Processes That Mediate the Relationship Between a Group Goal and Improved Group Performance

Elizabeth Weldon, Karen A. Jehn, and Priti Pradhan
Kellogg Graduate School of Management
Northwestern University

The relationships between the level of a group performance goal for quantity, group process, and group performance were assessed. Forty groups of 3 people performed 3 trials of a production task. One half of the groups were assigned a low goal for Sessions 2 and 3, and one half were assigned a high goal. To measure group process, videotapes of each group were analyzed and self-reports of behavior were collected. A significant difference in performance across the high and low goal conditions was found for Session 3, and measures of group process showed that effort, group planning, changes in individual and group performance plans, and reduced concern for quality mediated the group goal effect. These results are discussed in relation to Weldon and Weingart's (1988) model of group goals and group performance.

Many studies show that group goals can improve group performance. These studies show that groups working toward challenging performance goals perform better than groups working without explicit goals, and that the magnitude of the goal is an important determinant of the level of performance achieved (see Weldon & Weingart, 1988, and Pritchard, Jones, Roth, Stuebing, & Ekeberg, 1988, for a review of these studies).

These effects have been demonstrated many times, using goals for quantity and quality of performance, different tasks, naturally occurring groups, and ad hoc laboratory groups. However, little is known about the social, psychological, and behavioral processes responsible for these results. A better understanding of the processes involved could help group leaders facilitate the group goal effect.

In this article, we report the results of an experiment testing hypotheses about behaviors believed to mediate the relationship between a group goal and group performance when a goal for quantity is assigned for a moderately complex task involving pooled and sequential interdependence among group members. The hypotheses tested here were derived from Weldon and Weingart's (1988) analysis of group goals. In that analysis, Weldon and Weingart integrated studies of individual goals and individual task performance with studies of group performance to suggest six facets of group process that might explain the group goal effect. The term group process refers to individual behavior in groups and the ways that group members interact (Steiner, 1972; Weldon & Weingart, 1988). Thus, the introduction of a group goal is believed to change the behavior of individual group members and the way they interact, and the degree of change should be correlated with the level of the goal.

Processes That Mediate the Group Goal Effect

Effort

First, the group goal effect is believed to be mediated in part by the physical and mental energy that group members invest in their work (Weldon & Weingart, 1988). That is, group goals improve group performance in part because group members work faster and longer on the task, focus more attention on the task, and are less distracted by stimuli unrelated to the task. The level of effort invested in the task is believed to increase in proportion to the demands of the goal.

The impact of goal level on effort is predicted from studies of individual goals showing that effort increases with goal level (e.g., Bryan & Locke, 1967; Garland, 1982) and two studies of group goals showing significant relationships between goal level and effort. In those studies, group members working toward a high goal for a production task worked faster than group members working toward a low goal (Weingart, 1990), and group members working toward a challenging goal for an idea generation task reported working harder than group members working without an explicit performance goal (Weingart & Weldon, 1991).
Increased effort is expected to improve group performance, although the strength of this relationship is believed to vary with the appropriateness of the task strategy used, task complexity, and the nature of the work flow interdependence among group members (Weldon & Weingart, 1988). This prediction is based on (a) Hackman and Morris's (1975) model of group performance, which suggests that effort is an important determinant of group performance but that the impact of effort on group performance is moderated by the appropriateness of the task strategy used; (b) Wood and Locke's (1990) discussion of task complexity, which suggests that the importance of effort for improved performance increases with decreasing task complexity because effective task strategies can be determined more easily for simpler tasks; and (c) Weldon and Weingart's (1988) analysis of work flow interdependence, which suggests that the impact of effort on group performance decreases with increases in the coordination demands associated with different types of interdependence. Other things being equal, team interdependence requires the most coordination, followed by reciprocal, sequential, and pooled interdependence (Van de Ven, Delbecq, & Koenig, 1976).

This analysis leads to the hypothesis that increased effort is an important mediator of the group goal effect when a simple to moderately complex task is involved, the organization of the group involves pooled and sequential interdependence, and appropriate task strategies are used. Therefore, increased effort was expected to be an important mediator of the group goal effect in this experiment.

Planning

Second, planning should play an important role in the group goal effect (Weldon & Weingart, 1988). A performance plan is "a description of a time-and-function-linked series of actions that, if executed, will (it is supposed) lead to a specific goal/outcome/consequence" (McGrath, 1984, p. 128). Group members should be motivated to improve their performance plans because group members understand that more efficient work methods contribute to improved group performance. This hypothesis is consistent with studies of individual goals showing that the motivation to develop more effective task strategies increases with the level of an individual goal (Earley, Connolly, & Lee, 1989; Earley, Lee, & Lituchy, 1988) and a study of group goals showing that group members working on an additive task were more likely to change their personal performance strategies after an explicit group goal was introduced, compared with group members who continued to work on the task without an explicit goal (Weingart & Weldon, 1991).

Group members should be motivated to improve their individual performance plans and their group's plan (Weldon & Weingart, 1988). The group's performance plan describes the distribution of work across group members and the methods used to coordinate their actions. That is, the group plan specifies the assignment of tasks to people and the means used to integrate their actions to produce a coherent whole. Individual performance plans specify procedures for the performance of individual tasks. More specifically, individual plans specify the order in which assigned acts should be performed, the tools and techniques to be used to perform those acts, and the physical arrangement (layout) of materials, equipment, and tools within the work space. When group members work together to develop a group plan, planning is evident in their discussion of what should be done, who should do it, and how and when it should be done. When individuals plan, they consider actions required to perform the task, the interdependence of those acts, and how those acts might be performed.

Although a group goal is expected to motivate planning, planning will not always improve group performance. The impact of planning on performance depends on the complexity of the task, the work flow interdependence among group members, and the quality of the resulting plan, which is determined by the group members' understanding of the task. Task complexity moderates the impact of planning on performance because task complexity determines the extent to which alternative plans can be developed. As Wood and Locke (1990) have explained, there are few distinct ways to perform a simple task. Thus, for a simple task, additional planning would not improve group performance. The nature of the work flow interdependence moderates the impact of group planning because it determines the extent to which plans for coordination across group members are important to group success. When coordination demands are low, planning that focuses on coordination would not contribute much to improved performance. Experience with a task interacts with task complexity to moderate the effect, because experience increases the group members' understanding of a complex task, which increases the likelihood of developing an effective plan.

This analysis suggests that planning will play some role in the group goal effect when group members perform a moderately complex task involving pooled and sequential interdependence and when they have some experience with the task before the goal is assigned. Therefore, it was hypothesized that individual and group planning and changes in individual and group performance plans would increase with goal level in this experiment, and that planning and changes in individual and group plans would contribute to improved group performance.

Performance Monitoring

Third, performance monitoring is expected to mediate the group goal effect (Weldon & Weingart, 1988). Performance monitoring involves periodic assessments of progress toward the goal that allow group members to determine the likelihood of goal attainment, given the plan in use and the current rate of work. When monitoring suggests that the goal will not be met, group members can increase their efforts or change their performance plans. Although the importance of performance monitoring to goal attainment has been demonstrated for individuals working alone (Bandura, 1986, 1988; Morrison & Weldon, 1990), the importance of monitoring has not been tested in groups. However, performance monitoring should be important in groups because, like individuals, group members must assess the sufficiency of their efforts and the effectiveness of their plans in order to make adjustments when required to meet the goal.

The importance of performance monitoring should increase with increasing goal level because effort must be regulated more exactly and performance plans must be more effective as
goal level grows (Weldon & Weingart, 1988). Therefore, group members in this experiment should monitor the group's progress toward the goal more often when working toward a difficult goal, and increased monitoring should lead to improved performance.

**Decreased Quality**

Fourth, reductions in the quality of the group's performance are expected to mediate the group goal effect when a goal for quantity is involved (Weldon & Weingart, 1988). Several studies of individual goals show that quality drops with increasingly difficult goals for quantity (Bavelas & Lee, 1978; Rosswork, 1977). This drop in quality may be an unintended consequence of working faster or a conscious strategy for meeting the goal (Locke & Latham, 1990, chap. 4). On the basis of this reasoning, the quality of the work produced in this experiment was expected to decrease with increases in the group goal.

**Extrarole Behavior**

Fifth, extrarole behavior should be an important mediator of the group goal effect (Weldon & Weingart, 1988). As defined by Katz and Kahn (1978), extrarole behaviors are behaviors outside prescribed roles (i.e., actions not specified in job descriptions) performed to facilitate the accomplishment of organizational goals. When applied to groups, extrarole behaviors are actions not specified in individual or group performance plans that contribute to group performance. In general, these are behaviors that facilitate the performance of others or facilitate the coordination of group members.

The effects of goal level on extrarole behavior and these behaviors on group performance can be predicted from studies of cooperative reward structures, group process, and group performance, because group goals and cooperative reward structures create similar types of outcome interdependence among group members. A cooperative reward structure ties individual rewards to the level of the group's performance or links individual goals so that each group member meets his or her own goals only when the goals of others are met (Kelley & Thibaut, 1969). A group goal creates the same type of interdependence, because individuals succeed only when the group succeeds. For example, Weingart and Weldon (1991) investigated several reasons why group goals motivate improved performance, and found that group goals were experienced as a personal challenge and that students working toward a group goal expected to feel a strong sense of personal accomplishment if the group performed well. Therefore, because feelings of accomplishment depend on group success, individual satisfaction is linked to the success of the group. Similarly, individual satisfaction is linked to group success when the desire for contingent rewards or the desire to avoid punishment is the primary motivation to meet a goal. Individuals receive rewards or avoid punishment only when the group performs well.

Because the outcome interdependence among group members created by a group goal is similar to that produced by a cooperative reward structure, group goals and cooperative reward structures might have similar effects on group process and performance. Studies of reward structures show that group members working under cooperative conditions share more information (Zander & Wolfe, 1964), pay more attention to the ideas of others, feel that group members are friendlier, and experience fewer communication difficulties (Deutsch, 1949) than group members working under competitive reward structures (characterized by a negative relationship between individual outcomes) or individualistic schemes (outcomes of individual group members are unrelated). In addition, studies show that cooperative reward structures produce better group performance than competitive structures, particularly for tasks involving high levels of work flow interdependence (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981). On the basis of these results, it was hypothesized that extrarole behavior would increase with the magnitude of the group goal and would improve group performance.

**Morale-Building Communication**

Sixth, morale-building communication is expected to mediate the group goal effect (Weldon & Weingart, 1988). Morale-building communication is language that builds a sense of efficacy among group members, arouses their emotions, and inspires them to action. Two types of morale-building communication should be observed: (a) statements about a group member's or the group's ability to perform well, and (b) language designed to increase arousal, such as that used in "pep talks" and that used by charismatic leaders to inspire others (e.g., Bass, 1985; Yukl, 1981).

Statements about ability should influence group performance through their impact on perceptions of individual and collective efficacy. Perceptions of self-efficacy, defined as one's own judgement of "how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982, p. 122), have been shown to have a positive impact on the goal-directed behavior of individuals working alone (Locke, Frederick, Lee, & Bobko, 1984; Wood & Locke, 1987). Perceptions of group efficacy, defined as a group member's belief that the group as a whole can perform well, might play a similar role in groups. Statements about an individual's or the group's ability to perform well should influence perceptions of group efficacy, and these feelings should influence performance. Language designed to arouse emotion should influence performance through effort invested in the task because increased arousal produces faster, more energetic work.

The hypothesized effects of group goals on morale-building communication and morale-building communication on group performance are based on the belief that language can arouse emotion, stimulate enthusiasm, and build confidence in one's ability to meet a goal (Bass, 1985; Edelman, 1964; Pondy, 1978; Yukl, 1981), and on McQuail's (1987) observation that communication in small, task-oriented groups is intended in part to develop and maintain group consciousness, express solidarity, and enhance belonging and esprit de corps. According to Weldon and Weingart (1988), morale-building language serves these functions in groups. Therefore, morale-building communication was expected to increase with increasing group goals in this experiment and contribute to improved performance.
Goal Commitment

The extent to which a group goal actually affects these six dimensions of group process depends on commitment to goal attainment (Weldon & Weingart, 1988). Goal commitment is an attachment to or determination to reach a goal that is crucial to the success of the goal intervention (Locke, Shaw, Saari, & Latham, 1981). Goal commitment is important because it determines the extent to which an individual mobilizes personal resources to meet the goal (Locke & Latham, 1990, chap. 6).

Using a framework similar to that used by Locke, Latham, and Erez (1988) and Hollenbeck and Klein (1987) to analyze factors that influence commitment to an individual goal, Weldon and Weingart (1988) suggested variables that influence commitment to a group goal. Two of these, perceived legitimacy of an assigned goal and challenge-seeking motives, were expected to produce commitment in this experiment. Perceived legitimacy should be high because participants in experiments typically accept the experimenter's authority to demand improved performance (Locke et al., 1988). Challenge-seeking motives, which influence commitment because they influence the extent to which an individual experiences the goal as a challenge, should be high in this experiment because students are typically challenge seekers (Weingart & Weldon, 1991). Therefore, group members were expected to be committed to goal attainment in this experiment, and the relationships described earlier were expected to hold.

Current Experiment

The experiment reported here tested the hypothesized effects of a group goal on the six facets of group process described earlier and the impact of these behaviors on group performance when a group goal for quantity is assigned for a moderately complex task and when group members have some experience with the task before the goal is assigned. This experiment was not a complete test of Weldon and Weingart's (1988) model because the moderating effects of task complexity, task experience, and work flow interdependence on these processes and the impact of performance monitoring on effort and planning were not tested.

Method

Subjects

One hundred two master's of management students and 24 undergraduate students in communications studies participated to satisfy a course requirement or receive extra course credit. Subjects were scheduled to participate in groups of 3, creating 42 groups. Groups were randomly assigned to high and low goal treatment groups. Two groups were dropped from the high goal condition because the videotapes of their performance were unusable. This left 40 groups, composed of 96 master's students and 24 undergraduates.

Procedure

Group members were told that they were participating in a study of group performance. Participants worked in groups of 3 to build abstract structures using Tinkertoys, styrofoam balls, popsicle sticks, aluminum foil, macaroni, popcorn, glue, scissors, a needle, and thread. Building the structure required 26 acts (e.g., gluing macaroni to stick), 11 of which were unique, and these acts included seven precedence requirements. A precedence requirement indicates that a certain act must be performed before it is possible to perform others. Thus, the number of different acts required to perform the task and the sequence demands of the task created a moderately complex task (see Wood, 1986, for a discussion of unique acts and precedence requirements as determinants of task complexity).

This structure-building task was a divisible group task (Steiner, 1972), and every group did, in fact, divide the work to create specialized subtasks performed by different group members (each group member built part of the model). This division of labor created some sequential interdependence among group members. However, the sequential interdependence was not complete, because in each case group members could perform some of their work without input from other group members. In addition, the integration of subcomponents after they were complete typically required coordination among group members because, in most groups, the integrating act could not be performed without the help of others (e.g., tying a string of styrofoam balls between two pieces of the structure was accomplished more easily with the help of another group member).

Eleven boxes holding the supplies required to build the structure were placed on a table adjacent to the work space. Some of the boxes were close enough to be reached by stretching, but access to most required three to seven steps. Group members were shown a diagram of the structure to be built and were asked to build structures identical to the picture. Subjects were told that their structures must match the diagram and that the experimenter would check each structure to see that it did. Specifically, the experimenter said that the foil-wrapped styrofoam ball must be wrapped neatly, the styrofoam balls must not be strung too tightly or too loosely on the structure, the glued items must be stable (not sliding or shifting out of position), and the popsicle stick tree must be parallel to the base.

Groups then built one structure to familiarize themselves with the task. This was a practice session, and no time limit was imposed. After the practice session, the experimenter checked the structure for quality, and deviations from quality specifications were described to the group.

In Session 1, group members were told to build structures for 15 min. If group members asked how many structures they should build, the experimenter told them to work on the task for 15 min. The experimenter set a timer that was visible throughout the work session, and then left the room. After 15 min, the experimenter returned and checked the structures for quality, counted the number produced, and posted that number on a flip chart.

Group members were then told that they would participate in two more structure-building sessions, 15 min each. Each group was assigned a goal for these two sessions. The group goal was written on the flip chart, and group members were told that this goal applied to Sessions 2 and 3. That is, the goal assigned for Session 2 was also the number they were expected to produce for Session 3 (i.e., the goal would not increase).

After Session 2, the structures were checked for quality, and the number produced was recorded on the flip chart. The group members were reminded of their goal for Session 3 by writing that number again on the flip chart. After Session 3, group members completed a short questionnaire and were debriefed.

Quality Check

Although the quality of the structures was checked after each session, this inspection was not stringent. None of the structures built were rejected, even though the glue was sometimes messy, strings were not tied securely, and the aluminum foil was not wrapped neatly. In
fact, any structure that had all the pieces in the right place, and that held together until the experimenter had finished counting, passed the quality check. This loose attitude toward quality was adopted because, although quality was mentioned to group members, we were not interested in how group members balance concerns for quality and quantity when quality standards are strictly enforced. Instead, we hoped to determine whether reductions in quality are found when goals for quantity increase.

**Goal Level**

Eighteen groups were assigned a low performance goal and 22 were assigned a high performance goal. The low goal was calculated by adding one to the group's performance for Session 1, and the high goal was determined by adding five. This manipulation produced goals that were high or low relative to the group's previous performance on the task.

The assigned goal was linked to the group's performance during Session 1 to control for differences in skills and initial performance plans across groups. It was important to control for these differences because the effects of these variables might obscure the relationship between goal level and group process tested here. Although Weldon and Weingart (1988) did not discuss this issue, goal level is not the only variable expected to influence the level of the group process variables observed after a group goal is introduced. Skills and plans-in-use will also be important. For example, if the same goal were assigned to several different groups, the level of effort exerted and the amount of planning performed to meet that goal would depend not only on the level of the goal, but also on the skills of the group members and their plans-in-use. That is, skilled group members using effective plans would exert less effort and perform less planning to meet the goal than would group members less skilled and working with less effective performance plans. If it is assumed that differences in performance during Session 1 are produced primarily by differences in skill and the effectiveness of the plans developed by the group, this variation can be controlled by assigning goals that are high or low relative to the group's earlier performance on the task.

**Mediating Processes**

Three types of data were collected to measure the processes believed to mediate the group goal effect. Descriptions of each group member's actions during each work session were obtained; a content analysis of group members' conversation during and between Sessions 2 and 3 was performed; and self-reports of behavior were collected.

*Descriptions of acts performed.* Descriptions of each group member's actions during each session were produced from videotapes of each group's performance. A research assistant, who was blind to the hypotheses, watched each tape three times, focusing each time on a different group member, and listed every action performed (for example, stands up, gets green base from box, puts yellow stick in green base, moves box of balls, sticks ball in new ball, ties string to wheel, and adjusts balls on string). To check the accuracy of these listings, the experimenters randomly selected five 1-min segments from one third of the tapes and checked to see that every comprehensible word had been recorded. No errors were found in these segments, suggesting that the transcripts were generally quite accurate.

These descriptions were used to determine the acts performed by each group member (one aspect of the group's performance plan), the number of times group members went to the boxes to get supplies (a measure of efficiency for an individual's performance plan), and the number of adjustments made to structures to improve their appearance (indicating concern for quality).

To determine the distribution of acts across group members, all the acts required to build the structure (e.g., glue macaroni to popsicle stick and wrap ball in foil) were identified, and the acts performed by each group member during each session were noted. The extent to which the distribution of acts changed across sessions was determined by counting for each group member the number of acts performed during Session 2 but not performed during Session 1 (dropped acts), and the number of acts performed during Session 1 but not during Session 2 (dropped acts). These numbers were added for each group member and then summed across group members to measure the extent to which the distribution of acts changed from Session 1 to Session 2. The number of acts added and dropped by each group member from Session 2 to Session 3 were also determined, and these numbers were summed to assess the change in acts from Session 2 to Session 3.

To determine the efficiency of individual plans, the number of times group members got supplies from the boxes (called "gets") and the number of group members who moved the boxes of supplies during the work session were counted. The number of gets was determined by counting the get statements (e.g., "gets green stick from box") and get episodes in the descriptions of acts performed. A get episode was any series of get statements unbroken by a task-required act. Each get statement standing alone and each get episode counted as one get. The number of gets per structure built is a measure of efficiency, because fewer trips to the boxes reduce time and energy invested in procurement of supplies. The number of gets per structure for each group was determined by adding the number of gets across all group members who did not move their boxes and dividing that number by the number of structures produced. Group members who moved their boxes were not included in this sum, because moving a box is another way to increase the efficiency of an individual performance plan. When a box was moved, a get was required very little energy because the worker did not have to reach or move to get supplies. Therefore, fewer gets per structure and moving boxes of supplies were two different ways that group members could improve their individual performance plans.

The number of times group members made adjustments to the structures to improve their appearance was also counted. For example, a group member might adjust the balls on the string to improve their spacing or clip the tails on the string after tying. Each adjustment and each adjustment episode (i.e., a sequence of activities constituting one adjustment, e.g., takes popsicle stick tree from styrofoam ball, exchanges ball for another, and sticks tree in new ball) counted as one adjustment. The number of adjustments per structure built was determined for each group by summing the number of adjustments performed by each group member and dividing that number by the number of structures produced.

*Content analysis of discussion.* Transcribers who were blind to the hypotheses watched each tape and recorded everything said by group members after the goal for Session 2 was assigned. To check the accuracy of these transcripts, the experimenters randomly selected five 1-min segments from one third of the tapes and checked to see that every comprehensible word had been recorded. No errors were found in these segments, suggesting that the transcripts were generally quite accurate.

Two people judged the content of the transcripts. Both judges were blind to conditions, and one judge was blind to the hypotheses. Nine of the 40 transcripts were coded by both judges. The others were coded by one of the two.

Before coding the content, each judge unitized her transcript. Unitizing is the process of decomposing the conversation into units to be content analyzed. In this experiment, the unit of analysis was the "thought unit." A thought unit is a sequence of a few words conveying a single thought. The thought unit was an appropriate unit of analysis.
because, in interaction coding, the unit of analysis should be roughly equivalent to the unit of meaning (Lamb, 1979). Guidelines for unitizing are presented in the Appendix.

The interrater reliability for unitizing was determined by calculating Guetzkow's (1950) measure of disagreement for 12 transcripts that were unitized by both judges. This analysis produced an overall percentage of disagreement equal to 0.004%. That is, the judges disagreed on unitizing once for every 250 units identified.

The content of each thought unit was then determined. Each thought unit was assigned to one of nine content categories. The quality category included statements about the rights or wrongness of the structure relative to the quality specifications and statements about the quality of the supplies. Group planning included statements of who should do what, when, where and how, what has been done, what needs to be done, and who is doing what to build the structure. Monitoring included discussion of the number of structures built and time remaining in the work session. The acts and supplies category included any discussion of task-relevant acts and supplies that did not involve planning, quality, or monitoring. This discussion of acts and supplies provided a means of task-focused attention beyond that invested in planning, monitoring, and discussing quality. Extrarole interaction included all offers to help other group members perform their work and requests for help. Morale-building communication included positive comments about the group's ability or a member's ability to perform well. Negative communication included all negative comments about the group's ability or a member's ability to perform well. Although not part of Weldon and Weingart's (1988) model, this content category was added to the coding scheme to create an exhaustive accounting of the conversation among group members after negative comments were found in the first transcript. The relationships among negative comments, goal level, and group performance were tested here because negative comments might reflect perceived goal difficulty and, as a result, would be correlated with goal level and group performance. The nontask-related category included any conversation not relevant to building structures, such as discussion of part-time jobs or comments about mutual friends. Uncodable statements were statements for which the content was unclear. Complete descriptions of each category are presented in the Appendix.

To assign thought units to categories, the two judges were told to use the codes provided to categorize statements based on their judgments if necessary but not to draw inferences about the speaker's intent when making their judgments. They were also told to categorize a unit as a particular type of statement only when it was clearly an example of that category. A complete description of the guidelines used to categorize thought units is presented in the Appendix.

Each judge coded half the transcripts, plus four or five that were also coded by the other judge. This overlap provided two sets of ratings for these nine transcripts, which were used to determine the interrater agreement for each content category. Interrater agreement was determined by checking the number of times the judges agreed that each unit was and was not an example of a category. Agreement was very high for all categories: quality talk, 98%; planning, 94%; monitoring, 99%; acts and supplies, 96%; extrarole interaction, 90%; morale-building communication, 99%; negative communication, 99%; nontask-related, 97%; and uncodable, 99%. Kappa, a measure of agreement adjusted for extent of agreement expected by chance (Brennan & Prediger, 1981), was also calculated for each category. Kappas for each category were as follows: quality talk, 96%; planning, 88%; monitoring, 99%; acts and supplies, 92%; extrarole interaction, 97%; morale-building communication, 98%; negative communication, 98%; nontask-related, 95%; and uncodable, 99%. These numbers show that the content of the conversation could be categorized reliably, and that no difference in results attributable to the particular judge used would be expected.

Summary. The descriptions of actions performed by each group member, the content analysis of conversation, and the self-reports provided 13 measures of the six facets of group process believed to mediate the group goal effect and 1 measure of negative comments among group members. Effort was measured with (a) self-reports of working hard, (b) number of nontask-related units of conversation, and (c) conversation about acts and supplies. The self-reports were designed to measure physical effort invested in the task. Nontask-related talk and discussion of acts and supplies were measures of cognitive effort invested in the task beyond that invested in planning, monitoring, and discussing quality. Increased discussion of acts and supplies was believed to indicate increased effort, because increased talk about acts and supplies would be a by-product of task-focused attention (because attention was focused on the task, group members would talk more about their work). In contrast, increasing levels of nontask-related talk reflect less effort invested in the task, because focusing attention on nontask-related issues diverts attention from the task. As Lane (1982) pointed out, attention is a limited resource. As a result, increased focus on nontask-related issues means that less attention is focused on the task.

Concern for quality was measured by (a) discussion of quality among group members and (b) the number of adjustments per structure. A systematic assessment of quality was not made because the experimenter could not make a thorough inspection during the experiment, as a result of time constraints, and the judgment could not be made afterward because the structures were disassembled after each session to recycle the supplies. However, these measures provide good substitutes for a systematic assessment of the true quality of the structures.

Group planning was measured by the number of conversation units in the planning category, and changes in group performance plans were measured by (a) self-reports of change in the group strategy and (b) the change in acts performed by group members across sessions (number of acts added and dropped across sessions). Improvements in individual performance plans were measured by (a) the number of group members who moved boxes of supplies (move boxes) and (b) the number of gets per structure. Morale-building communication, monitoring, extrarole behavior, and negative comments were measured by the number of conversation units in each of these categories.

These measures of group process provide at least one measure of each mediating process. However, they do not provide complete operationalizations of each one. Only one type of extrarole interaction was measured; only one type of morale-building communication was assessed; only a few of the many ways that group and individual perfor-
mance plans could change were actually measured; and individual planning was not assessed. Therefore, it was expected that the variables measured here would mediate but not account completely for the group goal effect.

Postexperimental Questionnaire

In addition to measuring effort and strategy change, the postexperimental questionnaire, administered after Session 3, included two items testing Weldon and Weingart's (1988) belief that the perceived value of group planning increased with goal level ("In this experiment, a change in group strategy during Sessions 2 and 3 was necessary for goal attainment" and "In this experiment, a change in group strategy for Sessions 2 and 3 was important for goal attainment"); eight Likert-type items developed by Hollenbeck, Klein, O'Leary, and Wright (1989) to measure goal commitment, modified to refer to group goals rather than individual goals; items designed to measure each group member's understanding of the assigned goal; two items asking each group member's assessment of the increase in performance required to meet the assigned goal; and items designed to assess self-set group goals. Group members responded to the Likert-type items using 6-point scales (strongly disagree to strongly agree).

Group Performance

The number of structures built by each group was counted after each session. Structures that were partially complete were not included in this count.

Results

Manipulation Check

When asked to report the goal assigned to their group, 95% of the group members in the low goal condition and 98% of the group members in the high goal condition gave correct reports for Session 2. Ninety-eight percent of the group members in the low goal condition and 97% of the group members in the high goal condition gave correct reports for Session 3.

In addition, group members in the high goal condition felt more strongly that a large increase in performance over that achieved during Session 1 was required to meet the goal for Sessions 2 and 3, compared with group members in the low goal condition ($M_{high} = 5.21, SD = .92$; and $M_{low} = 3.24, SD = 1.36$), $t(118) = 9.48, p < .01$, and group members in the high goal condition agreed more strongly with the statement that "the difference between my group's performance on Session 1 and the goal for Session 2 was large" ($M_{high} = 4.54, SD = 1.14$; and $M_{low} = 3.13, SD = 1.43$), $t(118) = 6.08, p < .01$. Thus, perceptions of the increase in performance required to meet the group goal were consistent with actual differences associated with the high and low goal conditions.

Self-Set Group Goals

An assessment of self-set group goals showed that most groups worked toward the assigned goal for Session 2. Seventy percent of the group members in the low goal condition and 79% of those in the high goal condition reported that their group did not set a goal that was different from the assigned goal. Those in the low goal condition who reported that the group had set a different goal reported that the self-set goal was one more than the assigned goal. In the high goal condition, the self-set goal was one to three structures less than the assigned goal.

For Session 3, the majority of the group members in the low goal condition (67%) reported that the group had self-set a goal. These goals ranged from one more to two more structures than the assigned goal (one more was the modal response). In the high goal condition, only 24% of the group members reported that a different goal had been set. More than half of those (14% of all group members in the high goal condition) reported that the self-set group goal was one to two structures fewer than the assigned goal, and the others reported a higher goal (one additional structure).

From these data, we can conclude that high and low goal conditions were established in this experiment, even though the difference in the operative goals across the two conditions during Session 3 may have been lower than intended because of self-set goals.

Goal Commitment

The zero-order correlations among the eight items measuring commitment to goal attainment were not consistently high, which suggested that these items did not constitute a unidimensional scale. To address this issue, responses to the eight items were factor analyzed using an oblique rotation. Two uncorrelated ($r = -.134$) factors with eight values greater than one emerged. Factor loadings for each item are shown in Table 1. Factor 1 represents the group member's determination to meet the assigned goal, and Factor 2 reflects feelings that the assigned goal was an appropriate goal for the group.

The regression method was used to compute factor scores for each group member, and mean factor scores for the high and low goal conditions were compared. These comparisons showed that, on average, group members in the high and low goal conditions were equally determined to meet the assigned goal, $t(118) = 0.45, ns$, but group members in the low goal condition felt more strongly that the assigned goal was inappropriate for the group, $t(118) = -3.14, p < .01$. These data are consist-

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Factor Loadings for Items Measuring Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Factor 1</td>
</tr>
<tr>
<td>I was strongly committed to pursuing the group's goal</td>
<td>.790</td>
</tr>
<tr>
<td>Quite frankly, I didn't care if my group achieved its goal or not</td>
<td>-.787</td>
</tr>
<tr>
<td>If we were to do this again, the group's goal should be changed</td>
<td>.176</td>
</tr>
<tr>
<td>I was ready to abandon the group's goal</td>
<td>-.599</td>
</tr>
<tr>
<td>It was unrealistic for me to expect the group to reach the goal</td>
<td>-.584</td>
</tr>
<tr>
<td>I think the assigned goal was a good goal to shoot for</td>
<td>.402</td>
</tr>
<tr>
<td>I was highly motivated to help my group meet our assigned goal</td>
<td>.763</td>
</tr>
<tr>
<td>It was very important to me that the group meet the assigned goal</td>
<td>.819</td>
</tr>
</tbody>
</table>
tent with the large number of self-set group goals in the low goal condition.

From these data, we can conclude that conditions promoting goal commitment were established in this experiment and that group members in both conditions were committed to goal attainment.

**Value of Strategy Change**

As expected, group members in the high goal condition felt more strongly that a change in group strategy was necessary ($M_{hi} = 4.4$, $SD_{hi} = 1.42$; and $M_{lo} = 3.27$, $SD_{lo} = 1.76$) and important ($M_{hi} = 4.76$, $SD_{hi} = 1.35$; and $M_{lo} = 3.6$, $SD_{lo} = 1.60$) for goal attainment when compared with group members in the low goal condition, multivariate $F(2, 118) = 7.93$, $p < .01$.

**Mediating Processes**

Means and standard deviations for each measure of group process, broken down by condition and session, are shown in Table 3. Zero-order correlations between these variables are shown in Table 3.

**Session 2.** As shown in Table 3, the correlation between performance and goal level was not significant for Session 2, and few correlations predicted by the model were found. Only two measures of group process (adjustments to structures and reports of change in group strategy) were correlated with goal level, and only one of these (adjustments) was correlated with performance. Because no difference in performance across the two conditions was found, the model was not tested for Session 2.

**Session 3.** A significant correlation between performance and goal level was found for Session 3. Group members in the high goal condition produced, on average, two more structures ($M_h = 5.56$, $SD_{h} = 1.42$; and $M_l = 4.4$, $SD_{l} = 0.58$) for goal attainment than those in the low goal condition.

To test the mediating processes for Session 3, the test for mediation described by James and Brett (1984) was performed. This test involves three steps. First, using separate regression equations, each proposed mediator is regressed on the independent variable. Second, using a single equation, the dependent variable is regressed on all variables producing a significant result suggests that the proposed mediators account completely for the relationship between the independent and dependent variables. A significant result shows that the independent variable has an effect on the dependent variable not mediated by the other variables in the equation (i.e., a direct effect). When a direct effect is indicated, the variance explained by the direct effect (change in $R^2$) is compared with the total effect of the independent variable on the dependent variable to determine whether the direct effect accounts completely for their relationship. If the change in $R^2$ equals the total effect, then the proposed mediators do not mediate the effect. If $R^2$ change is less than the total effect, the effect is partially mediated by these variables.

To test for mediators of the group goal effect, each measure of group process was regressed on goal level. Effort, planning, group strategy change, move boxes, quality talk, and adjust-

<table>
<thead>
<tr>
<th>Measure/session</th>
<th>Low goal condition</th>
<th>High goal condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 1</td>
<td>4.50</td>
<td>1.58</td>
</tr>
<tr>
<td>Session 2</td>
<td>5.61</td>
<td>1.75</td>
</tr>
<tr>
<td>Session 3</td>
<td>6.56</td>
<td>1.92</td>
</tr>
<tr>
<td>Effort</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>4.93</td>
<td>0.49</td>
</tr>
<tr>
<td>Session 3</td>
<td>5.07</td>
<td>0.56</td>
</tr>
<tr>
<td>Nontask-related talk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>85.67</td>
<td>78.24</td>
</tr>
<tr>
<td>Session 3</td>
<td>90.00</td>
<td>88.93</td>
</tr>
<tr>
<td>Change in group strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>3.57</td>
<td>1.07</td>
</tr>
<tr>
<td>Session 3</td>
<td>2.87</td>
<td>0.98</td>
</tr>
<tr>
<td>Move boxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>0.33</td>
<td>0.59</td>
</tr>
<tr>
<td>Session 3</td>
<td>0.44</td>
<td>0.70</td>
</tr>
<tr>
<td>Gets per structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>3.86</td>
<td>2.63</td>
</tr>
<tr>
<td>Session 3</td>
<td>3.74</td>
<td>4.27</td>
</tr>
<tr>
<td>Group planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>35.39</td>
<td>21.16</td>
</tr>
<tr>
<td>Session 3</td>
<td>32.28</td>
<td>19.78</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>30.06</td>
<td>15.83</td>
</tr>
<tr>
<td>Session 3</td>
<td>29.83</td>
<td>17.92</td>
</tr>
<tr>
<td>Acts and supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>27.00</td>
<td>17.83</td>
</tr>
<tr>
<td>Session 3</td>
<td>32.61</td>
<td>24.02</td>
</tr>
<tr>
<td>Quality talk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>11.17</td>
<td>10.91</td>
</tr>
<tr>
<td>Session 3</td>
<td>15.00</td>
<td>12.64</td>
</tr>
<tr>
<td>Adjustments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>1.25</td>
<td>1.42</td>
</tr>
<tr>
<td>Session 3</td>
<td>0.81</td>
<td>0.65</td>
</tr>
<tr>
<td>Morale-building communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>5.78</td>
<td>3.46</td>
</tr>
<tr>
<td>Session 3</td>
<td>5.89</td>
<td>4.21</td>
</tr>
<tr>
<td>Negative comments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>3.61</td>
<td>3.73</td>
</tr>
<tr>
<td>Session 3</td>
<td>3.06</td>
<td>2.96</td>
</tr>
<tr>
<td>Extrarole behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>7.22</td>
<td>8.01</td>
</tr>
<tr>
<td>Session 3</td>
<td>7.44</td>
<td>7.91</td>
</tr>
<tr>
<td>Uncodable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>17.00</td>
<td>13.66</td>
</tr>
<tr>
<td>Session 3</td>
<td>17.61</td>
<td>18.80</td>
</tr>
</tbody>
</table>
component solution was forced because these variables measured four different dimensions of group process (effort, group planning and strategy change, individual strategy change, and concern for quality), and it is important to differentiate the effect of each one. This analysis was performed to reduce the number of variables in the model, which increases the power of the tests measuring the impact of each measure of group process on performance. The power of these tests was low, because the ratio of observations to predictors was small. As a result, the degrees of freedom available for significance tests were low, and the likelihood of committing a Type II error was high. In addition, this analysis reduced the correlations among the measures of group process by combining variables according to their intercorrelations. Component scores for each group were calculated using the regression method, and performance during Session 3 was regressed on the component scores.

The results of the two-step regression predicting group performance from the four components of group process and goal level are shown in Table 5. As shown, $R^2$ increased very little when goal level was added to the equation ($R^2_{change} = .004$), $F(1, 34) = 0.40$ for change, ns. The beta weights testing the relationships between each component and group process show that effort/adjustments, group planning and strategy change, and individual strategy change were important determinants of group performance but that the component characterized primarily by quality talk was not.

Predicting Group Performance

To predict group performance from all correlates of group performance, regardless of their relationship to the group goal effect, group performance was regressed on the three components of group process shown to mediate the group goal effect, goal level, and all other variables showing a significant zero-order correlation with group performance (i.e., change in acts, gets per structure, performance monitoring, and performance for Session 1). Performance for Session 1 was included in this analysis because this variable was thought to reflect differences in skills and initial performance plans that influence subsequent performance. The results of this analysis are shown in Table 6. Although the beta weights from this equation cannot
Table 4

Component Loadings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort</td>
<td>.887</td>
<td>.105</td>
<td>.054</td>
<td>.057</td>
</tr>
<tr>
<td>Change in group</td>
<td>-.155</td>
<td>.880</td>
<td>-.217</td>
<td>-.053</td>
</tr>
<tr>
<td>strategy</td>
<td>-.014</td>
<td>-.036</td>
<td>-.045</td>
<td>.995</td>
</tr>
<tr>
<td>Move boxes</td>
<td>.375</td>
<td>.751</td>
<td>.189</td>
<td>.066</td>
</tr>
<tr>
<td>Group planning</td>
<td>.043</td>
<td>-.141</td>
<td>.895</td>
<td>-.082</td>
</tr>
<tr>
<td>Adjustments</td>
<td>-.581</td>
<td>.212</td>
<td>.542</td>
<td>.035</td>
</tr>
</tbody>
</table>

be used to estimate the contribution of any particular variable to group performance, because the predictor variables are correlated, an estimate of their combined effects can be obtained. Together, these variables explain 72% of the variance in group performance, \( F(9, 30) = 8.64 \) for the equation, \( p < .01 \).

Discussion

These data provide information about the dimensions of group process that mediate the group goal effect and other variables that influence group performance. Support for Weldon and Weingart’s (1988) model, deviations from that model, and predictors of group performance are discussed next.

Delayed Effect of Goal on Performance

Group goal level had a significant impact on performance during Session 3 but no impact during Session 2. This result was not predicted, but the possibility of a delayed effect prompted our decision to run three work sessions instead of two. We believed that the impact of goal level on performance might be delayed because additional learning about the task might be required before performance could improve. Specifically, we thought that group members in the high goal condition might test several performance plans before identifying an effective one.

Evidence for this type of learning was found in the pattern of correlations among goal level, reports of group strategy change, and performance across the two work sessions. These correlations showed that during Session 2 group members in the high goal condition changed their group strategy more than group members in the low goal condition, but strategy change had no significant impact on performance. A significant correlation between strategy change and condition was also found for Session 3, but the impact of strategy change on performance was positive for Session 3. This finding suggests that alternative performance plans were tested in the high goal condition during Session 2, and this testing allowed group members to develop a plan that improved performance during Session 3.

In addition, a second type of learning may have taken place. Results showed that goal level had little impact on effort or individual performance strategies during Session 2 but had a significant impact on these two variables for Session 3. This suggests that group members learned from the results of their performance during Session 2 that the high goal was not easy to achieve, and this learning produced substantial change in individual and group behavior during Session 3. This response to negative feedback about performance in relation to a goal is consistent with that described by Locke and Latham (1990) and Bandura (1988) in their theories of goal-directed behavior, and with the concept of performance monitoring described by Weldon and Weingart (1988). However, the fact that behavioral adjustment in the high goal condition seemed to occur after Session 2 suggests that Weldon and Weingart’s description of performance monitoring should be amended. In Weldon and Weingart’s (1988) model, performance monitoring is believed to take place throughout the work session and group members are expected to make adjustments in response to this information as they work on the task. Although some performance monitoring did take place during work sessions and monitoring was associated with better performance, it may be that major adjustments in group processes occur in response to feedback about performance at the end of a work session or at some other meaningful stop point in the work.

The delayed effect of the group goal on group performance shows that the time elapsed between goal assignment and performance measurement is an important determinant of the effect discovered. Future research might focus on variables that influence the time required to obtain the effect. For example, in

Table 5

Performance During Session 3 as a Function of Components of Group Process and Goal Level

<table>
<thead>
<tr>
<th>Step</th>
<th>Equation 1: Step 1</th>
<th>Equation 2: All variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \beta )</td>
<td>( t )</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Effort/adjustments</td>
<td>.550</td>
<td>4.10**</td>
</tr>
<tr>
<td>2. Group planning/group strategy change</td>
<td>.322</td>
<td>2.52*</td>
</tr>
<tr>
<td>3. Concern for quality</td>
<td>-.104</td>
<td>-0.83</td>
</tr>
<tr>
<td>4. Individual strategy change</td>
<td>.452</td>
<td>3.44**</td>
</tr>
<tr>
<td>Step 2</td>
<td>Goal level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.075</td>
<td>.49</td>
</tr>
</tbody>
</table>

* \( p < .05 \).  ** \( p < .01 \).
this experiment, group members had some experience with the task before the goal was assigned. When groups have no experience, the time required to discover the group goal effect might be longer, because the time required to develop a plan sufficient to meet the high goal is increased. In addition, the length of work sessions may be important, because with shorter work sessions, group members would assess their performance and make adjustments to improve performance sooner than they would when longer sessions are involved.

**Self-Set Goals**

In many groups, group members set goals for themselves that were different from the assigned goal. A large proportion of these goals were set by group members in the low goal condition, who set higher goals for their groups. This finding is consistent with their feelings that the assigned goal was inappropriate for their group. However, in spite of these self-set goals, high and low goal conditions were created in this experiment. Although the self-set goals reduced the difference in operative goals across the two conditions, compared with the difference in the assigned goals, the distributions of self-set goals in the high goal and low goal conditions, expressed as increases over performance during Session 1, did not overlap.

The effect of the self-set goals on performance for Session 3 was to produce a mean difference in performance across the two conditions that was less than would be expected by the difference in the assigned goals. A similar result might be found any time that group members feel that an assigned goal is inappropriate, although the condition that produces the self-set goals would depend on goal levels. If the assigned goals had been higher in this experiment, group members in the high goal condition might have felt that the assigned goal was inappropriately high, leading them to set lower goals. As a result, differences in performance across the two conditions would be less than the difference in assigned goals, but that result would be due to lower performance in the high goal condition. When group members in both conditions feel that the goals are inappropriate, the difference in actual performance could be even less.

The role of self-set goals in the group goal effect should be studied in future research. These data suggest that self-set goals influence group process and group performance. However, this possibility could not be tested here, because self-set goals were measured at the end of the experiment. As a result, the causal ordering of self-set goals and performance cannot be determined. Although it seems likely that self-set goals cause performance, it may be that reports of self-set goals are post hoc explanations for performance that differs from the assigned goal. In addition, the level of the group's self-set goal was not always clear, because in some groups, group members disagreed about the level of the goal.

**Mediating Processes**

The role of effort in the group goal effect is consistent with studies of individual goals and effort (see Locke & Latham, 1990, chap. 4, for a review), models of group performance (Hackman, 1983; Hackman & Morris, 1975; Herold, 1979), and other studies of group goals (Weingart, 1990; Weingart & Weldon, 1991). In Weingart's (1990) study, an objective measure of effort (rate of work measured by the number of task relevant acts performed per minute averaged over group members) was used to assess effort for the same structure building task, and that study showed that effort increased with increasing goal difficulty and that effort was an important determinant of group performance. This finding supports the validity of the self-reports of effort collected here.

The reduction in adjustments found in the high goal condition is consistent with studies of individual goals and performance showing that product quality is reduced when difficult goals for quantity are assigned (Bavelas & Lee, 1978; Rosswork, 1977). In this experiment, the number of adjustments and quality talk were believed to reflect actual quality. This assumption seems justified for adjustments, because the logical connection between adjustments and quality is clear, and adjustments were negatively correlated with quantity as expected. That the goal effect was explained completely by the mediators in the model shows that a measure of actual quality would not contribute anything to our explanation of the group goal effect. It is possible, however, that a true measure of quality might reflect determinants of quality other than adjustments and, as a result, explain additional variance in group performance.

The role of individual strategy change in the group goal effect is consistent with studies of individual goals showing that individuals working alone are motivated to develop more effective task strategies when difficult goals are assigned (Earley et al., 1988, 1989; Earley & Perry, 1987; Earley, Wójnaroski, & Prest, 1987) and with Weingart and Weldon's (1991) study of group goals for an additive task. The relationship between individual strategy change and group performance demonstrates that, to some extent, group performance depends on the effectiveness of the strategies used by individuals to perform their personal task assignments. In light of these results, the role of individual planning and strategy change should be emphasized in models of group performance.

The impact of goal level on group planning and group strategy change is perhaps the most interesting finding reported here. This finding is interesting because other studies of planning show that groups typically do not plan (Hackman, 1983; Hackman & Morris, 1975; Herold, 1979), and other studies of group goals (Weingart, 1990; Weingart & Weldon, 1991). In Weingart's (1990) study, an objective measure of effort (rate of work measured by the number of task relevant acts performed per minute averaged over group members) was used to assess effort for the same structure building task, and that study showed that effort increased with increasing goal difficulty and that effort was an important determinant of group performance. This finding supports the validity of the self-reports of effort collected here.

The reduction in adjustments found in the high goal condition is consistent with studies of individual goals and performance showing that product quality is reduced when difficult goals for quantity are assigned (Bavelas & Lee, 1978; Rosswork, 1977). In this experiment, the number of adjustments and quality talk were believed to reflect actual quality. This assumption seems justified for adjustments, because the logical connection between adjustments and quality is clear, and adjustments were negatively correlated with quantity as expected. That the goal effect was explained completely by the mediators in the model shows that a measure of actual quality would not contribute anything to our explanation of the group goal effect. It is possible, however, that a true measure of quality might reflect determinants of quality other than adjustments and, as a result, explain additional variance in group performance.

The role of effort in the group goal effect is consistent with studies of individual goals and effort (see Locke & Latham, 1990, chap. 4, for a review), models of group performance (Hackman, 1983; Hackman & Morris, 1975; Herold, 1979), and other studies of group goals (Weingart, 1990; Weingart & Weldon, 1991). In Weingart's (1990) study, an objective measure of effort (rate of work measured by the number of task relevant acts performed per minute averaged over group members) was used to assess effort for the same structure building task, and that study showed that effort increased with increasing goal difficulty and that effort was an important determinant of group performance. This finding supports the validity of the self-reports of effort collected here.

The reduction in adjustments found in the high goal condition is consistent with studies of individual goals and performance showing that product quality is reduced when difficult goals for quantity are assigned (Bavelas & Lee, 1978; Rosswork, 1977). In this experiment, the number of adjustments and quality talk were believed to reflect actual quality. This assumption seems justified for adjustments, because the logical connection between adjustments and quality is clear, and adjustments were negatively correlated with quantity as expected. That the goal effect was explained completely by the mediators in the model shows that a measure of actual quality would not contribute anything to our explanation of the group goal effect. It is possible, however, that a true measure of quality might reflect determinants of quality other than adjustments and, as a result, explain additional variance in group performance.

The role of effort in the group goal effect is consistent with studies of individual goals and effort (see Locke & Latham, 1990, chap. 4, for a review), models of group performance (Hackman, 1983; Hackman & Morris, 1975; Herold, 1979), and other studies of group goals (Weingart, 1990; Weingart & Weldon, 1991). In Weingart's (1990) study, an objective measure of effort (rate of work measured by the number of task relevant acts performed per minute averaged over group members) was used to assess effort for the same structure building task, and that study showed that effort increased with increasing goal difficulty and that effort was an important determinant of group performance. This finding supports the validity of the self-reports of effort collected here.

The reduction in adjustments found in the high goal condition is consistent with studies of individual goals and performance showing that product quality is reduced when difficult goals for quantity are assigned (Bavelas & Lee, 1978; Rosswork, 1977). In this experiment, the number of adjustments and quality talk were believed to reflect actual quality. This assumption seems justified for adjustments, because the logical connection between adjustments and quality is clear, and adjustments were negatively correlated with quantity as expected. That the goal effect was explained completely by the mediators in the model shows that a measure of actual quality would not contribute anything to our explanation of the group goal effect. It is possible, however, that a true measure of quality might reflect determinants of quality other than adjustments and, as a result, explain additional variance in group performance.

The role of effort in the group goal effect is consistent with studies of individual goals and effort (see Locke & Latham, 1990, chap. 4, for a review), models of group performance (Hackman, 1983; Hackman & Morris, 1975; Herold, 1979), and other studies of group goals (Weingart, 1990; Weingart & Weldon, 1991). In Weingart's (1990) study, an objective measure of effort (rate of work measured by the number of task relevant acts performed per minute averaged over group members) was used to assess effort for the same structure building task, and that study showed that effort increased with increasing goal difficulty and that effort was an important determinant of group performance. This finding supports the validity of the self-reports of effort collected here.

The reduction in adjustments found in the high goal condition is consistent with studies of individual goals and performance showing that product quality is reduced when difficult goals for quantity are assigned (Bavelas & Lee, 1978; Rosswork, 1977). In this experiment, the number of adjustments and quality talk were believed to reflect actual quality. This assumption seems justified for adjustments, because the logical connection between adjustments and quality is clear, and adjustments were negatively correlated with quantity as expected. That the goal effect was explained completely by the mediators in the model shows that a measure of actual quality would not contribute anything to our explanation of the group goal effect. It is possible, however, that a true measure of quality might reflect determinants of quality other than adjustments and, as a result, explain additional variance in group performance.

The role of effort in the group goal effect is consistent with studies of individual goals and effort (see Locke & Latham, 1990, chap. 4, for a review), models of group performance (Hackman, 1983; Hackman & Morris, 1975; Herold, 1979), and other studies of group goals (Weingart, 1990; Weingart & Weldon, 1991). In Weingart's (1990) study, an objective measure of effort (rate of work measured by the number of task relevant acts performed per minute averaged over group members) was used to assess effort for the same structure building task, and that study showed that effort increased with increasing goal difficulty and that effort was an important determinant of group performance. This finding supports the validity of the self-reports of effort collected here.

The reduction in adjustments found in the high goal condition is consistent with studies of individual goals and performance showing that product quality is reduced when difficult goals for quantity are assigned (Bavelas & Lee, 1978; Rosswork, 1977). In this experiment, the number of adjustments and quality talk were believed to reflect actual quality. This assumption seems justified for adjustments, because the logical connection between adjustments and quality is clear, and adjustments were negatively correlated with quantity as expected. That the goal effect was explained completely by the mediators in the model shows that a measure of actual quality would not contribute anything to our explanation of the group goal effect. It is possible, however, that a true measure of quality might reflect determinants of quality other than adjustments and, as a result, explain additional variance in group performance.
Brousseau, & Weiss, 1976), particularly when production demands are high and separate planning sessions are not allowed (March, 1959, cited in Shure, Rogers, Larsen, & Tassone, 1962; Shure et al., 1962). It seems, however, that differences in tasks and experimental procedures can explain these results. In these other studies of planning, group members performed a cognitive task and, in Shure et al's experiment, group members communicated with written notes. Because planning is also a cognitive task and, in Shure et al's experiment, planning also took place through written notes, the resources used to plan were the same resources required to do the work. As a result, work had to stop when group members planned. In contrast, the videotapes from this experiment showed that group members could plan as they performed the work, because the manual manipulations required to build the structures did not interfere with the cognitive task of planning. Therefore, it seems that the extent to which group members will plan depends on goal difficulty, which increases the perceived value of planning, and the extent to which planning requires the same resources as doing the work.

Accounting for the group goal effect. Together, effort, adjustments, group planning and group strategy change, and individual strategy change accounted completely for the group goal effect. This result was unexpected because the measures of group process did not provide comprehensive measures of some constructs. For example, only two strategies for improving individual performance plans were assessed. Two reasons for our ability to account so completely for the group goal effect might be that the set of actions contributing to improved performance on this task was small, because the task was not highly complex, and that the measures of the mediating processes were based on our own experience with the task. It appears that participants in the high goal condition identified and used the same set of actions we identified and used to improve our own performance. A substantial proportion of the group goal effect might be left unexplained in situations where paths leading to improved performance constitute a larger and more varied set.

Processes that did not mediate the group goal effect. An explanation for the failure to find a correlation between goal level and the number of gets per structure might be that moving boxes and reducing gets were alternative ways to increase the efficiency of an individual performance plan, and because moving boxes is the more efficient of the two, goal level motivates more group members to move boxes than to reduce gets. As a result, moving boxes was correlated with goal level but the number of gets per structure was not. However, the number of gets per structure was an important determinant of group performance when boxes were not moved.

Failure to find a difference in morale-building communication across the two conditions might be attributed to the high levels of confidence among group members in both conditions. When group members working toward difficult goals are much less confident of success than those working toward easy goals, morale-building communication might be correlated with goal level. Failure to find an effect for negative comments might also be attributed to high levels of confidence among group members.

The null results for nontask-related talk and discussion of acts and supplies might be attributed to the particular demands of the task. Discussion of acts and supplies was expected to increase, and nontask-related talk was expected to decrease, as a result of increased task-focused attention. However, the latter prediction would hold only when task performance and nontask-related conversation require the same type of cognitive processing (i.e., draw on the same pool of cognitive capacity; Lane, 1982). As with planning, it appears that nontask-related conversation did not interfere with the gross motor movements of this task. However, nontask-related conversation might interfere with task performance when task acts require more precise execution or high level cognitive processes are involved. In those cases, increasingly difficult goals should reduce nontask-related talk.

The nonsignificant result for extrarole behavior might be explained by the operationalization of the concept used here. Our measure was designed to tap the willingness of group members to help each other perform their tasks by measuring requests and offers to help. This measure is deficient in two ways. First, it may be that helping occurred in the absence of verbal offers or requests. Second, only one type of extrarole interaction was assessed. In the future, the impact of goal level on extrarole interaction should be tested using a more sensitive and complete measure.

Failure to find a difference across conditions in performance monitoring might be explained by the small difference in operative goals across the two conditions. However, the difference in operative goals was large enough to produce significant differences for other measures of group process, which casts doubt on this explanation. It seems instead that the assumption driving this hypothesis—that the perceived value of performance monitoring increases with goal level—is incorrect. However, monitoring during work sessions was an important determinant of group performance, which suggests that encouraging this behavior would benefit group performance.

The reason for our failure to find an effect for the redistribution of work across group members might be that changes in the acts performed by group members in this experiment were not planned attempts to improve the group's plan by improving the match between people and tasks and redistributing uneven work loads, as Weldon and Weingart (1988) suggested. As shown in Table 3, change in acts was not correlated with planning or group strategy change. However, planned changes might be found when matches between tasks and people are particularly bad and individual assignments produce very uneven work loads. In future work, these two variables might be manipulated and correlations among goal level, change acts, planning, and strategy change assessed.

Predicting Group Performance

The dimensions of group process measured here were good predictors of group performance. The mediating processes alone accounted for 55% of the variance in group performance. When the three measures of group process that influenced group performance independent of the group goal effect, performance for Session 1, and goal level were included, nearly three quarters of the variance was explained.

Figure 1 summarizes the relationships among goal level, group processes, and group performance found in this experi-
ment. This diagram does not present a completely specified model of group goals and group performance because (a) the moderating effects of goal commitment, work flow interdependence, task complexity, and experience with the task described by Weldon and Weingart (1988) were not tested here; and (b) relationships between measures of group process were not explored. For example, the impact of performance monitoring on planning and effort should be tested with lag sequential analyses. Although goal level did not influence performance monitoring, it seems that performance monitoring would influence performance through these variables, as Weldon and Weingart suggested. In addition, the relationships among goal level, effort, and adjustments should be explored. When reduced quality is a by-product of working faster, goal level would not have a direct effect on adjustments. Goal level would influence effort, and increased effort would lead to decreased adjustments. In contrast, when reduced quality is a conscious strategy for improving quantity, goal level would have a direct effect on quality. These relationships should be tested in future research.

Conclusions

This experiment provides valuable information about processes that mediate the group goal effect and contributes to an understanding of effective group performance. As predicted by Weldon and Weingart (1988), goal level had a strong impact on group performance, and this effect was mediated by effort, individual strategy change, group planning, group strategy change, and concern for quality as measured by adjustments to structures. In addition, variables unrelated to the goal effect had an impact on group performance. Initial performance on the task, unplanned deviations from established work roles, and performance monitoring all contributed to group performance. Together, these results show that a group goal is an important contextual variable that influences group process and group performance and that individual planning, individual strategy change, spontaneous behaviors, and performance monitoring should be added to existing input–process–output models of group performance (e.g., Gladstein, 1984; Hackman, 1983; Hackman & Morris, 1975; Herold, 1979).

References

Earley, P. C., & Perry, B. C. (1987). Work plan availability and perfor-


(Appendix follows on next page)
Guidelines for Unitizing

1. Ignore the word OH.
2. Acknowledgment of a previous statement is a separate unit (e.g., [OK], [but I think we should also glue] is two units).
3. Conjunctions separate thought units.
4. Check to see whether the sentence would convey the same content if the preceding or ending phrase were omitted. If not, the two phrases are coded as two units. If so, then code it as one. "Wait, they need popsicle sticks" is coded as two units. However, "Hey, they need popsicle sticks" would be coded as one.

Description of Content Categories

Quality talk (a) Questions and statements about quality standards, the quality of the materials, whether the structure meets the quality specifications, or the rightness or wrongness of the structure; and (b) responses to and acknowledgment of these questions and statements.

Planning (a) Questions and statements about whether or not a certain act has been or should be performed, how a certain act should be performed, or who is performing, can perform, or should perform a certain act; and (b) responses to or acknowledgment of these questions and statements.

Monitoring (a) Questions or statements about the goal, the number of structures produced, or time left (or time passed) in the work session; and (b) responses to or acknowledgment of these questions and statements.

Acts and supplies (a) Questions and statements about supplies, information, or advice that are not concerned with quality and do not constitute planning; and (b) responses to or acknowledgment of these questions and statements.

Extrarole interaction (a) Offers of or requests for help and (b) responses to or acknowledgment of these offers and requests.

Morale-building communication (a) Positive evaluations of a group member's ability to perform well, the group's ability to perform well, the group's ability to meet the goal, the group's performance, or a group member's performance; and (b) responses to or acknowledgment of these statements.

Negative communication (a) Negative statements about a group member's ability to perform well, the group's ability to perform well, the group's ability to meet the goal, the group's performance, or a group member's performance; and (b) responses to or acknowledgment of these statements.

Nontask-related (a) Questions or statements about the experiment, socializing (e.g., talking about course work, jobs, or mutual friends), or any unit that does not fall in one of the other categories and is not uncodable; and (b) responses to or acknowledgment of these questions and comments.

Uncodable (a) Units for which the content is unclear, even when the context is considered, unfinished statements or questions, or indications by the transcriptionist that something was said but he or she could not understand it well enough to write it down; and (b) responses to or acknowledgment of these statements.

Guidelines for Categorizing Statements

1. Do not draw inferences about the purpose of a statement or the intent of the speaker in order to assign a code. Use the rules of content.
2. Categorize a unit as a particular type of statement only when it is clearly an example of that category. If the content is ambiguous, categorize the statement as uncodable.
3. Context can be used to determine the content of a unit. Consider previous statement first. Refer to next statements if previous statement doesn't help.
4. If speaker repeats his or her remark at the request of another group member, code the repetition.
5. There is nothing else in the room except task relevant objects unless otherwise noted.
6. Use a hierarchy: First, decide whether a statement involves planning, monitoring, or quality. If not, but the unit has to do with building structures, then the statement is task related (TR).

Received September 18, 1990
Revision received April 1, 1991
Accepted April 11, 1991