

Group Decision Making Under Stress

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Understanding the processes by which task groups function is a major concern of social psychologists who study small groups. Equally important to the applied group researcher is the understanding of how group processes are altered by the external environment. Research suggests that organizations respond to stress with a centralization of authority so that decision making becomes concentrated in the higher levels of an organizational hierarchy. In this study, this hypothesis was extended to the small-group level of analysis, and the effects of stress on group status and decision making were examined. Experimental results clarify and delimit the centralization-of-authority hypothesis: Rather than centralizing authority and decision making under stress, group leaders and group members become more receptive to information provided by others. Implications for group decision making are discussed.

Modern complex and high-risk technologies are inherently contradictory. On one hand, they greatly extend the range of human potential; for example, military anti-air warfare (AAW) systems allow military personnel to "see" aircraft at great distances. On the other hand, these systems also increase the potential for catastrophic error; in an AAW environment, the amount and complexity of information that must be processed in a short period of time once a target has been identified is enormous. We note several characteristics of these high-technology systems: (a) They pervade the aerospace, military, petrochemical, and nuclear industries; (b) they involve complex tasks that usually require interdependent or team performance; (c) during emergency or crisis conditions, operators have to make critical decisions under extreme stress; and (d) operator error is usually cited as a primary cause of system failure (see Perrow, 1984). Thus, although the necessity for effective performance under stress has been present since our ancestors were first chased with a club, it is likely that modern systems have both increased the stress under which humans must perform, as well as the consequences of poor performance.

The deleterious effects of stress on human performance are well documented and have been a focus of research in the social and behavioral sciences for a number of years. Numerous studies have demonstrated cognitive, behavioral, and emotional responses to stress at the individual level (Harris, 1981; Keinan, 1987; Taylor, Buunk, & Aspinwall, 1990). Considerably less is known about the effects of stress on *group* performance. This is particularly surprising for several reasons. First, the complexity and scope of modern-day tasks often require group efforts (see

Driskell & Olmstead, 1989; Foushee, 1984). Second, for these tasks, an understanding of group processes is as important to understanding task outcome as is knowledge of individual-level characteristics. For example, in a study of flight crew performance, Ruffel Smith (1979) found that the majority of errors were attributable to deficiencies in group process, not individual proficiency. Finally, group researchers have proposed that patterns of group interaction will be affected by environmental factors such as stress (see Hackman & Morris, 1975). Research on crowding (Baum & Paulus, 1987), the effects of groupthink (Janis, 1983), and groups in exotic environments (Harrison & Connors, 1984) represent notable attempts to address this topic. Nevertheless, there is limited data on how stress affects decision making in groups.

Some researchers have observed an increased tendency for subordinate group members to acquiesce to authority when under stress. For example, Foushee and Helmreich (1988) noted that subordinate flight-crew members are more hesitant to question the captain under emergency conditions, sometimes deferring to the extent of not offering valuable task information. One explanation for this phenomena is derived from the organizational literature and holds that organizations respond to stress by a centralization of authority so that control and authority for decision making is concentrated at higher levels of the organizational hierarchy (Hermann, 1963; Staw, Sandelands, & Dutton, 1981). However, this hypothesis has not been directly tested at the small-group level of analysis. Furthermore, some research suggests a competing explanation: Group members under stress (both high and low status) become more receptive to task information from others (Lanzetta, 1955; Torrance, 1967). The purpose of this study was to examine the effects of stress on group status and decision making and to provide a test of these alternative hypotheses.

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Stress and Group Decision Making

One of the most frequently cited propositions in the organizational literature is that, under stress, organizations undergo a

constriction in control, or a centralization of authority, so that control and decision making becomes concentrated in the higher levels of an organizational hierarchy (Holsti, 1971; Milburn, Schuler, & Watman, 1983; Smart & Vertinsky, 1977). Exploring organizational dynamics, Staw et al. (1981) claimed that under such conditions, organizational control is increased, decisions of dominant members in the organization may prevail more readily, and the exercise of influence becomes more centralized. Hermann (1963) also noted that, in response to crisis, authority and decision-making activities shift to higher levels of a hierarchical structure. This centralization of authority in organizations under stress, and the increased reliance on leaders to make decisions, is seen as an adaptive response to external threat because it places responsibility in the hands of those most central to the organization's values and goals (Staw et al., 1981).

At a macro level, Hertzler (1940) argued that larger societal groups are also willing to give away decision-making rights to have group performance more effectively coordinated by a central authority. Drawing on an historical analysis, Hertzler found that practically every dictatorship examined, from those of Caesar and Augustus to those of Cromwell, Richelieu, and Napoleon, was preceded by periods of stress or emergency. In ancient Greece and Rome, constitutional provision was made for the appointment of a dictator in time of crisis or emergency. Today, the United States' War Powers Act gives the President almost dictatorial powers in case of war or national emergency. Hertzler noted that a "mass, in time of crisis is nearly always ready . . . to give control to anyone who gives evidence of ability to wield it efficiently" (p. 160). The greater the stress, the greater the compulsion to give power to a central authority (cf. Hook, 1943; Korten, 1962).

Applied to the small-group level of analysis, the centralization-of-authority thesis suggests that stress should strengthen the hierarchical structure of authority relations in the group. This implies that (a) under stress, group members will defer more to the opinions, ideas, and actions of the group leader and (b) at the same time, the leader will be more likely to reject input from group members. In other words, group members should become more subordinate, whereas the group leader should become more superordinate. There is some anecdotal evidence for the occurrence of this type of process in small groups under stress. Helmreich (1979) observed that airline flight crews experience an increased dependence on the crew captain under high stress conditions. As a function of this increased dependence, crew members tend to place more responsibility for task performance on the captain and are less likely to provide decision input on their own. Flight records show that, in some instances, valuable task information possessed by lower status crew members was not presented to the crew captain, often resulting in severe consequences (see Foushee, 1984; Foushee & Helmreich, 1988). In a different setting, Janis (1954) observed that disaster victims show a marked tendency to increase dependence on authority, yielding to the directives of those in leadership roles with an almost automatic obedience.

However, the empirical evidence for the occurrence of this process at the group level is equivocal. Some empirical research has shown that individuals in groups under stress tend to transfer responsibility or yield control more to other members (particularly those higher in a status hierarchy). Worchel, An-

dreoli, and Folger (1977) found that members of competing groups identified fewer members as leaders than did members of cooperating groups, suggesting a centralization of authority under stress. Klein (1976) found that, under certain conditions, group members attributed more responsibility to leaders when under stress. Hamblin (1958) found that, during group decision making, the leader's suggestions were more likely to be accepted by other members of the group during periods of stress. These results are consistent with the centralization-of-authority thesis: Stress strengthens the hierarchical structure of the group, such that (a) group members defer more to the leader and (b) the leader becomes less responsive to subordinates' task inputs.

On the other hand, Torrance (1967) observed a slightly different process operating in groups under stress. His studies of military teams suggest that group members are indeed increasingly willing to defer to a leader when under stress. However, Torrance observed that leaders also were more compelled to seek the judgments of others in stressful conditions. Similarly, Lanzetta (1955) found that, in four-person groups, stress resulted in an increase in equalitarian group-oriented behaviors (i.e., opinion seeking and general discussions). Furthermore, as stress increased, competitive acts related to leadership decreased. According to the centralization-of-authority thesis, equalitarian behaviors ought to decrease and leadership behaviors ought to increase in these groups. Instead, Lanzetta concluded, stress resulted in a more democratic approach to problem-solving. These studies suggest that, rather than a centralization of authority in the leader, high and low status group members become increasingly receptive to the task inputs of others. According to the increased-receptivity hypothesis, group members tend to defer more to the group leader for decision making while the leader becomes more, not less, responsive to inputs from other team members. From this perspective, the group leader engages in more egalitarian decision-making behavior than is predicted by the centralization-of-authority thesis.

In summary, the centralization-of-authority hypothesis predicts that as authority is centralized under stress, subordinate group members transfer more responsibility for group decisions to the leader while the leader becomes less likely to accept input from subordinates. An alternative hypothesis is that, under stress, *all* group members become more receptive to task information provided by others.

The present study was conducted to investigate the effects of stress on status and decision making in groups and to provide data to evaluate these two competing hypotheses. The examination of authority relations in groups is important for several reasons. First, hierarchically organized groups compose the majority of real-world work groups. Second, as the previously cited studies indicate, how group status structure changes in response to stress is unresolved. Third, changes in group status or authority structure directly affect how decisions are made in groups.

Method

Subjects

Subjects were 78 male students at a U.S. Navy technical school, who volunteered for the study and were randomly assigned to one of four experimental conditions.

Procedure

The design of this research is a variant of a basic experiment developed for studies of status in groups (for a more detailed description, see Driskell, 1982). The experiment required that two subjects work as a team, making a series of binary choices on an ambiguous laboratory task. In Phase 1 of the experiment, the primary study manipulations are introduced. In this study, we varied the status of the individual (high status relative to partner vs. low status relative to partner) and level of stress (stress absent vs. stress present). In Phase 2 of the experiment, subjects worked on a group task, and data were gathered on the effects of the Phase 1 manipulations on influence in group decision making.

The sequence of the experiment was as follows. Subjects were seated in individual laboratory rooms and told that they would be working on a team decision-making task. They were introduced to their partner over closed-circuit television (actually, all subjects within each condition saw the same partner on videotape; this was done so that subjects did not pick up extraneous status-related cues, such as style of speech, from a "live" partner). The experimenter proceeded to describe the task to be performed. All experimental procedures were also recorded and presented via videotape to ensure a standard administration across conditions. The experiment consisted of four experimental conditions, differing in the type of status information available to the subjects as well as in the presence or absence of stress.

Status Manipulation

The status characteristic used to place subjects into high or low status positions was military rank. In the low-status conditions, each subject was introduced to their partner, a Lieutenant Webster (the stimulus person on videotape). Because the subjects themselves were of lower rank, this placed them in a low status position relative to their partner. Therefore, in the low status conditions, each subject's team consisted of himself and Lieutenant Webster.

In the high status conditions, each subject was introduced to a Seaman Webster. Because the subjects themselves were of a higher rank, this placed them in a high status position relative to their partner. Therefore, in the high status conditions, each subject's team consisted of himself and Seaman Webster.

Stress Manipulation

Subjects performed the group decision-making task under normal or acute stress conditions. We defined acute stress as an interaction that (a) threatens the individual's physical or psychological well-being and (b) increases individual responsibility for successful task performance. We used a two-part stress manipulation to operationalize both of these components.

First, to activate the threat aspect of acute stress, we told subjects they would perform the group task under simulated conditions of a tear-gas drill. Subjects were told that during performance of the group task, a small amount of tear gas would be introduced into the room. The experimental setting was configured with warning signs, exhaust vents, and so forth to be consistent with this scenario. This tear gas simulation is similar to a training exercise that is familiar to this subject population and is viewed as quite aversive. Of course, no tear gas actually was used in this study; therefore, the anticipatory threat of the tear gas constituted the stress manipulation.

Second, subjects were told that only *their* final score would count as the team score on the task. This served to increase individual responsibility for task outcome; if subjects failed, the team failed. Lazarus (1966) noted that an interaction is appraised as stressful only if the individual judges that something is at stake. Subjects' greater stake in task outcome, such that failure had greater consequences, was the second component of the acute stress manipulation.

Task

The data-collection task required team decision making on a series of 25 ambiguous two-pattern checkerboard slides. The subjects' task was to choose which of the two patterns contained a greater area of white. For each slide, subjects made an initial choice as to the correct answer, observed their partner's choice, and then made a final decision. Subjects were told that they were to work as a team, taking their partner's choice as their own final choice if that helped them to make a correct final decision.

Several characteristics of this task are important. First, it simulates the "initial choice—evaluation of partners' input—final choice" pattern of group decision making. Second, the slides had been pretested so that there was in fact no objective basis for making a correct decision; that is, each pattern had an approximately 50% chance of being chosen (this was done so that there was no external basis for making a task decision other than the status information manipulated in Phase 1). Finally, most of the partner's choices observed by the subjects were experimentally induced disagreements. Therefore, on each disagreement trial, a subject could accept influence by taking the partner's initial choice as his own final choice, or the subject could reject the partner's influence by keeping his own initial choice as his final choice. The measure $P(s)$ is the proportion of self- or stay resolutions made by each subject, a measure of rejection of influence. Driskell and Mullen (1990) found $P(s)$ to be a reliable measure of status in groups; subjects in a more superordinate or higher status group position exhibited a higher $P(s)$, accepting less influence from others, and subjects in a lower status position exhibited a lower $P(s)$, deferring more to others' task decisions.

Following the completion of this task, subjects completed a questionnaire assessing their perceptions of their partner and the level of stress. Each subject was then interviewed individually, fully debriefed, and thanked for participating in the study.

Results

A manipulation check was performed to gauge the success of the status and stress manipulations. Because higher status persons are generally perceived as more competent than lower status persons, we asked subjects to rate their partner in terms of how capable he seemed and how well they thought their partner would do in situations in general. Subjects in the high status conditions viewed their partner as less capable ($M_s = 3.76$ vs. 5.03), $t(72) = 5.90$, $p < .001$, and likely to do more poorly ($M_s = 3.35$ vs. 4.51), $t(72) = 5.49$, $p < .001$) than did subjects in the low status conditions. Thus, military rank proved to be an effective status manipulation for these subjects. Results also indicated that subjects in the stress conditions were more likely than subjects in the no-stress conditions to report that they were excited ($M_s = 3.86$ vs. 4.78), $t(72) = 2.85$, $p < .01$, and that they felt panicky ($M_s = 4.27$ vs. 5.08), $t(72) = 2.64$, $p = .01$.

$P(s)$ data for the four conditions of the study are presented in Table 1. $P(s)$ scores (the proportion of self-resolutions after disagreement) were transformed to the *number* of self-resolutions

Table 1
Mean Proportion of Self-Resolutions as a Function of Status and Stress

| Status | No stress | Acute stress |
|--------|-----------|--------------|
| Low | .570 | .411 |
| High | .733 | .595 |

per person and were analyzed in a 2 (status) \times 2 (stress) analysis of variance. There was a significant main effect of status, $F(1, 73) = 25.46, p < .001$. That is, the low status group members were more likely to defer to their partner's task choices than were the high status group members. There was also a main effect of stress, $F(1, 73) = 18.35, p < .001$. The introduction of stress caused group members to become more deferential. Finally, there was no Status \times Stress interaction, $F(1, 73) = 0.073, p = .79$. Contrary to the centralization-of-authority hypothesis, both high and low status group members responded to stress in a similar manner, becoming more willing to accept task input from their partner during decision making.

Discussion

Results from this study clarify and delimit the generalization of the centralization-of-authority hypothesis to small group interaction. According to this hypothesis, stress results in a centralization of authority, such that decision making is concentrated at higher levels of the group hierarchy. The implication of this hypothesis is that, under stress, group members with higher positions in the group status hierarchy become more authoritative (and less receptive to the task inputs of other group members) and group members with lower status positions become more subordinate (and more receptive to decision inputs from others). However, the present results, based on interaction in two-person decision-making groups under stress, indicate the operation of a different process, characterized by the increased receptivity of both high and low status group members to the task inputs of others.

The results of this experiment indicate that, first, status was a significant determinant of group interaction. As expected, low status group members were much more likely to defer to the decision inputs of higher status group members, and high status group members were generally less likely to defer to subordinate group members. This robust effect of status in organizing task interaction has been demonstrated to operate on the basis of a wide range of status characteristics, including military rank (Berger, Cohen, & Zelditch, 1972), sex (Eagly, 1983), race (Webster & Driskell, 1978), and education (Moore, 1968).

Second, we found that low status group members became even more willing to defer to others when under stress. This is consistent with earlier data from Klein (1976), Worchel et al. (1977), and Hamblin (1958). Furthermore, our data support the observations of Foushee and Helmreich (1988), who noted that subordinate aircrew members become even more hesitant to take action during emergencies. Foushee and Helmreich described one study in which flight captains feigned partial incapacitation during a simulated final landing approach (Harper, Kidera, & Cullen, 1971). Harper et al. found that 25% of these simulated flights "crashed" because the first officer failed to take control. The present results document this tendency for lower status group members to become more subordinate under stress.

Finally, we found that high status group members under stress also became more receptive to the task inputs of their partner. This result is contrary to the centralization-of-authority hypothesis, which predicts that high status group members should become more rejecting of others' input as they increas-

ingly make decisions on their own. Our data suggest an increased receptivity under stress, whereby high status members become *more* likely to attend to the task contributions of other group members in decision making.

The basis for the status and authority structure in groups is cooperative exchange between group members. High status group leaders accept increased responsibility for task performance and in exchange receive deference from other group members and greater input into the task. Lower status group members exchange reduced decision-making rights for the increased probability of group success. Our results suggest that the nature of this exchange is modified somewhat under stress. How can the tendency for group members to become more receptive to others when under stress be accounted for?

One explanation for these results is couched in terms of social comparison. Festinger (1954) argued that people are often information dependent, or dependent on others to help them evaluate the correctness of information. Whereas in some cases there are objective standards by which to make decisions (such as the use of a yardstick to measure the length of an object), in many cases a social comparison process (utilizing information from others) must be used to test the validity of ambiguous stimuli. Therefore, individuals compare their opinions and capabilities with those of other individuals to judge whether they are correct, proper, or accurate. Furthermore, some research suggests that the desire to evaluate one's resources and opinions increases in stressful or threatening situations (see Taylor et al., 1990). In other words, the desire for task-relevant information may increase as external stress makes effective task performance more critical.

Second, individuals may also become more receptive to task inputs from other group members out of a greater desire to share or diffuse responsibility under the critical performance conditions imposed by stress. We defined acute stress as a situation involving (a) threat to personal well-being and (b) increased responsibility such that the consequences of poor performance are more critical. Therefore, group members under stress may become more receptive to the task inputs of others in an attempt to share or diffuse this increased responsibility.

The results of this research have direct implications for applied groups. First, consider the decision behavior of lower status group members. Lower status group members were generally more deferential than high status members, and this tendency became greater under stress. The tendency for lower status group members to become more subordinate under stress has been observed in flight crews, with often disastrous results (National Transportation Safety Board, 1979, 1982). As a result, some people have called for the implementation of assertiveness training to overcome the increased loss of information that may result from a subordinate group member's hesitancy to exert influence. However, we see this phenomena less as a function of individual nonassertiveness than as the normal operation of a social psychological group process. In other words, subordinate group members are not nonassertive but are exhibiting status-typed behavior. That is, the group status structure defines the hierarchical nature of group interaction (i.e., captains exert more influence in decision making, and subordinate team members exert less). Problems occur when

this process works too efficiently, for instance, when lower status group members are under stress.

However, some researchers have been successful in reducing the inequality in participation and influence between high and low status group members. Cohen (1982) increased the interaction of low status schoolchildren through interventions intended to alter the performance expectations of both high and low status children (to reduce the competent vs. less competent connotations that accompany high and low status positions) and by encouraging team cooperation. Note that Cohen targeted both high and low status group members. Because we view the subordinate group member's deferential behavior as the manifestation of a cooperative group status process rather than as an individual affliction, we believe that the behavior of both high and low status group members must be altered to achieve a significant change in interaction. It is likely that interventions aimed at only one group member (such as assertiveness training for the subordinate group member) may be only marginally effective. In fact, Katz (1970) found that providing lower status group members with assertiveness training prior to group interaction did increase their interaction somewhat but that high status group members reacted with considerable hostility (they felt that the lower status group members were behaving inappropriately). Similarly, Foushee (1982) reported a flight crew incident in which, after repeated flight advisories from a copilot, the captain responded, "Just look out the damn window" (p. 1,063). In summary, research suggests that interventions that attempt to (a) alter the superordinate-subordinate performance expectations induced by differences in status and (b) build team cooperation can be successful at increasing the interaction of low status group members; however, these interventions must involve both high and low status group members. In fact, one key aspect of the aircrew coordination training programs that have been implemented in the commercial and military aviation community is that they target *crew* processes, not just individual behavior.

Now consider the decision behavior of high status group members. Under stress, high status group members in this study tended to be more responsive to task inputs from their partners. We view this as a generally positive result, especially in contrast to the increasingly authoritarian behavior of leaders predicted by the centralization-of-authority hypothesis. In fact, there are likely to be very few real-world situations, even under stress conditions, in which an increased tendency for group leaders to consider other team members' task input in decision making would be detrimental. However, the increased reliance of lower status group members on the group leader to make decisions under stress, and the increased tendency for the group leader to attend to subordinates' input, may result in greater workload for the team leader. This suggests that realistic training that simulates this potential overload under stressful conditions may prove valuable for team leaders.

Finally, we note several limitations of the current study and avenues for further investigation. First, the primary purpose of this research was to test competing hypotheses of small group performance under stress. Subsequent research must be conducted to determine the applicability of these findings to real-world settings of interest, such as flight crew interaction.

Second, stress, as operationalized in this study, was not di-

rectly tied to task performance. There is a difference between ambient stress and performance-contingent stress. Ambient stress is background stress; that is, individuals are forced to perform a task in the presence of the stressor, but successful performance of the task does not decrease or remove the stress. Examples would include a group performing a task in a crowded, noisy, or fast-paced environment. In such a setting, the stress is ongoing and tasks must be performed, but performance of the tasks does not eliminate the stress. In a performance-contingent stress setting, such as a flight crew emergency, the threat is removed if the crew performs effectively. Further research is required to examine whether groups may respond in a different manner to ambient and performance-contingent stress.

Third, this study suggests that the centralization-of-authority hypothesis, derived from the organizational literature, must be limited in its application to small groups. However, it is possible that stress produces an increased receptivity to information from others in small groups and also leads to centralization of authority in larger organizations. That is, the leader in a large organization or large group may centralize authority *and* rely more heavily on a few trusted subordinates when under stress. In a small task group, the leader may be more receptive to the input of all group members (and not move to centralize decision making) because these group members provide the only available sources of task information. In other words, leaders may centralize authority and decision making only in larger groups, in which there are numerous sources of task information. Whether group size moderates the use of these strategies is not known.

Finally, we have taken a decidedly situational approach to group interaction. For example, we have argued that subordinate group members defer more frequently in decision-making interaction because of the positions they occupy in the group status structure. It is not that they do not have more assertive behaviors in their behavioral repertoire but that the deferential behavior is situationally specific to that interaction (such as the interaction between a captain and copilot). Given this situational specificity, it should be possible to alter detrimental patterns of group behavior by altering features of the task environment. Further research is needed to examine the effects of such interventions, including training to support team coordination, on group performance.

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