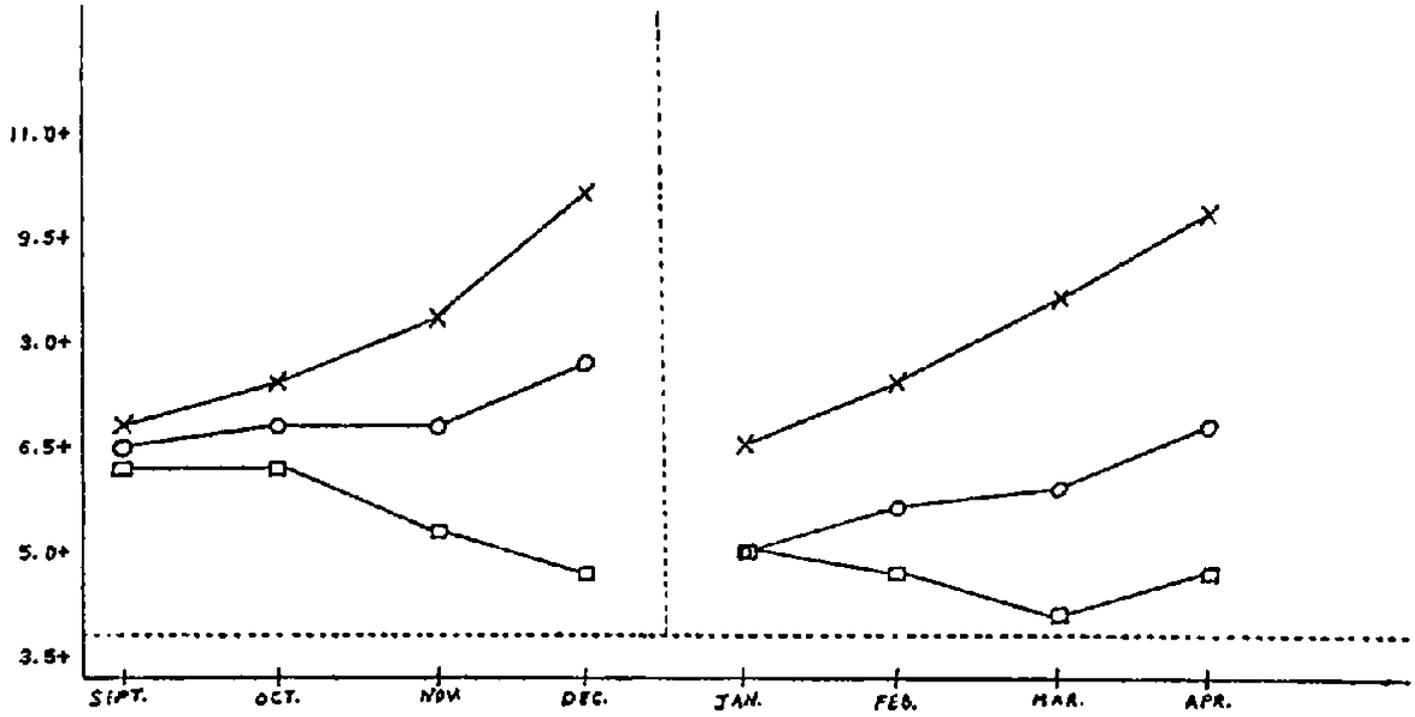


FIGURE 1. Stress scale scores for academic year,
X Stress prone group, O average for all Native students
Adjuster students, . . - National student average from Berry (1965).