A Cybernetic Framework for Studying Occupational Stress

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Introduction

In a report by the Joint Working Party of the Royal College of Physicians of London and the British Cardiac Society (1976), it was established that in 1975, coronary heart disease accounted for 52% of all deaths of men aged from 45 to 54, and 41% of those aged from 25 to 44. In contrast, in 1951, heart disease accounted for less than 20% of deaths in men aged from 45 to 49. This upward trend, in one of the major manifestations of stress-related illness in our society, is unmistakably continuing, which has created an enormous interest in research studying stress identification and prevention.

There is a growing body of evidence from studies in experimental laboratory settings (Kahn & Quinn, 1970; Quinn, Seashore, & Magione, 1971) and in the workplace (Cooper & Marshall, 1978) to suggest that occupational stress is an important causal factor in these diseases. The empirical work in this field has expanded at such a rate (Cooper & Payne, 1978) that we have been unable to put these developments into a conceptual-theoretical context; that is, we have no coherent framework to make sense of the information now available to us. Cartwright and Zander (1960) have argued that all scientific endeavour moves progressively through the stages of armchair speculation, to data collection, to theory-building. Osler (1910), Selye (1946), and others (Ryle & Russell, 1949) provided the early speculative notions of the dynamics of the mechanisms of occupational stressors and the general adaptation syndromes. It is our intention here to begin the process of theory-building in the occupational stress field by putting forward a cybernetic theory of stress.

The need for a cybernetic theory of stress

The theory of stress used here is derived from the framework and concepts of cybernetics, or systems control (Weiner, 1948, 1954; Ashby, 1954, 1966). Briefly, cybernetics is concerned with the use of information and feedback...
to control purposeful behavior. The basic premise of this theory is that behavior is directed at reducing deviations from a specific goal-state – i.e., “it is the deviations from the goal-state itself that direct the behavior of the system, rather than some predetermined internal mechanism that aims blindly” (Buckley, 1967, p. 53). This perspective has been used widely in the biological, physical, and social sciences to explain how systems (i.e., organisms, plants, things) adjust or adapt their actions to cope with disturbances from goal achievement.

The idea of the individual adapting to disturbances is not new in the stress field. Starting with the pioneering work of Cannon (1932) into the homeostatic processes operating to maintain the organism’s equilibrium, much of the theory and research related to stress has followed (often implicitly) a cybernetic framework (Basowitz, Korchin, & Grinker, 1958; Cofer & Appley, 1964; McGrath, 1976). Although this has drawn attention to the organism-environment interaction (or the person-environment fit), the systematic application of cybernetic concepts has been relatively uneven among the disciplines studying stress (i.e., medicine, psychology, management, and sociology). This makes it difficult to compare the different concepts of stress, or to integrate the variety of research findings into a coherent theory. This latter difficulty is especially troublesome in the occupational stress (OS) field, where empiricism has far outstripped theory-building (Cooper & Marshall, 1976, 1978).

A more formal application of cybernetic theory would greatly help theorizing and research in OS. Considerable research has shown that individuals must cope with a variety of potential stresses in the work environment (Cooper & Payne, 1978; McGrath, 1976). Cybernetic theory provides a comprehensive portrayal of this person-environment interaction. It emphasizes time, information, and feedback (Shibutani, 1968). The temporal dimension provides a dynamic view of stress frequently missing in OS research. Indeed, McGrath (1970) contends that “temporal factors are crucial, and manifold, in research on human stress…. Yet, very little consideration has been given to such temporal factors in theory or in research…. Time may be one of the most important and most neglected parameters of the problem.” The focus on information underscores the key notion that information mediates the person-environment relationship. The idea of feedback recognizes that coping behavior is purposeful, directed by knowledge of its previous effects. These factors are central to an understanding of stress. Moreover, they are equally applicable to the stress phenomena studied both by physiologists and social scientists.

For purposes of explanation, Miller’s (1965) application of cybernetics to living systems is used here. Although Miller’s (1965) conceptual framework has not been used in the specific context of the stress field, we feel that some of his concepts can aid us in theory-building to understand occupational stress. This perspective explains how living systems (i.e., plants and