

A MULTIDIMENSIONAL APPROACH TO THE GROUP COHESION–GROUP PERFORMANCE RELATIONSHIP

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This study (a) examined the multidimensionality of both group cohesion and group performance, (b) investigated the relationship between group-level task and social cohesion and group effectiveness, and (c) examined the longitudinal changes in cohesion and performance and the direction of effect between cohesion and performance. First, the authors hypothesized that both task and social cohesion would predict positively all dimensions of group performance. Second, that a stronger relationship would be observed between task cohesion and task effectiveness and between social cohesion and system viability. Third, that all dimensions of cohesion and performance would increase over time. Finally, that cohesion would be both the antecedent and the consequence of performance but that the performance-cohesion relationship would be stronger than the cohesion-performance relationship. Results supported the hypothesized one-to-one relationship between specific dimensions of group cohesion and group performance. Task cohesion was the sole predictor of self-rated performance at both Time 1 and Time 2, whereas social cohesion was the only predictor of system viability at Time 1 and the stronger predictor at Time 2. Social cohesion at Time 2 predicted performance on group task. However, no longitudinal changes were found in cohesion or performance. Finally, group cohesion was found to be the antecedent, but not the consequence, of group performance.

The group cohesion–group performance relationship has been studied extensively. Earlier researchers were unable to find a systematic relationship between performance and cohesion (Forsyth, 1990; Mitchell, 1982; Steiner, 1972; Stogdill, 1972). Two recent meta-analytic studies concluded that a small but positive relationship between group cohesion and group performance existed (Evans & Dion, 1991; Mullen & Copper, 1994). However, subse-

quent studies disagreed with these meta-analyses on whether the cohesion-performance relationship was moderated by other variables such as level of analysis, task interdependency, goal acceptance, and group norm (Gully, Devine, & Whitney, 1995; Langfred, 1998; Podsakoff, MacKenzie, & Ahearne, 1997).

One explanation for this confusion in the literature was the inconsistency in the definitions and measurements of cohesion (Cota, Evans, Dion, Kilik, & Longman, 1995; Mudrack, 1989a, 1989b) and performance. Over the years, researchers have proposed alternative definitions and conceptual models of group cohesion. For example, group cohesion was defined as the "total field of forces causing members to remain in the group" (Festinger, Schachter, & Back, 1950, p. 164), "the resistance of the group to disruptive forces" (Gross & Martin, 1952, p. 553), and "a dynamic process which is reflected in the tendency for a group to stick together and remain united in the pursuit of its goals and objectives" (Carron, 1982, p. 124).

Reviewers have called for empirical research to be based on a consistent definition and measurement of group cohesion (Cota et al., 1995; Mudrack, 1989a, 1989b). Both Cota et al. (1995) and Mudrack (1989a, 1989b) recommended that Carron, Widmeyer, and Brawley's (1985) "multidimensional" model was a good starting point for cohesion researchers to begin research using a common definition and measurement.

MULTIDIMENSIONALITY OF GROUP COHESION

Carron et al. (1985) noted that the various definitions of cohesion could be categorized into two major groups: (a) group integration (GI), "a member's perceptions of the group as a totality"; and (b) individual attraction to group (ATG), "a member's personal attraction to the group" (p. 248). They argued that both perceptions helped to bind members to their group. Furthermore, Carron et al. asserted that both GI and ATG could be focused on either the task or the social aspect of the group. Thus, cohesion was conceptualized

as consisting of four unique constructs: (a) group integration–task (GI-T), (b) group integration–social (GI-S), (c) individual attraction to group–task (ATG-T), and (d) individual attraction to group–social (ATG-S).

Cota et al. (1995) proposed that the work of Carron et al. (1985) offered a promising future to cohesion research because (a) “the task-social and individual-group dimensions are important to understanding cohesion in many types of groups and have been identified independently by other researchers” (p. 576), and (b) “the implications of the two-dimensional model have been tested with the GEQ [Group Environment Questionnaire] in a growing number of empirical reports” (Cota et al., 1995, p. 576).

A significant contribution of Carron and his colleagues (1995) was the development of their multidimensional conceptual model, which was operationalized in the form of the GEQ. The development of GEQ enabled a programmatic research on cohesion in sport psychology using a common set of definitions and measurements (e.g., Boone, Beitel, & Kuhlman, 1997; Gardner, Shields, Bredemeier, & Bostrom, 1996; Li & Harmer, 1996; Prapavessis & Carron, 1997; Shields, Gardner, Bredemeier, & Bostro, 1997). Over the years, researchers showed that GEQ subscale scores had separate and meaningful patterns of correlations with variables that were important to group functioning and effectiveness. For example, Prapavessis and Carron (1997) reported that athletes who scored high on the ATG-T scale worked harder than athletes who scored low on the ATG-T. Boone et al. (1997) found that members of losing baseball teams exhibited significant decreases on the ATG-T, GI-T, and GI-S subscales, but no such change was found in members of the winning teams.

The model of cohesion by Carron et al. (1985) was specifically developed for sport teams and has only just begun to be tested outside the sport setting. Recent discussion on the structure and measurement of this model (Carless, 2000; Carless & DePaola, 2000; Carron & Brawley, 2000) highlighted the challenges of adapting the GEQ for measuring cohesion in work teams. Carless and DePaola (2000) did not find support for the four-factor structure.

They concluded that results of their study together with other findings (Hogg & Hains, 1998) questioned the usefulness of defining group cohesion at the individual level (Carless, 2000).

In their reply to Carless and DePaola (2000), Carron and Brawley (2000) argued that the dynamic nature of work groups should be taken into consideration when researchers adapt the multidimensional model and GEQ for their research projects. In particular, Carron and Brawley noted that it is important for researchers to define a clear theoretical model that is appropriate for their research project and to select and pilot appropriate measures for the theoretical model of cohesion. Furthermore, Carron and Brawley suggested that researchers need to consider carefully the level at which their analyses should be conducted.

Researchers have not yet confirmed the exact factor structure of group cohesion in the work setting. However, recent studies have suggested that group-level task and social cohesion constructs are more appropriate for research that investigates the relationship between group cohesion and group performance because (a) the limited number of studies with non-sporting teams generally found good support for the task-social distinction but not for the group-individual distinction (Carless & DePaola, 2000; Dyce & Cornell, 1996), and (b) group-level task and social cohesion are at the same level of analysis as group performance (Gully et al., 1995).

The first aim of the current study was to test the two-factor structure (task and social) of cohesion at the group level and to establish the content validity of the modified GEQ items to student work teams. Although we did not expect the understanding of group cohesion to change from sport teams to work teams, GEQ items needed to be modified to apply to the work setting. To achieve this, GEQ items that made reference to a group's playing time, game winning, and playing seasons were changed to refer to work teams' assigned task, working hours, and project outcomes. The second aim was to examine the specific relationships between different dimensions of cohesion and performance using a modified GEQ and Hackman's (1990) multidimensional model of group performance.

MULTIDIMENSIONALITY OF GROUP PERFORMANCE

Although there has been considerable debate over the definition and structure of cohesion, little attention has been given to the outcome variable in the cohesion-performance relationship. There has been vast variation in the definition and measurement of group performance; however, little work has been done to establish a consistent definition for group performance. Group performance is generally operationalized as some form of task effectiveness or group productivity (Gully et al., 1995; Mullen & Copper, 1994). Examples of measures of group performance include task scores (Zaccaro & McCoy, 1988), decision quality (Miesing & Preble, 1985; Mullen, Anthony, Salas, & Driskell, 1994), number of wins (Grace, 1954), and problem-solving scores (Goodacre, 1951).

The conceptualization of group performance is equally important to the understanding of cohesion-performance relationship. Like cohesion, group performance is also a multidimensional construct (Gist, Locke, & Taylor, 1987; Hackman, 1990). Hackman's (1990) three-dimensional model of group performance considers a group's contribution to its embedded organization, to itself, and to its composite members and defines a group's performance at these three corresponding levels as (a) "the degree to which the group output . . . meets the standards of quantity, quality, and timeliness" of the organization (i.e., productivity); (b) "the degree to which the process of carrying out the work enhances the capability of members to work together interdependently in the future" (i.e., system viability); and (c) "the degree to which the group experience contributes to the growth and personal well-being of team members" (i.e., professional growth) (Hackman, 1990, pp. 6-7).

Hackman's (1990) model provides a comprehensive framework for the understanding of group performance. From an organization's perspective, an effective work group should not only enhance the overall effectiveness of the organization but also be able to sustain its own existence (i.e., system viability) and assist the professional growth of its members. Despite the theoretical appeal of Hackman's multidimensional conceptualization of group performance, it has been rarely employed in empirical research. To date,

there appears to be only one empirical study that employed Hackman's three-dimensional framework of group performance (Riehl, 1998). However, even this study reported only the work group's task effectiveness and not system viability or professional growth.

In the present study, the three-dimensional model of group performance was employed. We examined the impact of GI-T and GI-S on all three dimensions of group performance: task effectiveness, system viability, and professional growth. Task effectiveness was measured by both the group's objective performance on the task and a self-reported subjective measure of group performance. Previous researchers who examined the cohesion-performance relationship, using the unidimensional definition of group performance, often found a stronger relationship between task cohesion and group performance (Carless, 2000; Mullen & Copper, 1994; Zaccaro, 1991). However, this was because group performance was often operationalized as only the "task effectiveness" dimension of the multidimensional performance model.

We proposed that the cohesion-performance relationship would be strongest when there is a match between the specific dimension of cohesion and performance under investigation. It was hypothesized that both task and social cohesion would be positive predictors of group task performance, subjective measure of group performance, and system viability. Moreover, task cohesion would be a stronger positive predictor of task performance and subjective measure of group performance, and social cohesion would be a stronger positive predictor of system viability. However, the relationship between task and social cohesion and professional growth would be less clear, given that professional growth was an individual-level variable. Despite the fact that professional growth was of less interest to a study that examined the relationship between group cohesion and group performance, a measure of professional growth was included to test the factor structure of Hackman's (1990) model. This examination of Hackman's model was in itself an important step toward the understanding of the cohesion-performance relationship in light of the absence of empirical operationalization for Hackman's model in the literature.

**DIRECTION OF EFFECT BETWEEN
GROUP COHESION AND PERFORMANCE**

Although there has been interest in the direction of effect in the cohesion-performance relationship, there has been no clear resolution of this issue (Levine & Moreland, 1990; Mullen & Copper, 1994) until Mullen and Copper's (1994) recent meta-analysis. Mullen and Copper concluded that "although cohesiveness may indeed lead the group to perform better, the tendency for the group to experience greater cohesiveness after successful performance maybe even stronger" (p. 222). However, Mullen and Copper's conclusion should be interpreted with caution. It was conducted based on a small number of studies due to the lack of research specifically designed to examine the direction of the cohesion-performance relationship. Furthermore, Gully et al. (1995) noted that the Mullen and Copper meta-analysis combined cross-lagged relationships irrespective of the time interval between the measurement of cohesion and performance. Based on Mullen and Copper's finding, we hypothesized for both the cohesion-performance and performance-cohesion relationship. Furthermore, we expected that the performance-cohesion relationship would be stronger than the cohesion-performance relationship. That is, in addition to performance being predicted by Time 1 and Time 2 cohesion, cohesion at Time 2 would be predicted by performance at Time 1.

**TEMPORAL DEVELOPMENT OF GROUP
COHESION AND GROUP PERFORMANCE**

Carron and Brawley (2000) urged researchers to take into consideration the dynamic nature of groups and to examine the temporal changes that occur in groups over time. This study employed a longitudinal design to investigate the temporal changes in group cohesion and performance as well as the direction of effect between cohesion and performance. We hypothesized that both task and social cohesion as well as subjective measure of group performance, system viability, and professional growth would increase over time. However, the relationship between cohesion and performance was expected to be the same at both times.

HYPOTHESES

The specific hypotheses tested in this study are as follows:

Hypothesis 1: Group cohesion would be a multidimensional construct.

Hypothesis 2: Group performance would be a multidimensional construct.

Hypothesis 3: Both task and social cohesion would be positive predictors of group task performance, subjective measure of group performance, and system viability.

Hypothesis 4: Task cohesion would be a stronger positive predictor of task performance and subjective measure of group performance.

Hypothesis 5: Social cohesion would be a stronger positive predictor of system viability.

Hypothesis 6: Cohesion would be both the antecedent and the consequence of group performance.

Hypothesis 7: The performance-cohesion relationship would be stronger than the cohesion-performance relationship.

Hypothesis 8: Task and social cohesion, subjective measure of group performance, system viability, and professional growth would increase over time.

METHOD

PARTICIPANTS

Eighty students from a 3rd-year organizational psychology course participated in this study on a voluntary basis. Participants were informed that an independent researcher was interested in collecting research data and a small part of the results would be used as materials for their report-writing assignment later in the semester. Informed consent was obtained from students who participated in the study. As part of the course requirement, students formed into groups of 3 or 4 to work on a job-analysis assignment. The group project lasted for 5 weeks. Time 1 measure was taken in the 2nd week of the project, and Time 2 measure was taken in the 5th week of the project. Across the two time periods, there were a total of 28 groups. A group was included only if at least half of the group (i.e.,

a minimum of 2 members) provided useable responses. This resulted in 25 groups at Time 1, 22 groups at Time 2, and 17 groups across Times 1 and 2. A group was only retained in the data set for the longitudinal analysis if at least half of the group members remained in the group from Time 1 to Time 2.

MEASURES

Cohesion. The nine group integration items in the GEQ (Widmeyer, Brawley, & Carron, 1985) were modified to measure group-level task and social cohesion in the student work teams. Modifications to GEQ items were made to change references to sport teams' playing time, seasons, and game winnings to project teams' assigned task, working hours, and project outcomes, respectively. For example, Item 15, "our team would like to spend time together in the off season" was changed to "our team would like to spend time outside of work hours." Item 14, "our team members have conflicting aspirations for the team's performance" was deleted because it was less applicable to student groups. Item 11 was also removed because it reduced the internal consistency of the group-level social cohesion scale.

Task cohesion. After the removal of irrelevant and inconsistent items, group-level task cohesion was measured by a four-item scale (GEQ Items 10, 12, 16, and 18) (see Table 2 for items). The final scale had Cronbach's α of .62 at Time 1 ($n = 66$) and .60 at Time 2 ($n = 61$). Both were smaller than that reported for GEQ ($\alpha = .70$) (Widmeyer et al., 1985). The test-retest reliability for the task cohesion scale was .73 ($n = 50, p < .01$).

Social cohesion. Group-level social cohesion was measured by a three-item scale (GEQ Items 13, 15, and 17). The social cohesion scale had Cronbach's α of .77 ($n = 68$) at Time 1 and .75 ($n = 62$) at Time 2. Both were close to that reported for GEQ ($\alpha = .75$) (Widmeyer et al., 1985). The test-retest reliability for the social cohesion scale was .75 ($n = 50, p < .01$).

EFFECTIVENESS

Group grade. Each student group gave a presentation of their job-analysis project to the class. The presentations were marked out of 10 by the course tutors according to the marking criteria designed for the assignment. Note that the grades were assigned to the group, and as such this was a group-level construct. The grades ranged from 6 to 10 with a mean of 7.96 and a standard deviation of 0.76 ($n = 27$).

The subjective measure of group performance. The subjective measurement of performance consisted of two items. Participants were asked to rate on a 5-point scale how productive they thought their team was (1 = *not productive at all* to 5 = *very productive*) and how well they thought they had worked together as a group (1 = *very poor* to 5 = *very good*). The subjective measure of productivity had an internal consistency of .73 ($n = 62$) at both Time 1 and Time 2.

System viability. Two items were designed to measure system viability. Participants were asked to respond on a 5-point scale how much they enjoyed working with other group members (1 = *very little* to 5 = *very much*) and how much they would like to come back to work with their original group on a different project if there were to be a follow-up study in the future (1 = *not at all* to 5 = *very much*). The system-viability scale had an internal consistency of .81 ($n = 62$) and .83 ($n = 62$) at Time 1 and Time 2, respectively.

Professional growth. Professional growth of group members was measured by two items. Participants were asked to indicate on a 5-point scale how much technical knowledge they had learned from the group project (1 = *not much at all* to 5 = *very much*) and how much the group project had helped them to understand how to work in a team environment (1 = *not much at all* to 5 = *very much*). The professional-growth scale had an internal consistency of .70 ($n = 68$) and .68 ($n = 62$) at Time 1 and Time 2, respectively.

DATA ANALYSIS

Two principal components analyses were conducted using the individual-level data to assess the structure of cohesion and group performance. All hypothesis testing was done using group-level data using only groups that were well represented ($n \geq 2$ for 3- or 4-person groups) and only after high within-group agreement was demonstrated for all group-level measures (see data aggregation in the Results section). Linear regression analyses were conducted to examine the relationship between the two dimensions of cohesion and each of the performance measure at both times as well as the direction of relationship between cohesion and performance. Repeated measure t tests were performed to investigate temporal changes in cohesion and performance.

RESULTS

Table 1 shows the means, standard deviations, intercorrelations, and internal consistency alphas for the study variables. In general, groups reported experiencing task cohesion above the midpoint (5) of the scale ($M = 6.38$ and 6.46 at Time 1 and Time 2, respectively) and social cohesion below the midpoint of the scale ($M = 3.97$ and 4.11 at Time 1 and Time 2, respectively). All the correlations were in the expected direction.

FACTOR STRUCTURES

Cohesion. Principal components analysis, based on the individual-level data, supported the two-factor structure of GEQ at both Time 1 and Time 2. Thus, Hypothesis 1, that group cohesion would be a multidimensional construct, was supported. The two-factor model accounted for 58.4% and 54.8% of variance at Time 1 and Time 2, respectively. Eigenvalues for task cohesion and social cohesion were 2.02 and 2.63 at Time 1 and 1.54 and 2.80 at Time 2. However, two items of the task cohesion scale loaded higher on the social

TABLE 1: Means, Standard Deviations, Internal Consistency Alphas, and Intercorrelations of Study Variables ($N = 17$)

| <i>Study Variable</i> | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------------|------|------|----------|----------|---------|----------|----------|----------|----------|---------|----------|---------|
| Task cohesion t1 | 6.38 | 1.07 | (.62***) | | | | | | | | | |
| Social cohesion t1 | 3.97 | 1.78 | .23 | (.77***) | | | | | | | | |
| SMP t1 | 3.77 | 0.52 | .68*** | .16 | (.73**) | | | | | | | |
| System viability t1 | 3.76 | 0.68 | .25 | .55*** | .47** | (.81***) | | | | | | |
| PG t1 | 2.65 | 0.78 | .55*** | .11 | .60*** | .08 | (.70***) | | | | | |
| Task cohesion t2 | 6.46 | 0.90 | .75*** | .32 | .52** | .65*** | .17 | (.60***) | | | | |
| Social cohesion t2 | 4.11 | 1.61 | .44 | .75*** | .12 | .48** | .25 | .24 | (.75***) | | | |
| SMP t2 | 3.82 | 0.56 | .54*** | .31 | .48** | .54** | .41 | .78*** | .22 | (.73**) | | |
| System viability t2 | 3.75 | 0.68 | .51** | .33 | .14 | .53** | .04 | .46** | .70*** | .52** | (.83***) | |
| PG t2 | 3.11 | 0.58 | -.19 | .02 | .18 | -.10 | .63*** | .21 | -.07 | .37 | .04 | (.68**) |

NOTE: t1 = Time 1, t2 = Time 2, SMP = subjective measure of productivity, PG = professional growth. Internal consistency alphas were derived from individual data. Intercorrelations between variables at t1 were derived from the t1 sample of 25 groups. Intercorrelations between variables at t2 were derived from the t2 sample of 22 groups. Intercorrelations between variables across the two times were derived from the longitudinal sample of 17 groups.

** $p < .05$. *** $p < .01$.

cohesion factor for at least one time, and one social cohesion item loaded higher on the task cohesion factor at both Time 1 and Time 2 (see Table 2 for the structure matrix). This social cohesion item was removed from the scale because its loadings on the social cohesion factor were less than .15 at both Time 1 and Time 2. Furthermore, the removal of this item increased the internal consistency of the social cohesion scale. On the other hand, the two dual-loading task cohesion items were retained in the scale because their loadings on the task cohesion factor were greater than .35 at both times, and removing any of these items would have reduced the internal consistency of the task cohesion measure.

Performance. Principal component analysis, based on the individual data, provided some support for the three-factor structure of performance. Thus, Hypothesis 2, that group performance would be a multidimensional construct, was supported. The three-factor solution accounted for 82.7% and 82% of variances at Time 1 and Time 2, respectively. However, only two factors had eigenvalues greater than 1. The two factors together accounted for 73.8% and 70.3% of the variance at Time 1 and Time 2, respectively. The third factor, professional growth, had eigenvalues of .53 and .70 at Time 1 and Time 2 and accounted for 8.9% and 11.7% of the variance after the extraction of the first two factors. Furthermore, one item for the professional growth scale dual-loaded on the subjective measure of group performance factor at Time 1. This item was retained in the scale because the internal consistency was relatively high at both Time 1 and Time 2 for the professional growth scale. Also, removing this item would have left us with a single-item measure of professional growth. However, given the small eigenvalue of the professional growth scale, this construct was removed from the regression analysis that examined the causal relationship between cohesion and performance across time.

DATA AGGREGATION

Both group cohesion and group performance were conceptualized as group-level constructs; thus, all analyses in this study were

TABLE 2: Structure Matrix: Varimax Rotation Factor Analysis of the Group Environment Questionnaire (GEQ) and the Performance Scales

| <i>Scale</i> | <i>Factor</i> | | | | | |
|------------------------------------------------------|------------------|-------------------|------------------|------------------|-----------|-----------|
| | <i>Time 1</i> | | <i>Time 2</i> | | | |
| | <i>Task</i> | <i>Social</i> | <i>Task</i> | <i>Social</i> | | |
| GEQ–Group Integration scales | | | | | | |
| Group Cohesion–Task (GIT) | | | | | | |
| United in trying to reach its goal for performance | .74 | .22 | .73 | -.05 | | |
| All task responsibility for any mistake | .58 | -.02 | .36 ^a | .42 | | |
| Everyone tries to help if members have problems | .39 ^a | .61 | .43 ^a | .53 | | |
| Communicate freely about each other's responsibility | .75 | .30 | .77 | .11 | | |
| Group Cohesion–Social (GIS) | | | | | | |
| Members rather go out on their own than as a team | .80 | -.05 ^b | .70 | .13 ^b | | |
| Team members rarely socialize together | .13 | .73 | .02 | .82 | | |
| Like to spend time outside of work hours | -.02 | .78 | .12 | .77 | | |
| Stick together outside of the team project | -.19 | .88 | .20 | .79 | | |
| <i>Scale</i> | <i>Factor</i> | | | | | |
| | <i>Time 1</i> | | | <i>Time 2</i> | | |
| | <i>SMP</i> | <i>SV</i> | <i>PG</i> | <i>SMP</i> | <i>SV</i> | <i>PG</i> |
| Performance scales | | | | | | |
| Subjective Measure of Performance (SMP) | | | | | | |
| Perceived productivity | .68 | .34 | .36 | .70 | .37 | .21 |
| Work well together | .80 | .44 | .05 | .94 | .11 | .07 |
| System Viability (SV) | | | | | | |
| Willing to work together in the future | .12 | .90 | -.04 | .22 | .93 | .09 |
| Enjoyed working with other group members | .31 | .87 | .15 | .30 | .66 | -.07 |
| Professional Growth (PG) | | | | | | |
| Learned to work in groups | .60 | -.25 | .60 ^a | .11 | -.16 | .87 |
| Learned technical knowledge | .15 | .13 | .95 | .06 | .28 | .85 |

a. Items that overlapped with other factors.

b. Items lower than the minimum .30 criterion.

done at the group level. Group-level data were obtained by aggregating individual data to the group level. Gully et al. (1995) recommended assessing the level of within-group agreement prior to aggregating individual data at the group level. However, this recommendation has rarely been followed in the cohesion literature.

TABLE 3: Within-Group Interrater Reliability for All Scales at Time 1 and Time 2

| | <i>Time 1</i> | <i>Time 2</i> |
|-----------------------------------------|---------------|---------------|
| Task cohesion | .89 | .91 |
| Social cohesion | .86 | .79 |
| Subjective measure of group performance | .97 | .92 |
| System viability | .93 | .86 |
| Professional growth | .93 | .89 |

In the current study, within-group interrater reliability was calculated for each of the cohesion and performance scales using James, Demaree, and Wolf's (1984) multiple-item within-group interrater reliability index ($r_{WG(j)}$). Table 3 shows the $r_{WG(j)}$ for all scales at Time 1 and Time 2. All scales except social cohesion at Time 2 ($r_{WG(j)} = .79$) had a within-group interrater reliability of above .8. Thus, aggregation of data to the group level was justified (Kozlowski & Hattrup, 1992). Despite the fact that personal growth was defined as an individual-level construct, there was good level of within-group agreement ($r_{WG(j)} = .93$ and $.87$ at Time 1 and Time 2, respectively). Thus, all analyses were conducted at the group level.

COHESION AND PERFORMANCE AT TIME 1 AND TIME 2 (HYPOTHESES 4 AND 5)

Three regressions predicting subjective measure of group performance, system viability, and professional growth were performed to examine the relationship between cohesion and performance at Time 1. Task and social cohesion were the predictors (see Table 4). Task cohesion was the only significant predictor for subjective measure of group performance ($\beta = .68, p < .001$) and professional growth ($\beta = .55, p < .005$), whereas social cohesion was the only significant predictor for system viability ($\beta = .62, p < .005$). Furthermore, neither task nor social cohesion at Time 1 predicted the group grade for the presentation.

The same analyses were repeated with data from Time 2. Task cohesion was the only significant predictor for subjective measure of group performance ($\beta = .77, p < .001$). Both task ($\beta = .31, p < .05$)

TABLE 4: Results of Multiple Regression for Subjective Measures of Productivity, System Viability, and Professional Growth Predicted by Task and Social Cohesion

| | <i>Dependent Variables</i> | | | | | | | |
|--------------------------|----------------------------|---------|------------|---------|-------------------------|---------|----------------------------|---------|
| | <i>Group Grade</i> | | <i>SMP</i> | | <i>System Viability</i> | | <i>Professional Growth</i> | |
| | B | β | B | β | B | β | B | β |
| Time 1 ($n = 25$) | | | | | | | | |
| Task cohesion | .06 | .09 | .33*** | .68*** | .08 | .13 | .40 | .55*** |
| Social cohesion | .09 | .21 | .002 | .01 | .20*** | .52*** | -.007 | -.015 |
| R^2 | .06 | | .46*** | | .32*** | | .30*** | |
| Adjusted R^2 | -.03 | | .41*** | | .26*** | | .24*** | |
| Power ($\alpha < .05$) | .23 | | .97 | | .82 | | .82 | |
| Time 2 ($n = 22$) | | | | | | | | |
| Task cohesion | .18 | .18 | .48*** | .77*** | .24** | .31** | .15 | .24 |
| Social Cohesion | .20 | .37** | .01 | .03 | .27*** | .62*** | -.04 | .13 |
| R^2 | .20 | | .61*** | | .57*** | | .05 | |
| Adjusted R^2 | .12 | | .57*** | | .53*** | | -.04 | |
| Power | .42 | | > .99 | | .99 | | < .23 | |

NOTE: SMP = subjective measure of productivity. Power was calculated using the R^2 reported, $\alpha < .05$, and Cohen's Power Table for regression analysis.

** $p < .05$. *** $p < .01$, one-tailed.

and social ($\beta = .61, p < .005$) cohesion were significant predictors of system viability, but the predictive power of social cohesion was stronger. Furthermore, neither task nor social cohesion predicted the group members' professional growth. Finally, social cohesion was the only significant predictor of group grades ($\beta = .21, p = .05$). Overall, results of this study supported the hypotheses that task cohesion would be a stronger positive predictor for subjective measure of group performance (Hypothesis 4) and that social cohesion would be a stronger positive predictor for system viability (Hypothesis 5). However, only partial support was found for the hypothesis that both task and social cohesion would predict positively a group's performance on task, subjective measure of group performance, and system viability (Hypothesis 3). Furthermore, the hypothesis that task cohesion would be a stronger positive predictor of group grade was not supported (Hypothesis 4).

**CAUSALITY OF THE COHESION-PERFORMANCE
RELATIONSHIP (HYPOTHESES 6 AND 7)**

To understand if cohesion was the antecedent or the consequence of group performance, we first conducted two sets of hierarchical multiple regressions to examine the effect of performance on cohesion after controlling for the effect of the corresponding cohesion at Time 1 (see Table 5). As expected, Time 1 task cohesion was a significant predictor of Time 2 task cohesion ($\beta = .61, p < .01$), and Time 1 social cohesion was a significant predictor of Time 2 social cohesion ($\beta = .60, p < .01$). After controlling for the corresponding cohesion at Time 1, neither subjective measure of group performance nor system viability at Time 1 predicted task cohesion at Time 2 (R^2 change = .03, n.s., $\beta = .17$ and $\beta = .07$ for subjective measure of group performance and system viability, respectively), and only system viability was a marginally significant predictor for social cohesion at Time 2 (R^2 change = .06, n.s., $\beta = .46, p < .10$ for system viability, $\beta = .27$, n.s., for subjective measure of group performance). Thus, the hypothesis that cohesion would be both the antecedent and the consequence of group performance (Hypothesis 6) was not supported. Hypothesis 7, predicting that the performance-cohesion relationship would be stronger than the cohesion-performance relationship, was not supported.

**TEMPORAL CHANGES
OVER TIME (HYPOTHESIS 8)**

Personal growth was the only scale that changed over time ($M = 2.8$ and 3.09 at Time 1 and Time 2, respectively; $t(16) = -1.85, p < .05$). Group members reported to have learned more of the technical knowledge and about how to work in teams from the group project at Time 2 as compared to Time 1. Task cohesion or social cohesion showed no significant change over time ($M = 6.63$ and 6.51 for social cohesion and 4.16 and 4.01 for task cohesion at Time 1 and Time 2, respectively). Thus, the hypothesis that task and social cohesion, as well as subjective measure of group performance, system viability, and professional growth would increase over time (Hypothesis 8) was not supported.

TABLE 5: Regression of Subjective Measure of Group Performance and System Viability on Task and Social Cohesion at Time 2 After Controlling for the Effect of the Corresponding Cohesion at Time 1

| | <i>Dependent Variables</i> | | | | | | | |
|----------------------------|--------------------------------|---------|---------------|---------|----------------------------------|---------|---------------|---------|
| | <i>Task Cohesion at Time 2</i> | | | | <i>Social Cohesion at Time 2</i> | | | |
| | <i>Step 1</i> | | <i>Step 2</i> | | <i>Step 1</i> | | <i>Step 2</i> | |
| | B | β | B | β | B | β | B | β |
| Task cohesion at Time 1 | 0.58** | | 0.61** | | | | | |
| Social cohesion at Time 1 | | | | | 0.52*** | | 0.60*** | |
| SMP at Time 1 | | | 0.35 | 0.17 | | | -1.27 | -0.27 |
| System viability at Time 1 | | | 0.09 | 0.06 | | | 1.46 | 0.46* |
| R^2 | .56*** | | .59*** | | .56*** | | .63*** | |
| Adjusted R^2 | | | .49*** | | | | .55*** | |
| R^2 change | | | .03 | | | | .07 | |
| Power | .96 | | | | .96 | | | |
| Power for the R^2 change | | | < .29 | | | | .29 | |

NOTE: $N = 17$. SMP = subjective measure of productivity. Power was calculated using the R^2 reported, $\alpha < .05$, and Cohen's Power Table for regression analysis.

* $p < .10$. ** $p < .05$. *** $p < .01$, one-tailed.

DISCUSSION

This study was designed to (a) examine the multidimensionality of both group cohesion and group performance, (b) study the specific relationships between various dimensions of cohesion and performance, (c) investigate the longitudinal changes in cohesion and performance, and (d) understand the direction of effect between cohesion and performance.

MULTIDIMENSIONALITY OF GROUP COHESION AND PERFORMANCE

Results of this study supported the factor structure of the multidimensional conceptualization of both group cohesion and group performance (Hypotheses 1 and 2). For group cohesion, the two-factor structure of social and task cohesion at the group level

was generally supported. This study tested only the social and group cohesion at the group level, as the main focus of the study was on the relationship between cohesion and performance at the group level. Thus, the two-factor structure found in this study is limited in its ability to parallel the Carless and DePaola (2000) and Dyce and Cornell (1996) studies. These studies tested the four-factor structure of GEQ and found support for only the two-factor solution of social and task cohesion. However, we did find support for the social and task cohesion distinction at the group level. The lower internal consistency of the task cohesion scale in this study may suggest that the group integration task cohesion items in GEQ are more applicable to sport teams than to student work groups. Alternatively, the GI-task cohesion measures may lack content or construct validity or both in light of the fact that (a) Carron and his colleagues obtained only a reliability value of .7 for this scale (Widmeyer et al., 1985), and (b) Carless and DePaola (2000) found that two items from the GI-T scale loaded together with another two items from the ATG-T scale to form the task cohesion factor. Future studies are needed to develop new measures of GI-T and to establish the content and construct validity of such a measure.

For group performance, the three-factor (productivity, system viability, and professional growth) structure of Hackman's (1990) model of performance was supported. This finding is promising in the absence of other empirical measures of Hackman's model. However, caution should be exercised when interpreting results with regard to the professional growth dimension. The professional growth dimension had a small eigenvalue, and one item dual loaded on another performance dimension at Time 1. Results also suggested that the two items were measuring different aspects of professional growth (i.e., technical or group dynamics) and were unreliable together as a scale. On the positive side, the professional growth dimension is an individual-level construct and should have had a weaker relationship with other group-level constructs (Gully et al., 1995), which is congruent with the finding of this study. Further research is needed to clarify the relationship between different aspects of professional growth.

COHESION AND PERFORMANCE

Results indicated only partial support for Hypothesis 3. Only social cohesion at Time 2 was a significant predictor of the group's grade. This finding differs from previous research, which consistently found the ATG-T to be a predictor of objective measures of group productivity (e.g., Boone et al., 1997; Prapavessis & Carron, 1997). This different pattern of result could be due to the nature of the group task in this study. As mentioned earlier, the groups were required to make a presentation rather than a written report. Unlike written assignments, class presentations require close cooperation among group members. Group members needed to present different parts of the assignment together as a coherent whole, and the better group members get along with one another (i.e., social cohesion), the easier it is for them to present their work in a relaxed and creative manner. This may explain why social cohesion was a better predictor of group grade than task cohesion.

On the other hand, task cohesion did have a relatively large β weight, and post hoc power analysis showed that this particular analysis only had a power of .42. Thus, task cohesion might still be a significant predictor of group grade given a larger sample size. Nevertheless, results of this study showed that social cohesion is a more important predictor for a task that requires high level of group interaction and creativity.

Hypotheses 4 and 5 were supported. Task cohesion was the only predictor for subjective measure of group performance at both Time 1 and Time 2, whereas social cohesion was the only predictor of system viability at Time 1 and the stronger predictor of system viability at Time 2. This suggests that group members' perception of how effective they are as a working unit is dependent on their feelings about the similarity, closeness, and bonding within the teams as a whole around the group's task but not around the group as a social unit. This finding agrees with previous research, which operationalized group performance as task effectiveness and found stronger links between task cohesion and group performance (Carless, 2000; Mullen & Copper, 1994; Zaccaro, 1991). On the other hand, a group's ability to work interdependently in the future

was found to be more strongly related to members' feelings of similarity, closeness, and bonding around the group as a social unit and less to feelings regarding the group's task. This finding agrees with Zaccaro's finding that interpersonal cohesion better predicted contextual performance (such as more frequent group interaction [Zaccaro & Lowe, 1988] and lower absenteeism [Zaccaro & McCoy, 1988]).

As expected, the relationship between task and social cohesion and professional growth was less clear. Task cohesion was a significant predictor of professional growth at Time 1, but this effect disappeared at Time 2. Given that the constructs are at a different theoretical level of analysis, it is not surprising that the relationship between cohesion and professional growth was much weaker. However, at least when group members first started doing the task together, their feelings about similarity, closeness, and bonding within the team as a whole around the group's task is important to their perception of how much they have learned from the group project. Finally, the relationship between specific dimensions of cohesion and performance were mostly the same at Time 1 and Time 2.

Overall results of this study showed that there is a one-to-one match between different dimensions of group cohesion and group effectiveness. This finding has important implications for both researchers and practitioners in the area. For those who are interested in researching the cohesion and performance relationship, careful consideration should be given to the dimensions of cohesion and performance under study and the specific relationships between them. For practitioners who are interested in improving a group's performance via increasing its cohesion, specific dimensions of cohesion should be targeted for improvement in a given dimension of group performance.

TEMPORAL CHANGES AND THE CAUSALITY OF COHESION-PERFORMANCE RELATIONSHIP

Hypothesis 8 was not supported. Contrary to our prediction, there were no longitudinal changes in task or social cohesion over time. This was contrary to the notion that groups mature over time

(Wekselberg, Goggin, & Collings, 1997). However, it should be noted that student groups only worked together for 5 weeks, and the two measures were taken 2 weeks apart. Thus, groups may not have had sufficient time to develop. Although this study is limited by its small sample size ($N = 17$ for the longitudinal analysis), the lack of temporal change is more a reflection of the small effect size due to the close temporal distance between the two measures. There were no temporal changes in subjective measure of group performance and system viability either. However, the fact that students reported that they learned more about how to conduct job analysis and work in groups over time (i.e., professional growth) is encouraging. In summary, except along the dimension of professional growth, Hypothesis 8 was not supported.

Hypotheses 6 and 7 were not supported. System viability and subjective performance at Time 1 failed to significantly account for additional variance in the task and social cohesion at Time 2 after controlling for the effect of the corresponding cohesion at Time 1. Thus, group cohesion was only the antecedent but not the consequence of group performance (Hypothesis 6). Consequently, Hypothesis 7, which argued that the performance-cohesion relationship would be stronger than the cohesion-performance relationship, was not supported either. However, the statistical power for these two analyses were low when the α level was set to .05 (see Table 5). Time 1 subjective measure of group performance had a relatively high positive beta weight when predicting task cohesion at Time 2, even after controlling for the effect of the corresponding cohesion at Time 1. Time 1 system viability also had a relatively high positive beta weight when predicting social cohesion at Time 2, even after controlling for the effect of the corresponding cohesion at Time 1. In fact, system viability would have been a significant predictor if the α level were set at .1 to increase power in light of the small sample size. Furthermore, Time 1 subjective measure of productivity had a relatively high negative beta weight when predicting social cohesion after controlling social cohesion at Time 1. Thus, results of our study do implicate the reciprocal relationship between group cohesion and group performance. However, the

small sample size limited our ability to draw any definite conclusions.

On the other hand, the findings of our study did differ from Mullen and Copper's (1994) conclusion that the performance-cohesion relationship was stronger than the cohesion-performance relationship. This contradictory finding warrants the need for researchers to continue examining the direction of the causal relationship between cohesion and performance.

LIMITATIONS

A major limitation of this study is its sole reliance on self-reported outcome measures for system viability. The internal validity of this study could be challenged if group members were unable to distinguish between the outcome measure of system viability (members' willingness to work with other group members again in the future) and the group process measure of cohesion (a group's tendency to stick together and remain united in the pursuit of its goals and objectives). To eliminate this threat to internal validity, an exploratory principal-component factor analysis was conducted on all items measuring the dimensions of group cohesion and group performance. Using the eigenvalue greater than one criteria, task cohesion and social cohesion were identified as distinct factors from measures of group performance. However, the three dimensions of group performance could not be clearly separated from one another in the same analysis. This factor analysis was not reported here because of its small cases-to-variable ratio. Presenting factor structures separately for cohesion and performance items was a more focused and reliable option given the small sample size.

Despite the presence of common method variance and the problems associated with construct overlap, results from factor and regression analyses indicated that the one-to-one relationship between task cohesion and subjective measure of group performance and social cohesion and system viability could be observed over and above the methodological limitations of this study. In

addition, group grades were rated by course tutors who had no knowledge of the other constructs being measured or the research hypotheses. Thus, the positive relationship observed between group grade and social cohesion was less susceptible to these methodological problems.

A second limitation of this study was the inability to assess consistency of rating between the two tutors who assigned the group grade. However, the tutors were given explicit guidelines and assessment criteria on which to rate the groups, and their average grade and grade distribution were very similar. In addition, the small group size in our study limits the generalizability of the current findings to large groups. Finally, the small sample size of the study restricted the power of some of the analyses. However, the large effect size, normal distribution of the variables, and group-level analysis ensured the robustness of most analyses (Tables 4 and 5). Furthermore, although 3rd-year student work groups might not share exactly the same experience with organizational project teams working in a dynamic environment, the nature of the group task was practical and intensive enough to warrant the reality of a group experience. Future research could explore the impact of dynamic situational variables on the cohesion-performance relationship.

CONCLUSION

Results of this study generally supported the multidimensional approach to group cohesion and group performance and the hypothesized one-to-one relationships between group cohesion dimensions (task, social) and group performance (task performance, system viability, professional growth). Researchers who are interested in the cohesion-performance relationship should tailor their measurements carefully to the specific dimensions of the two constructs under investigation. In addition, hypotheses about the relationship between cohesion and performance should be made more specifically about the one-to-one relationship between the dimensions of cohesion and performance under investigation. Furthermore, practitioners who are interested in improving group

cohesion as a means of improving group performance should consider carefully which dimension of cohesion is more important to the targeted performance measure. For example, if the aim is to reduce turnover rate in the group, then interventions specifically aimed at improving a group's social cohesion should be implemented. On the other hand, if the goal is to improve a group's task effectiveness, then task cohesion should be targeted.

Results from this study helped to establish the generalizability of GEQ to a new setting—student work groups. Based on this finding, we think GEQ would be a useful measure for future research on organizational teams. Results also suggested that Hackman's (1990) three-dimensional model of group performance is a useful conceptualization to examine the multiple functionalities of groups. Future research is needed to improve the applicability of the task cohesion items to work groups and to develop a comprehensive set of measures for the dimensions of performance.

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