

THE MEASUREMENT OF COHESION IN WORK TEAMS

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This study examined a work-adapted version of the Group Environment Questionnaire. The sample consisted of 120 employees of an Australian public sector organization who worked in teams. Confirmatory factor analysis was used to examine four alternate models. None of the models examined fit the data, thus the scale was revised. Subscales of the work-group characteristics scale were used to demonstrate the construct validity of the revised scale; regional managers' ratings of work-group performance were used to examine the criterion-related validity. The findings showed that task cohesion compared to social cohesion and individual attraction to the group was the strongest correlate of all the variables examined.

A key variable in models of effective work teams is group cohesiveness (e.g., Cohen & Bailey, 1997; Hackman, 1987; Sundstrom, De Meuse, & Futrell, 1990). Despite the importance of group cohesiveness, there is a lack of agreement about how to conceptualize and measure it (Cota, Longman, Evans, Dion, & Kilik, 1995; Hogg, 1992). Cohesion has traditionally been defined as a unitary construct (Mullen & Copper, 1994; Zaccaro, 1991) and tended to reflect Festinger's (1950) notion that cohesion is "the total field of forces which act on members to remain in the group. These forces may depend on the attractiveness or unattractiveness of either the prestige of the group, members of the group, or the activities in which the group engages" (p. 274). Thus, cohesion has generally been operationalized as attraction to the group and assessed by

AUTHORS' NOTE: *We would like to acknowledge the helpful comments and suggestions made by Michael Hogg.*

SMALL GROUP RESEARCH, Vol. 31 No. 1, February 2000 71-88
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asking members how much they liked one another or the how long they wanted to stay in the group (Hogg, 1992).

More recently, there has been a shift to a multidimensional view of cohesion. This approach argues that in addition to interpersonal attraction, cohesion can be defined as commitment to the task (Zaccaro, 1991; Zaccaro & Lowe, 1988). Evidence indicates that task cohesion is more closely related to work performance than interpersonal cohesion (Mullen & Copper, 1994; Zaccaro, 1991; Zaccaro & Lowe, 1988). Within an organizational context, differentiating task cohesion from interpersonal cohesion has important practical implications. Improved group performance is more likely to accrue from targeting behaviors that enhance commitment to the group task rather than behavior that increases people's liking for one another.

Although there is increasing agreement that cohesion is a multidimensional construct, there is a lack of appropriate measures that reflect this conceptualization. Given the significance of cohesion for work teams, it is surprising that there is a deficiency of suitable measures for organizational research and practical application. This study responds to the call for research on how to measure a multidimensional construct of cohesion (Cota et al., 1995). In particular, the recommendation that a "useful starting point in locating a measurement suitable for this definition [i.e., a multidimensional view] might involve an adaptation of an extant sport psychology measure of cohesiveness" (Mudrack, 1989, p. 781) was followed. The Group Environment Questionnaire (GEQ) (Widmeyer, Brawley & Carron, 1985) was designed for sport teams. The advantage of GEQ is that the authors used a theoretical model to develop the scale and preliminary evidence indicates it has adequate psychometric properties for research. Unknown is whether the GEQ can be adapted for work teams. Thus, the first aim of this study was to examine the factor structure of an adapted version of the GEQ for work teams. An integral part of scale evaluation is to examine the extent to which the scale correlates with (a) similar measures (i.e., construct validity) and (b) appropriate criterion or outcome measures (i.e., criterion-related validity; Hinkin, 1995). The second aim was to demonstrate the construct- and criterion-related validity

of the adapted GEQ. The study sample consisted of members of naturally occurring work teams who formed a stable, identifiable unit.

According to Widmeyer and colleagues (1985), there are two key distinctions to be made when defining group cohesiveness. First, there is the distinction between the individual and the group. The individual aspect of cohesion is encapsulated in the notion of individual attraction to the group; that is, the extent to which the individual wants to be accepted by group members and remains in the group. The group aspect is represented by perceptions of the group as a whole (referred to as group integration), which is the degree of closeness, similarity, and unity within the group. The second distinction is between task and social cohesiveness. Task cohesiveness is the extent of "motivation towards achieving the organization's goals and objectives" (Widmeyer et al., 1985, p. 17). Similar to this, social cohesiveness refers to the motivation to develop and maintain social relationships within the group. Thus, using this conceptual framework, Widmeyer and colleagues defined cohesion as: (a) Group Integration-Task, which is an individual team member's perceptions about the similarity and closeness within the team about accomplishing the task; (b) Group Integration-Social, which reflects individual team member's perceptions about closeness and bonding regarding the team's social activities; (c) Individual Attraction to Group-Task, which describes individual team members' feelings about personal involvement in the group task; and (d) Individual Attraction to Group-Social, which reflects individual team members' feelings about personal involvement in the social interaction of the group.

An extensive process of interviews, administration, and modification of the scale was used to develop the GEQ (Carron, Widmeyer, & Brawley, 1985; Widmeyer et al., 1985). The first step involved three separate projects in which team members from a wide variety of sport teams were interviewed. Respondents were asked to describe behavioral and affective aspects of cohesion in addition to other related issues. Responses were coded according to whether they reflected one of the four theoretical constructs identified. The second step involved reviewing the current literature on

cohesion and coding the operational definitions according to the four conceptual categories. The responses generated from the three projects and the literature review were used by a small team of researchers to generate an initial item pool of 354 items. Using the four-construct model of cohesion, the pool of items was reduced to 53. Five experts judges were asked to examine the 53 items and assess the extent to which each item reflected the conceptual model. All items were retained and administered to 212 athletes from a number of teams. Item analysis led to a further reduction in the number of items from 54 to 24. The 24-item version was further examined by factor analysis and a final revision of the scale led to an 18-item version that assesses four constructs: Group Integration-Task, Group Integration-Social, Individual Attraction to Group-Task and Individual Attraction to Group-Social. Recent evidence with a sample of musicians ($N = 315$) failed to support the four factors of the GEQ (Dyce & Cornell, 1996). Evidence suggested that the GEQ assesses either two or three factors.

The GEQ was developed to assess cohesion in sport teams, yet the same conceptual model can be applied to work teams. The distinction between the individual attraction to the group and group integration or cohesion recognizes the importance of individual members' desires to stay in the group and the properties of the group as a whole, for example, connectedness, bonding, and sticking together. It has also been argued that because cohesion has both individual-level (e.g., absenteeism, turnover) and group-level outcomes (e.g., team performance), conceptually, it is important to recognize this distinction when defining cohesion (Wech, Mossholder, Steel, & Bennet, 1998). Practically, this distinction has important implications for organizations. To address the issue of work-group effectiveness, organizations need to understand the individual- and group-level perspective.

The meta-analytic findings of Mullen and Copper (1994) illustrate the usefulness of distinguishing between task and social cohesion. Previous meta-analytic studies that had failed to distinguish between different ways of operationalizing cohesion reported that there was no clear relationship between cohesion and performance (e.g., Stogdill, 1972). Mullen and Copper reported that task

cohesion was modestly related to work-group performance, whereas social cohesion was unrelated to work-group performance. The distinction between task and social has also been made about leadership of work teams (e.g., Fleishman & Peters, 1962; Hersey & Blanchard, 1969) and group processes (Gladstein, 1984). Thus, it is becoming generally accepted that separating task and social cohesion is worthwhile (Cota et al., 1995) and that there is a need for a reliable and valid measure that captures this distinction (Mudrack, 1989).

CONSTRUCT- AND CRITERION-RELATED VALIDITY

In addition to examining the factor structure of the work-group cohesion scale, the construct- and criterion-related validity were examined. Cohesive group members are cooperative, supportive of one another, and have open communication (Griffith, 1988; Wech et al., 1998). Cooperation may involve sharing the workload to achieve group goals and participating in the decision-making process (Hogg, 1992). Cohesive groups are typically described as having strong morale or group spirit (Bollen & Hoyle, 1990; Griffith, 1988). Campion, Medsker, and Higgs (1993) devised a scale to assess work-group characteristics associated with group effectiveness. A number of the subscales assess dimensions that are associated with group cohesion, for example, group spirit/morale, social support, communication/cooperation within the team, the extent of workload sharing, and participation in decision making and goal interdependence. Because the latter dimensions are similar in meaning to group cohesion, it is expected that they will moderately correlate with the GEQ; this will be taken as evidence of construct validity (Anastasi & Urbina, 1997; Cronbach, 1990).

Consistent with Cohen and Bailey's (1997) approach to the assessment of team effectiveness, individual- and group-level outcomes were used as criteria. At the individual level, cohesion should accrue in higher job satisfaction (Cohen & Bailey, 1997; Griffith, 1988); at the group level, cohesion is associated with team performance (Mullen & Copper, 1994). It is anticipated that task and social cohesion will differentially correlate with team

performance (Messick, 1989). To avoid the effects of common method variance (Spector & Brannick, 1995) consistent with the approach of Mullen and Copper (1994), ratings of the criterion team performance were obtained from regional managers. Thus, evidence of a relationship between the GEQ and job satisfaction and team performance will be used to indicate criterion-related validity.

MODELS TESTED IN THIS STUDY

First, consistent with the notion that cohesion is a unidimensional construct (e.g., Back, 1950; Schachter, 1951), a single-factor model was examined (Model 1). This model assumes that cohesion is a unitary construct defined by highly interrelated perceptions about the group. The next model examined was a two-factor model based on Widmeyer and colleague's (1985) distinction between individual attraction to the group and group integration (Model 2). The third model examined was also a two-factor model; this model tested the increasingly popular view that cohesion can be defined by task and social cohesion (Model 3; Bettenhausen, 1991; Cota et al., 1995). The fourth model tested Widmeyer and colleague's hypothesis that cohesion consists of four constructs: Group Integration–Task, Group Integration–Social, Individual Attraction to Group–Task and Individual Attraction to Group–Social (Model 4).

METHOD

PARTICIPANTS AND PROCEDURE

Multiple copies of the questionnaire were sent to managers of Australian public sector retail outlets ($n = 84$) for distribution to employees. A cover letter explaining the purpose of the project and inviting participation, together with a letter of support from the human resource manager was attached to the questionnaire. Pre-paid envelopes were provided for the return of the questionnaire. Responses were obtained from 120 employees (48 females, 63

males, and 6 of undisclosed gender). The mean number of respondents from each outlet was 2 ($SD = 1.4$) and the total number of teams surveyed was 59. The age of participants ranged from 19 to 64 years and the average age was 37 years ($SD = 10.39$). The average team size was eight members ($SD = 5$). The range of time individuals had worked at the retail outlet varied considerably; the minimum was 1 month and the maximum was 33 years (median 3 years, $M = 5.7$ years, $SD = 7.3$ years). Ratings of work-group performance were obtained from four regional managers. Regional managers were responsible for 16 to 33 retail outlets.

MEASURES

Team Cohesion. The 18-item GEQ (Widmeyer et al., 1985) was adapted for work teams. This involved changing the wording on six items to reflect an organizational environment instead of a sport context. For example, "I'm unhappy with my team's desire to win" was changed to, "I'm unhappy with my team's level of commitment to the task." The response format was a 9-point Likert scale for each, ranging from 1 (*strongly disagree*) to 9 (*strongly agree*).

Work-Group Characteristics. Seven subscales from the work-group characteristics (Campion et al., 1993) questionnaire were used. These were group spirit/morale ($\alpha = .84$), social support ($\alpha = .90$), communication/cooperation within the team ($\alpha = .84$), the extent of workload sharing ($\alpha = .90$), participation in decision making ($\alpha = .90$), goal interdependence ($\alpha = .74$), and preference for teamwork ($\alpha = .93$). Each scale had three items and the response format was a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Team Effectiveness. A five-item scale devised by the first author (Carless, 1995) was used to assess work-group effectiveness. The scale assesses members' perceptions of the quality of work, the standard of work, and the effectiveness of the team. A sample item is, "Compared to other units I have known, the effectiveness of my current team is excellent." The response format was a 5-point

Likert scale, ranging from 1 (*rarely or never*) to 5 (*very frequently or always*). The alpha coefficient was .94.

Job Satisfaction. The Minnesota Satisfaction Questionnaire (Weiss, Dawis, England, & Lofquist, 1967) was used to assess global employee satisfaction with their work. The scale has 20 items and the response format is a 5-point Likert scale, which ranged from 1 (*very dissatisfied*) to 5 (*very satisfied*). The alpha coefficient was .91.

Work-Group Performance. Regional managers rated retail outlets on the extent of the work groups' customer service, effectiveness, efficiency, work completion, and service innovation. The nine-item scale devised by the second author was designed to assess the performance of the retail postal outlets. The response format was a 7-point Likert scale ranging from 1 (*below required standard*) to 7 (*excellent standard*). In addition, regional managers were asked to provide an overall rating of effectiveness, efficiency, and customer service of the retail outlet. Ratings ranged from 0% to 100% and descriptions were given for each increment of 10. For example, 91%-100% was defined as, "Consistently achieves acceptable levels of effectiveness, efficiency, and customer service." The stem of the definition was varied for each categorical rating to reflect decreasing levels of performance (e.g., "Usually," "Periodically"). There was a high degree of overlap between the single-item overall rating and the nine-item scale ($r = .74$). Thus, it was decided to combine the ratings into one overall rating of work-group performance. Factor analyses of the 10 items confirmed that they assessed one underlying construct that explained 62% of the variance. The alpha coefficient of the 10 items was .93.

RESULTS

LISREL 8 (Joreskog & Sorbom, 1993) was used to analyze the 18 items. A covariance matrix was used and the method of estimation was maximum likelihood. The goodness-of-fit statistics for the

tested models are shown in Table 1. All of the four models examined were a poor fit to the data. The goodness-of-fit index (GFI) and the adjusted goodness-of-fit index (AGFI) were less than .90, the standard recommended for acceptable models (Cuttance, 1987), and the root mean square error of approximation (RMSEA) was less than .08 (Browne & Cudeck, 1993). Finally, the nonnormed fit index (NNFI) and the relative noncentrality index (RNI) confirmed the conclusion that each of the four models examined do not represent the data adequately. Thus, the next task was to examine the data and see if a reliable measure of cohesion could be constructed from the items.

Following Gerbing and Hamilton's (1996) recommendations, exploratory factor analysis was used to reexamine the data. Using principal components extraction, Cattell's scree test and Kaiser's criterion suggested there were three underlying constructs. Cross-loading items and items with a low loading were removed.¹ The fit of a three-factor model to the remaining 12 items was assessed by CFA. Although the fit was adequate, two items had loadings less than .55. These items were removed and the fit of the final model is presented in Table 1; the items and loadings are presented in Table 2. The fit indices suggest that the three-factor model is an adequate fit to the data. Although the AGFI is less than ideal, Cuttance (1987) suggests that models with an AGFI greater than .80 are acceptable. The three constructs are (a) task cohesion, the extent to which the team is united and committed to achieving the work task; (b) social cohesion, the degree to which team members like socializing together; and (c) individual attraction to the group, the extent to which individual team members are attracted to the group. The revised scale was named the Team Cohesion (TC) scale. Examination of the factor correlation matrix indicated that there was evidence of discriminant validity. The correlations were as follows: task and social cohesion, $r = .53$; social cohesion and individual attraction to the group, $r = .58$; and task cohesion and individual attraction to the group, $r = .26$. The alpha coefficients range from .63 to .81 and are presented in Table 2.

The next step was to examine the construct- and criterion-related validity of the TC scale. The correlations and partial correlations

TABLE 1: Goodness-of-Fit Statistics for the Group Environment Questionnaire and Team Cohesion

<i>Scale and Model</i>	χ^2	df	p	<i>RMSEA</i>	<i>RMSR</i>	<i>GFI</i>	<i>AGFI</i>	<i>NNFI</i>	<i>RNI</i>
Group Environment Questionnaire									
Model 1 (1 factor)	348	135	< .001	.12	.09	.74	.67	.70	.73
Model 2 (2 factors: interpersonal attraction and group integration)	316	134	< .001	.11	.09	.76	.69	.74	.77
Model 3 (2 factors: task and social)	312	134	< .001	.11	.09	.77	.71	.74	.77
Model 4 (4 factors)	253	129	< .001	.09	.08	.82	.77	.81	.84
Team Cohesion									
Revised scale (3 factors; 10 items)	52	32	< .001	.07	.06	.92	.86	.92	.94

NOTE: RMSEA = root mean square error of approximation; RMSR = root mean square residual; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; NNFI = nonnormed fit index; RNI = relative noncentrality index. Model 4 is based on Widmeyer, Brawley, and Carron's (1985) 4-factor model.

TABLE 2: Confirmatory Factor Analysis of the Revised Scale of Cohesion

	<i>Task Cohesion</i>	<i>Social Cohesion</i>	<i>Individual Attraction to the Group</i>
Our team is united in trying to reach its goals for performance	.67		
I'm unhappy with my team's level of commitment to the task (R)	.73		
Our team members have conflicting aspirations for the team's performance (R)	.66		
This team does not give me enough opportunities to improve my personal performance (R)	.57		
Our team would like to spend time together outside of work hours		.76	
Members of our team do not stick together outside of work time (R)		.79	
Our team members rarely party together (R)		.71	
Members of our team would rather go out on their own than get together as a team (R)		.67	
For me this team is one of the most important social groups to which I belong			.79
Some of my best friends are in this team			.60
Alpha coefficients	.74	.81	.63

NOTE: R = reverse scored. Based on Widemeyer, Brawley, and Carron (1985).

between TC and the variables of interest are presented in Table 3. With all of the variables examined with the exception of a preference for team work, it is evident that task cohesion is more strongly related to team characteristics and the outcome variables than social cohesion and individual attraction to the group. Individual attraction to the group is largely unrelated to most of the variables. Strong correlations were found between task cohesion and team spirit ($r = .72$), social support among team members ($r = .68$), the extent of cooperative behavior among team members ($r = .62$), and the extent of sharing the workload equally ($r = .58$). Participation in team decision making and the degree to which individual goals were determined by team goals were moderately related to task cohesion ($r = .48$ and $r = .33$, respectively). The pattern of correlations between individual preferences for teamwork and each of the facets of cohesion were similar and modest.

TABLE 3: Correlations and Partial Correlations Between Cohesion, Work-Group Characteristics, and Team Performance

	<i>Task Cohesion</i> ^a	<i>Social Cohesion</i> ^b	<i>Individual Attraction to the Group</i>
Team morale/spirit	72** (64**)	46** (21*)	22*
Social support	68** (62**)	39** (11 ns)	12
Communication/cooperation within team	62** (54**)	49** (32**)	21*
Workload sharing	58** (46**)	46** (28**)	23*
Participation	48** (42**)	29** (11 ns)	-03
Goal interdependence	33** (28**)	13 (-01 ns)	-03
Preference for team work	24** (12 ns)	25** (17 ns)	28**
Job satisfaction	49** (42**)	31** (13 ns)	11
Team effectiveness	67** (60**)	36** (09 ns)	14
Team work performance (regional manager rating)	29** (26**)	15 (07 ns)	07

NOTE: Decimal points have been omitted.

a. Controlling for social cohesion.

b. Controlling for task cohesion.

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

With regard to the outcome variables, task cohesion was moderately related to job satisfaction ($r = .49$), strongly related to team member ratings of team effectiveness ($r = .67$), and modestly related to supervisor ratings of team performance ($r = .29$). The latter correlation is similar to that reported by Mullen and Copper (1994). Because we were interested in the relationship between task cohesion and other variables when social cohesion was controlled for, partial correlations were calculated. Similarly, partial correlations were calculated for social cohesion and other variables when task cohesion was controlled for. The partial correlations show that task cohesion explains most of the variance, whereas social cohesion explains little unique variance.

DISCUSSION

The first aim of this research was to examine the psychometric qualities of an adapted version of the GEQ for work teams.

Confirmatory factor analysis of the items indicated that none of the models examined were a good fit to the data. That is, the work-adapted 18-item scale did not measure either of the two-factor models proposed (Model 2, individual attraction to the group and group integration and Model 3, task and social cohesion) or Widmeyer and colleague's four-factor model (Model 4). These findings are consistent with Dyce and Cornell (1996), who were also unable to replicate a four-factor structure in the GEQ.

Further examination of the items led to the development of a three-factor model with a reduced set of items. The three constructs were task cohesion, the degree of commitment to the task; social cohesion, the extent to which members interacted socially; and individual attraction to the group, the extent to which individual team members saw the group as an attractive social group. Of the four items that formed task cohesion, two items were originally from the Individual Attraction to the Group–Task subscale and two from Group Integration–Task. All of the items that formed social cohesion were from the Group Integration–Social subscale and similarly, the two items that formed individual attraction to the group were from the Individual Attraction–Social subscale. There has been considerable debate about whether cohesion reflects individual or group processes (Zaccaro, 1991). These data suggest that task cohesion is a mixture of both individual- and group-level processes and that in the workplace, individuals don't distinguish between individual- and group-level task cohesion. Further research is needed on the issue.

Of particular interest, is the differential pattern of relationships between the facets of cohesion and the examined variables. Task cohesion showed a stronger pattern of relationship with all of the team characteristics examined compared to social cohesion and individual attraction to the group; further examination of the data with partial correlations supported this view. Of the three cohesion facets, task cohesion was the only facet significantly related to supervisor ratings of team performance. These findings are consistent with previous research (Mullen & Copper, 1994; Zaccaro, 1991) that have also shown that commitment to the task is related to work-group performance, whereas the social aspects of cohesion

are unrelated to work-group performance. Guzzo and Shea (1992) argue that group tasks are important in determining the effectiveness of groups in at least three ways: as sources of individual member motivation, as a moderator of the relationship between member interaction and effectiveness, or as determinants of the instrumental interactions (i.e., task-related interactions) among group members. Evidence from this research suggests that a shared commitment to group goals is associated with teams that are more effective, efficient, and that give better customer service as rated by regional managers.

These findings raise questions about the usefulness of assessing social cohesion and individual attraction to the group in work groups. There is some evidence that social cohesion may be an antecedent of task cohesion. Zaccaro and Lowe (1988) reported that interpersonal or social cohesion increases task cohesion. It is possible that social cohesion is a necessary precondition for groups to be able to develop a common commitment to the task. On one hand, the moderate correlation between task and social cohesion ($r = .53$) found in this study adds support to this argument. On the other hand, according to Hackman (1987), interventions that have focused primarily on improving the quality of interpersonal relationships do not lead to consistent improvements in group task performance. If social cohesion is an antecedent of task cohesion, it would be logical to expect a change in task performance. Stronger correlations were found between task cohesion and the work-group characteristics of social support ($r = .68$) and communication/cooperation within the team ($r = .62$) than between social cohesion and work group characteristics. These findings raise some interesting conceptual issues about how to define and operationalize social cohesion. Widmeyer and colleagues (1985) define social cohesion as "a general orientation or motivation toward developing and maintaining social relationships within the group" (p. 16). However, the items that measure this construct focus on the extent to which members socialize together. This narrow operationalization of social cohesion may partly explain the weak relationships between social cohesion and work-group characteristics.

There has been considerable confusion about how to conceptualize social or interpersonal cohesion and how to delineate the construct itself from related variables (Piper, Marrache, Lacroix, Richardsen, & Jones, 1983). Some would argue that helping each other out (i.e., social support) and cooperating with other team members are part of the definition of social cohesion (Langfred, 1998; O'Reilly & Caldwell, 1985; Wech et al., 1998). An alternate view is that communication and cooperation are antecedents of social cohesion (Carron, 1988; Lott & Lott, 1965). Future researchers should explore an expanded definition of social cohesion that includes communication, cooperation, and supportive behavior within the group. It is generally agreed that cohesion is an integral aspect of models of effective team performance (e.g., Cohen & Bailey, 1997; Hackman, 1987; Sundstrom et al., 1990). An understanding of the specific behaviors associated with effective team performance can assist organizations in developing appropriate interventions and training programs.

These findings were based on a single sample from one organization. Further research is needed with groups that have heterogeneous membership and are employed in a wide range of organizational settings. Given the dynamic nature of teams, future research is also needed that examines the psychometric properties of this scale over an extended period of time. A strength of this research is that the sample consisted of naturally occurring work groups with individuals who rely on each other to complete the task. The work groups are physically located together and interact frequently throughout the day. Access to real groups enabled the collection of construct- and criterion-related validity.

These findings add to the growing body of literature that supports the view that cohesion is a multidimensional construct. Differential correlations were found between task cohesion, social cohesion, individual attraction to the group, and the variables examined. Partial correlations showed that of the three components of cohesion, task cohesion explained most of the variance with work-group characteristics. In addition, task cohesion was the better predictor of work-group performance compared to social cohesion and individual attraction to the group. The strong correlations

between task cohesion and several related work-group characteristics raise questions about how to conceptualize and operationalize social cohesion. There is need for further theoretical and empirical research on work-group cohesion.

NOTE

1. Details of the items that were removed are available from the author, Sally A. Carless, at Monash University, Psychology Department, PO Box 197, Caulfield East, Australia 3145; e-mail: Sally.Carless@sci.monash.edu.au.

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