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ADAPTATION TO STRESS IN TEAM DECISION-MAKING AND COORDINATION

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ABSTRACT

Teams with records of superior performance have one common critical characteristic: they are extremely adaptive to varying task demands. These teams were observed to switch between several different coordination strategies and organizational structures, with different lines of authority, communication patterns, and task responsibilities, as they move between normal operations and high-tempo or emergency situations. Two questions are central to the issue: What are the effects of external stressors on team performance, and what are the mechanisms by which teams of decision-makers cope with stress? Our main hypothesis is that team coordination strategies evolve from *explicit coordination* under low workload conditions to *implicit coordination* as workload increases. To illustrate these ideas, this paper presents findings from an experimental study on the effects of stress on the performance of command teams. The computer-based experimental task simulates operations in a naval environment in which a hierarchical team of four decision-makers must coordinate complex and ambiguous information to make identifications on air targets. Three task-related stressors –time-pressure, uncertainty, and ambiguity–, and one information-structural variable were manipulated in a within-subject, full-factorial design. Results show some complex patterns of the way the different stressors combine to generate stress and affect the team decision and coordination strategies. Implicit coordination patterns, anticipatory behavior, and redirection of the team communication strategy are evident under conditions of increased time-pressure. Discrepancy between the subordinates' and the team leader's mental model of the costs of errors generates non-trivial patterns of error-making in the teams. The team leader's periodic update had a stabilizing effect on the team communication strategy. Different implementations of team training interventions to enhance mutual anticipation, prevent inadequate adaptation to stress, and foster implicit coordination in command teams are proposed.

INTRODUCTION

Highly complex decision-making processes in a shipboard Combat Information Center (CIC) rely significantly on efficient coordination by the entire command team. This research seeks to understand how well-trained command teams adapt their coordination strategies to a changing tactical decision-making environment, and what team training interventions and structural reconfigurations can best contribute to the team's ability to maintain superior performance under a wide range of stressful operational conditions.

Our central premise and guideline for developing recommendations on team training and structuring evolves around the notion of team adaptation: high-performance teams, when faced with an increasingly demanding task environment, will adapt their decision-making strategies, coordination strategies, and even their structure in order to maintain stress under an acceptable threshold while keeping a required level of performance. Figure 1 illustrates this concept by showing the adaptation mechanisms used by well-trained teams to cope with stress. In this physical analogy, stress is viewed as a phenomenon resulting from the application of external operational conditions onto a team structure made of individual operators and decision makers.

It is obvious that a reconfiguration of the team structure may render the team more robust against increasingly demanding operational conditions and thereby keeping stress at an acceptable level for the team. Moreover, as the team's workload increases due to an increase in the level of external stressors, the team adapt its decision-making and coordination strategies, thereby enabling the team members to operate below a critical stress level.

A number of issues arise in defining a team and in specifying what is meant by team performance and team coordination. There have been various definitions of teams in the literature (Hall and Rizzo, 1975; Serfaty and Kleinman, 1985; Morgan et al., 1984). We have chosen a definition, proposed by Salas et al. (1993), that is congruent with the premise outlined in Figure 1: "A team is a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively, toward a common goal/objective/mission, who have each been assigned specific roles and/or functions to perform, and who have a limited life span of membership." As Salas et al. point out, this definition implies that in order to achieve a required level of performance for a task, efficient and reliable teams must: 1) coordinate their resources, information, and actions; 2) adapt continuously their strategies to the demands of the task environment; and 3) use the organizational structure that supports the team process. Any failure to perform these three activities consistently may result in team errors. Changes in external and internal conditions produce two kinds of errors: individual errors, which tend to propagate within the team and affect team performance as a whole, and team errors, which occur because of a breakdown or lack of communication in the team. Although the occurrence of these errors can be significantly reduced by individual training, further improvement can be achieved by: (i) team structuring (e.g., organizational structure,