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PATTERNS OF INTERDEPENDENCE IN WORK TEAMS: A TWO-LEVEL INVESTIGATION OF THE RELATIONS WITH JOB AND TEAM SATISFACTION

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A questionnaire study in 17 school and 24 engineering teams examined affective reactions to task and goal interdependence at the group and individual level of analysis. Group-level task interdependence was positively related to group members' job and team satisfaction. Within–group differences in the degree of task interdependence were unrelated to affective responses. Interactions revealed that within–group task interdependence is positively related to both job and team satisfaction only if the degree of goal interdependence in the work team is high.

Any work group unites employees in a more or less interdependent fashion. The members of a work group depend on each other for not only the successful completion of their jobs but also the achievement of superordinate goals and desired outcomes (Guzzo & Shea, 1992; Shea & Guzzo, 1987). The role of interdependence in the functioning of work groups has been acknowledged and examined in many empirical studies (e.g., Saavedra, Earley, & Van Dyne, 1993; Thompson, 1967; Wageman, 1995). However, interdependence as an important group design parameter has mainly been examined in connection with performance-related issues (e.g., Campion, Medsker, & Higgs, 1993; Campion, Papper, & Medsker, 1996; Guzzo & Shea, 1992; Saavedra et al., 1993). Little is known about how group members affectively respond to different types of interdependence or the combinations of interdependencies that make members feel satisfied about their jobs and the groups in which they work. These issues are nevertheless important because the affective reactions of group members are related to their psychological and physical health (Sonnentag, 1996). Furthermore, positive affective reactions influence the development and maintenance of the group as a system (Hackman, 1987; Sundstrom, De Meuse, & Futrell, 1990). Finally, it has recently been argued that the aggregated affective responses of group

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members may be positively related to group performance through the salient productivity related behaviors of the employees (Ostroff, 1992). In the present research, we sought greater insight into the affective reactions of team members to intragroup interdependence. Specifically, supplementing some scarce laboratory experiments, we report on a field study of how two forms of interdependence relate to job and team satisfaction.

Forms of Interdependence

The degree and type of interdependence in work groups stems from several sources including the differentiation of roles, the distribution of skills and resources, the manner in which goals are defined and achieved, and the manner in which performance is rewarded and feedback is given (Wageman, 1995). A core distinction made in a number of reviews is the one between task and goal interdependence (cf. Mitchell & Silver, 1990).

Task interdependence has been defined as a characteristic of the team as a whole (e.g., Campion, et al., 1993; Campion, et al., 1996; Guzzo & Shea, 1992; Saavedra et al., 1993) and as a characteristic of individual job incumbents (e.g., Brass, 1985; Kiggundu, 1983). In both cases, task interdependence is considered to be a structural feature of the instrumental relations that exist between team members. Team members are task interdependent when they must share materials, information, or expertise in order to achieve the desired performance or output (Cummings, 1978; Susman, 1976). The degree of task interdependence typically increases as the work becomes more difficult and the personnel require greater assistance from others to perform their jobs. Members of a sales department clearly operate relatively independent from one another, whereas most members of surgical teams occupy jobs with considerable task interdependence. Within a team, however, differences in the degree of task interdependence may also occur. The anesthetist in a surgical team, for example, works relatively independent from the surgeons and their assistants. Apparently, both between–group and within–group variation in the degree of task interdependence occurs depending on similarities and differences in the jobs of individual employees within and across groups.

Goal interdependence figures most prominently in studies at the group level (e.g., Johnson & Johnson, 1989; Mitchell & Silver, 1991; Saavedra et al., 1993), and is defined as the degree to which group members are assigned joint group goals and receive group feedback (e.g., Deutsch, 1973; Thomas, 1957). Joint group goals refer to the quantitative and qualitative performance to be achieved by all members of a group together; they reflect the purpose and mission of the group (Perrow, 1961). For example, an assembly team can be expected to assemble 120 radios a day or a

group of metal workers can be asked to reduce their scrap from 10% to 3%. Group feedback involves information on the actual state of achievement of the group goal (Algera, 1990). A supervisor may, for example, report that the group members assembled an average 130 radios a day in the previous month, instead of the planned 120. Research suggests that to be effective, group goals should be accompanied by group feedback. Locke and Latham (1990), for example, showed in their extensive review of the goal-setting literature that group goals and group feedback are inextricably related in their effects on performance. That is, group goals without group feedback have no effect, and group feedback without group goals automatically result in self-set group goals. Erez (1977) and Matsui, Kakuyama, and Onglatco (1987), among others, also posited that, to be functional, group goals must be accompanied by group feedback. Finally, Saavedra et al. (1993) argued that only group goals accompanied by group feedback might maximize effectiveness and result in synergistic gains. In line with this literature, the current research utilized a conceptualization of goal interdependence that captures both group goals and group feedback. This conceptualization of goal interdependence should not be mixed up with outcome interdependence, the degree to which the significant outcomes a group member receives depend on the performance of the other group members (Wageman, 1995). In contrast to goal interdependence, outcome interdependence refers to the degree to which individuals receive rewards based on their performance as a group, as in a gainsharing plan. It is also important to note that, whereas several studies examined the effects of task interdependence in combination with different reward structures on performance (e.g., Miller & Hamblin, 1963; Rosenbaum et al., 1980; Thomas, 1957; Wageman, 1995; Wageman & Baker, 1997), the effects of task interdependence in conjunction with goal interdependence represent an underinvestigated research area.

Interdependence and Satisfaction

Until now, the empirical literature is inconsistent at best about the exact relation between interdependence and satisfaction. At the group level, some studies have shown a positive relation to exist between the degree of group task interdependence and aggregated job satisfaction (Campion et al., 1996; Mohr, 1971). Other studies, however, have found no significant relations between group task interdependence and aggregated job satisfaction (Campion et al., 1993; Slocum & Sims, 1980). Research explicitly linking individual-level task interdependence with affective outcomes has also yielded inconclusive results. Some investigations have shown individual task interdependence to be positively related

to job satisfaction (e.g., Kiggundu, 1983), whereas other research has shown a negative relation (e.g., Brass, 1985) or no relation at all (e.g., Billings, Klimoski, & Breaugh, 1977).

With regard to goal interdependence, Pritchard, Jones, Roth, Stuebing, and Ekeberg (1988) demonstrate a positive impact of group goals and group feedback on performance, cooperation, morale, job satisfaction, and positive employee attitudes. In that study, however, the group members simultaneously worked under conditions of high task interdependence, which means that the observed positive results can be due to high goal interdependence, high task interdependence, or a combination of the two. Campion et al. (1993) found both group goals and group feedback to be unrelated to the affective responses of group members. In contrast, Campion et al. (1996) reported a positive relation between these variables. The effects examined in these studies were merely additive and for unknown reasons the possible interactive effects of the interdependence dimensions were not examined.

Neither task interdependence nor goal interdependence alone thus appears to be consistently related to the affective responses of group members. One reason for the inconsistent findings of previous field studies examining the relationship between the interdependence dimensions and satisfaction may be the confusion about either the work group or the individual worker as the appropriate level of analysis. Group-level conceptualizations of task interdependence cannot uncover subtle differences in the degree of satisfaction of individual team members. Individual-level conceptualizations of task interdependence, on the other hand, fail to capture differences in the relation between interdependence and satisfaction across groups. In order to further map the interdependence dynamics in teams, a novel research tack is needed that combines the advantages of group-level and individual-level approaches to the study of interdependence. As will be seen, this can be done by examining the effects of task and goal interdependence in a hierarchical linear model. In such a model, the empirical relations between the theoretical constructs are assumed to be a function of both between and within–group variation.

Another reason for the inconsistent findings in previous field research may be that in all studies relating interdependence to affective outcomes, the possible interactive effects of task and goal interdependence on job and team satisfaction were not systematically investigated. Although increasing degrees of task interdependence may usually result in more varied and challenging work and, therefore, in increased team member satisfaction, the organizational interdependence literature has shown that increased task interdependence is not always positively related to satisfaction. The experimental research suggests that

highly task interdependent settings may indeed sometimes pose problems with regard to intragroup cooperation, including the coordination, timing, and sequence of the group members' actions (Saavedra et al., 1993; Thompson, 1967; Wageman & Baker, 1997). Steiner (1972) refers to such problems as "process losses." It seems reasonable to assume that due to process losses the potentially positive relation between task interdependence and both job and team satisfaction may actually decline. Based on the above-mentioned experimental interdependence research we hypothesize that goal interdependence will moderate the relation between task interdependence and satisfaction. Considerable goal interdependence may mitigate the process losses associated with increased degrees of task interdependence because goal interdependence stimulates the development of cooperative behaviors among group members (Deutsch, 1973; Johnson & Johnson, 1989; O'Leary-Kelly, Martocchio, & Frink, 1994; Tjosvold, Andrews, & Struthers, 1991). In addition, goal-setting research indicates that group goals and feedback direct group members' attention and effort to collective performance instead of individual performance, thereby increasing coordination and cooperation among group members (Locke & Latham, 1990; Mitchell & Silver, 1990). Saavedra et al. (1993, p. 61) noted that "given that work groups can exercise some choice in how they plan, coordinate, and execute, goals and feedback may predispose group members to work collectively or independently on the group's task." In a similar vein, Weldon and Weingart (1993) argued that goal interdependence can improve performance on an interdependent task because it promotes cooperation among group members. In cases of high goal interdependence, task interdependence will therefore be positively related to satisfaction with the job and team. When the level of goal interdependence in the work group is relatively low, group members may lack the necessary incentive to cooperate and may pay more attention to their individual task performance (Johnson & Johnson, 1989; Mitchel & Silver, 1990; Saavedra et al., 1993). Increasing degrees of task interdependence will then be associated with process losses, and, as a result, the relation between task interdependence and satisfaction with the job and team will be less positive or even negative. Whether these process losses will produce a neutral or even negative relation between task interdependence and satisfaction will depend on their severity. In other words, the direction and the strength of the relation between task interdependence and team member satisfaction will depend on the degree of goal interdependence. The field study presented below was designed to examine the main and interactive effects of task and goal interdependence on job and team satisfaction at both the group and individual level of analysis.

Method

Sampling

To increase the variation in the degree of intragroup interdependence, we collected questionnaire data from a nonprofit and from a profit organization in which the key coordinating mechanisms are standardization of skills and mutual adjustment rather than direct supervision or standardization of work output (Mintzberg, 1979). Because substantive analyses on the separate subsamples showed basically similar results, the data from the two subsamples were combined into one data set. Given the relatively small number of observations in each subsample, this procedure increased statistical power and confidence in our ability to draw conclusions.

Subsample 1 involved 71 members of 17 elementary school teams in the Netherlands. The teams were distributed across 17 schools (i.e., 1 team per school) and ranged in size from 3 to 10 people. All of the teams were well-delineated. Forty-five percent of the respondents were men. The mean age was 37.9 years ($SD = 9.7$), and mean position tenure was 14.3 years ($SD = 5.2$). Each of the teams included a variety of jobs and roles involving teachers, principals, their assistants, remedial teachers, and combinations of two or more of these. Questionnaire packages were mailed to those principals who had agreed to participate in the study. The principals distributed the questionnaires to the other members of the team. A cover letter described the purpose of the study, assured the potential respondents of data confidentiality, and provided instructions for the completion and return of the questionnaire. The participants completed the questionnaire in their own time and mailed it directly to the researcher. To verify the accuracy of the quantitative data, additional qualitative data were collected via a semistructured interview with a randomly selected member from each of the 17 teams. The interview data showed the number of interpersonal contacts among colleagues per week to vary from 0 to 30 while the total amount of contact varied from 0 to 13 hours per week. Some of the contacts were formally prescribed by meetings, discussions, talks, and personal contacts. The other contacts were informal, for example, prior to work, during breaks, or after working hours. The respondents mostly communicated about personal well-being and functioning, students, parents, and policy issues; they provided each other with advice and help. Within most teams, clear group goals were identifiable. These were goals such as optimal care for students, optimizing the team's professional abilities, creating an optimal pedagogical climate, enhancing student well-being, introducing a system to monitor student performance, and improving

the number and quality of the contacts with parents. However, principals differed in the extent to which they communicated these group goals to the other group members and monitored their achievement. In addition, within several teams, the members received some kind of group feedback. The most frequently cited forms of team feedback were team performance appraisals, team evaluation meetings, and analyses of the strengths and weaknesses of the team.

Subsample 2 consisted of 26 work groups in an engineering company. A work group was defined as a group of personnel reporting directly to the same supervisor. All of the work groups were well-delineated, the members identified themselves with the team, and the management identified the members with the team. Questionnaires were distributed to 140 employees by their direct supervisor. The response rate was 81%. Seven questionnaires were incompletely answered and were therefore excluded from further analysis. The final sample consisted of 107 male respondents distributed across 24 groups ranging in size from 3 to 13 people, with at least three respondents per group. The mean age was 36.2 years (SD = 13.2), and the mean length of employment or tenure was 9.3 years (SD = 9.54). The work groups consisted of electrical and mechanical engineers, planning engineers, foremen, project managers, and calculators. The group members were working on the construction and maintenance of several kinds of technical installations for use in large buildings and manufacturing processes. Two main types of work groups could be clearly identified: production and coordination teams. The 13 production teams could be further subdivided into 5 service and 8 assembly teams. The service teams responded to customer calls about machine breakdowns and visited customer sites for preventive maintenance. The assembly teams were responsible for the construction of complex technical installations in large buildings following detailed plans and specifications. The work of the assembly teams thus required the coordination of technical rather than problem-solving skills. The 11 coordinating teams consisted of technicians, calculators, and a project manager, who all worked at the office on the preparation, control, and monitoring of the production teams' work. These workers were more highly educated than the members of the production teams (Technical College instead of Technical School), and most of their activities were more complex and required more creativity. In all of the work groups, the individual members varied in the extent to which they depended on other group members for knowledge of different products, services or other job-related matters. The work groups also varied in the extent to which they received group goals and group feedback. Whereas all of the groups had detailed production plans and strict deadlines, the supervisors differed in the extent to which they communicated these group goals to the group

members. In a similar vein, some of the supervisors provided explicit feedback and information on how well the group was doing and others did not. The teams thus varied in the degrees of task and goal interdependence.

Measures

The questionnaire consisted of randomly ordered self-report Likert-type items (1 = *strongly agree*, 5 = *strongly disagree*). When appropriate, the items for each scale were averaged to produce a composite score for each respondent.

Task interdependence. Rousseau (1985) argued that if a variable of interest means the same thing at different levels, it should be measured at the lowest level possible. The individual team members' scores can then be aggregated to obtain a group-level measure of the construct. For this reason, in the present study task interdependence (TI) was measured at the individual level of analysis. A pool of eight task interdependence items was originally created on the basis of previous research (Kiggundu, 1983; Mohr, 1971; Pearce & Gregersen, 1991). The items were submitted to professional colleagues for consideration, and three of the TI-items were viewed as redundant and therefore discarded. The remaining five items were then pretested on a separate sample of 180 employees at an engineering company (cf. Van der Vegt, Emans, & Van de Vliert, 1998). The initial task interdependence scale was revised, and some of the items underwent minor rephrasing. The final items were: "I have to obtain information and advice from my colleagues in order to complete my work," "I depend on my colleagues for the completion of my work," "I have a one-person job; I rarely have to check or work with others," "I have to work closely with my colleagues to do my work properly," and "In order to complete their work, my colleagues have to obtain information and advice from me." A one-way analysis of variance with group as the independent variable and the scores of the group members for task interdependence as the dependent variable showed the between-group variance to be significantly greater than the within-group variance, $F(40, 134) = 2.44$, $p < .001$, $\eta = .65$. We also assessed within–group agreement with regard to task interdependence using the multiple-item estimator $r_{wg(j)}$ discussed by James, Demaree, & Wolf (1984). The results of this analysis yielded a median value of .63, showing that—despite significant between–group differences—there are also substantial within–group differences in the degree of task interdependence.

Goal interdependence. In line with previous research, goal interdependence was conceptualized as a group-level variable. In Sample 1, each work group member rated the extent to which members of the

group were assigned group goals and group feedback by responding to the following two statements (Campion et al., 1993): "Team members are informed about the goals they should attain as a group" and "Team members receive feedback on the basis of their collective performance." Again, a one-way analysis of variance with group as the independent variable and the scores of the group members for goal interdependence as the dependent variables showed the between-group variance to be significantly greater than the within-group variance, $F(17, 53) = 1.98$, $p < .05$, $\eta = .67$. The multiple-item estimator $r_{wg(j)}$ yielded a median value of .84. This $r_{wg(j)}$ value is similar in magnitude to the values reported in previous research (e.g., Campion et al., 1993, 1996) and made us conclude that the group members' scores on goal interdependence are sufficiently homogeneous to warrant aggregation. In Sample 2, each work group's supervisor rated the extent to which the group members were presented with group goals and group feedback by responding to the above statements. The two ratings were found to be substantially interrelated, $r(24) = .56$, $p < .001$, and were combined to form an overall measure of goal interdependence.

Job satisfaction. Three survey items adapted from Hackman and Oldham (1980) assessed a group member's overall satisfaction with his or her work (e.g., "Generally speaking, I am very satisfied with this job").

Team satisfaction. Team satisfaction was measured by the following three items (Gladstein, 1984): "I am satisfied with my present colleagues," "I am pleased with the way my colleagues and I work together," and "I am very satisfied with working in this team."

Analyses

We conducted confirmatory factor analysis with the LISREL 8 computer package (Jöreskog & Sörbom, 1989) to assess the convergent and discriminant validity of the items measuring interdependence and the affective outcome variables. Parameter estimates were made using the Maximum Likelihood method. When evaluating models, we used multiple measures of fit. In addition to the chi-square statistic, which is largely influenced by sample size (Bentler & Bonett, 1980), two other measures of fit are commonly used—the goodness-of-fit index (GFI), and the standardized root mean square of the residuals (SRMSR). These measures generally range between 0 and 1. The values for the GFI should meet or exceed the 0.9 rule to obtain a good fit; the SRMSR is an estimate of the average magnitude of the fitted residuals and should ideally be less than or equal to 0.05. The chi-square, GFI, and RMSR are absolute or stand alone measures of fit in that they directly assess how well a model accounts for observed covariance. We also applied a measure

that assesses the practical fit of a proposed model relative to that of a null model, the comparative fit index (CFI). The CFI has been found to outperform many fit indices in simulation research and should ideally be greater than or equal to .90 (Bentler & Bonett, 1980).

Given the hierarchical structure of our data, the predicted relationships between task interdependence and the affective outcome variables were considered within a hierarchical linear model (Bryk & Raudenbusch, 1992). This is a statistical model for hierarchically structured data which takes into account between-group variability as well as within–group variability. Using ordinary regression analysis would possibly lead to unreliable results because individuals in the same group share common influences, so that the assumption of independent observations would be violated (cf. Bryk & Raudenbush, 1992; Hoffmann & Stetzer, 1996). To test whether the main effect of task interdependence was due to differences between groups or between individuals, the task interdependence scores were partitioned into the group mean and the within–group deviation variable (individual score minus group mean). The regression coefficient of the group mean is the between–group coefficient, whereas the regression coefficient of the deviation variable is the within–group coefficient (cf. Bryk & Raudenbush, 1992; Snijders & Bosker, 1993). If the regression coefficient is significant for the group mean and nonsignificant for the deviation score, then the effect of task interdependence operates only at the group level. If, conversely, the regression coefficient is significant for the deviation variable and nonsignificant for the group mean, then the effect operates at the individual level. If there is a between–group as well as a within–group effect, task interdependence operates at the group and individual level simultaneously. The partitioning of task interdependence scores into the group mean and the deviation scores implies that the predicted interaction effect between task and goal interdependence has also to be partitioned into two parts. First, a goal interdependence × aggregated task interdependence interaction, indicating that the hypothesized effect occurs due to differences between groups. Second, a goal interdependence × task interdependence (deviation) cross-level interaction, indicating that the hypothesized effect occurs due to differences in task interdependence between members of the same group. Data analysis was performed using the ML3 computer package (Prosser, Rasbash, & Goldstein, 1991).

Results

Confirmatory Factor Analysis

Before testing the hypothesized effects of intragroup interdependence on the affective outcome variables, the convergent and discrim-

TABLE 1

Descriptive Statistics and Intercorrelations for Interdependence Dimensions and Affective Responses

	M	*SD*	α	1	2	3
1. Task interdependence	3.22	.76	.76			
2. Goal interdependence	3.19	.79	.72	.26*		
3. Job satisfaction	4.06	.77	.88	.23*	.12	
4. Team satisfaction	3.63	.63	.84	.29**	.17*	.43***

Note: $N = 178$. To compute the individual-level Pearson correlations, the group's scores for size and goal interdependence were assigned to each individual group member.
*$p < .05$ **$p < .01$ ***$p < .001$

inant validity of the individual variables had to be established. To establish convergent validity, each item must contribute to only one dimension. To establish discriminant validity, the dimensions underlying a construct, although naturally related to some degree, should reflect distinct components instead of being equivalent to each other. Because goal interdependence was measured by means of supervisor ratings in the second sample, this variable was excluded from the confirmatory factor analyses.

Convergent validity. We first examined whether each item for measuring the dimensions of task interdependence, job satisfaction, and team satisfaction had a statistically significant factor loading on the a priori specified factor. As expected, all of the factor loadings were found to be highly significant with *t*-values ranging from 8.30 to 19.63. These results strongly support the convergent validity for each of the dimensions.

Discriminant validity. Next, we assessed the discriminant validity of the task interdependence scale and both satisfaction measures by comparing the fit of a 3-factor Model to the fit of a 2-factor and a 1-factor Model. The 2-factor Model distinguished between task interdependence and satisfaction. The results of the confirmatory factor analyses showed the 3-factor Model ($\chi^2[32] = 74.77$; GFI = .94; SRMSR = .04; CFI = .97) to produce a significantly better fit than the 2-factor Model ($\chi^2[33] = 198.89$; GFI = .85; SRMSR = .10; CFI = .89), and the 1-factor Model ($\chi^2[35] = 306.08$; GFI = .82; SRMSR = .12; CFI = .82), which supports the discriminant validity of the scales measuring task interdependence, job satisfaction, and team satisfaction. An additional analysis on the Sample 1 data, adding the items measuring self-report goal interdependence, showed the convergent and discriminant validity of all four measures used. The descriptive statistics and correlations for the interdependence dimensions and the affective outcome variables are presented in Table 1.

TABLE 2

Regression of Affective Responses on Goal and Task Interdependence

	Job satisfaction			Team satisfaction		
	Estimate	t	R^2	Estimate	t	R^2
Group-level variance	.16			.10		
Individual-level variance	.84			.90		
Goal interdependence (group)	−.01	.10	.00	.02	.31	.00
Task interdependence (group)	.28**	2.97	.09	.36***	4.61	.14
Task interdependence (individual)	.10	1.48	.10	.11	1.52	.15
Goal interdependence × task interdependence (group)	.08	.91	.11	−.01	.16	.15
Goal interdependence × task interdependence (individual)	.18**	2.63	.14	.16*	2.30	.18

*$p < .05$ **$p < .01$ ***$p < .001$

Multilevel Analyses

As a first step in our analysis, we computed a so-called "empty" multilevel model for decomposition of the total variance of the criterion variables into group–level and individual–level variance. On the basis of this information, the intraclass correlation (i.e., the percentage of the total variance attributable to group membership) could be computed by dividing the group–level variance by the sum of the group–level and individual–level variance. Next, the group–level variables goal interdependence, aggregated task interdependence, and the deviation score for task interdependence were added to the model, respectively. Finally, the group–level and cross–level goal interdependence × task interdependence interactions were added (Baron & Kenny, 1986). To aid interpretation, all continuous variables were standardized before the interaction terms and regression statistics were calculated (Aiken & West, 1991).

Empty model. Decomposition of the total variance showed the group-level variance to be smaller than the individual-level variance for job as well as team satisfaction (see Table 2). On the basis of this information the intraclass correlation (ICC) was computed to be .16 for job satisfaction and .10 for team satisfaction (Bartko, 1976). This violation of the requirement of statistical independence emphasizes the need for hierarchical linear modeling.

Goal and task interdependence. Adding goal interdependence to the hierarchical linear model revealed no significant relation with job or team satisfaction. However, aggregated task interdependence was found to be positively related to both job and team satisfaction, explaining a substantial amount of the total variance in job satisfaction (9%) and team satisfaction (14%). The individual–level deviation score for task

interdependence appeared to be unrelated to both affective outcome variables.

Interactive effects. In keeping with our hypothesis, the goal interdependence × task interdependence interaction effect reached significance for job satisfaction as well as team satisfaction. Interestingly, for both job and team satisfaction the interaction effect occurred due to within–group and not between–group differences in the degree of task interdependence. The interaction between the interdependence dimensions explained an additional 3% of the total variance in job satisfaction as well as an additional 3% of the total variance in team satisfaction.

In order to clarify the significant cross-level interactions, the predicted values for job satisfaction and team satisfaction were calculated using the bs from the regression equation (for an elaborate description of this procedure, see Aiken & West, 1991). The predicted values for each of the outcome variables at values one standard deviation above and below the mean scores for task interdependence were computed, and show task interdependence in groups characterized by high goal interdependence to be positively related to job and team satisfaction. In groups characterized by low goal interdependence, on the other hand, task interdependence was found to be unrelated to positive affective responses. Figure 1 shows this effect for job satisfaction. The predicted values for team satisfaction reveal a similar pattern. These results show the nonsignificant overall relation between goal interdependence and the affective responses to be attributable to buffering by differences in the degree of task interdependence between team members. On the whole, the results provide strong support for the hypothesized interaction effect between task and goal interdependence.

Discussion

Both task and goal interdependence in work groups appear to operate as two-edged swords. Task interdependence may be either beneficial or detrimental to the affective responses of work group members depending on the degree of goal interdependence, and vice versa. In widely different school and enginering teams characterized by high goal interdependence, members experiencing relatively high levels of task interdependence appeared to be more satisfied with their job and team than members experiencing relatively low levels of task interdependence. The reverse pattern emerged for members of groups characterized by low goal interdependence. Interestingly, the interactions between task interdependence and goal interdependence were found to predominantly explain the affective outcomes at the individual level. Thus, the detrimental effects of mismatched task interdependence and

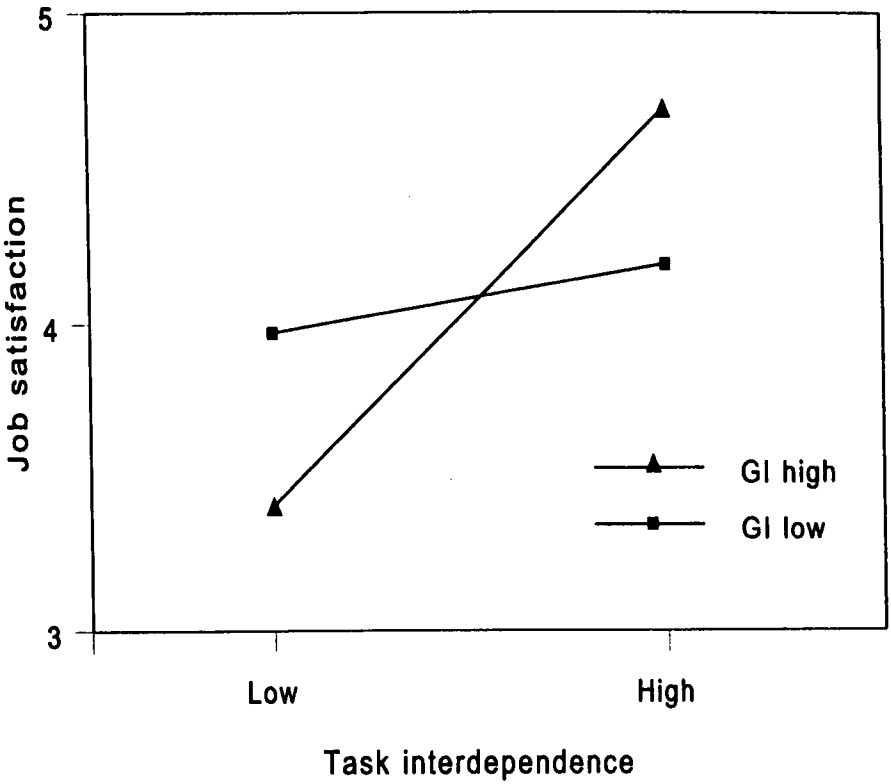

Figure 1: **Regression of Job Satisfaction on Task Interdependence for Low and High Levels of Goal Interdependence (GI)**

goal interdependence occur as a result of within–group differences in the degree of task interdependence. This implies that, rather than the whole work group, only a few of its individual members experience the process losses associated with mismatched task and goal interdependence.

The finding that task and goal interdependence interact in their effect on affective responses is in line with previous laboratory research on cooperation and competition that has focused on matching the level of task interdependence with rewards—instead of goals. These studies showed mismatched task and outcome interdependence to deteriorate motivation and coordination (Earley & Northcraft, 1989; Miller & Hamblin, 1963; Rosenbaum et al., 1980; Thomas, 1957) and increase interpersonal costs and conflict (Saavedra et al., 1993; Van de Ven & Ferry, 1980). Under high task interdependence, a reward system that

distributed payoffs equally resulted in more cooperation and higher performance than a reward system that was high on differential payment. Although goal interdependence differs from outcome interdependence, as outlined in the introduction, the results of the present research reveal that similar processes are associated with mismatched task and *goal* interdependence of at least some of the members of real-life organizational groups.

The above results are of particular theoretical interest for several reasons. For one, they may help explain some of the inconsistent results of previous field studies examining the relations between individual task interdependence and the affective responses of team members (e.g., Brass, 1985; Kiggundu, 1983; Pearce & Gregersen, 1991). These studies may have yielded conflicting results because they failed to take the moderating role of group-level goal interdependence into account. In a similar vein, the group–level studies relating task and goal interdependence to the affective responses of team members may have yielded conflicting results because they either overlooked the interactive effects of task and goal interdependence on the outcome variables (Campion et al., 1993, 1996) or did not recognize the degree of task interdependence to vary widely within most teams (Campion et al., 1993, 1996; Wageman, 1995). Basically operationalizing task interdependence at the individual level enabled us to explain a significant amount of between–group and within–group variance in the affective outcome variables. Cross-level examinations such as those presented in this study are statistically much more powerful than group–level examinations and might therefore be used in future theory building about the simultaneous effects of individual–level and group–level variables on affective responses of group members. Finally, and to the best of our knowledge, the present study is the first to report interactive effects of task and goal interdependence on affective outcomes in actual field settings. Specifically, we covered teams embedded in the overall structural configurations of a professional bureaucracy (schools) and adhocracy (engineering company) with widely different key coordinating mechanisms such as standardization of skills and mutual adjustment, respectively (Mintzberg, 1979). Consequently, the findings of laboratory studies showing interactive effects of task and outcome interdependence on intragroup cooperation, conflict, and productivity are externally validated and extended (e.g., Miller & Hamblin, 1963; Rosenbaum et al., 1980; Thomas, 1957; Wageman, 1995).

The present research has, of course, its limitations. A first weakness is that the cross-sectional nature of the two studies precludes causal statements about the relation between the interdependence dimensions and the affective elements of work group effectiveness. For example, the causal ordering of task interdependence and work satisfaction may be

just the opposite of what has been put forward. Negative affective states could lead workers to isolate themselves from the group and thereby decrease an individual's level of task interdependence (Van de Vliert, 1997). However, just why this dynamic should be particularly strong under conditions that either all members of the group together or supervisors consider highly goal interdependent would then still remain unclear. In our opinion, reversing the causal order therefore cannot explain the observed 2-way cross-level interactions, and tentative evidence is thus provided for the causal ordering suggested here.

The cross-sectional survey design used here also does not fully capture the dynamics of work group interdependence, which leaves interesting questions for future research. A dynamic model of work group interdependence should account for the very real possibility of changing levels of task interdependence. Prior research (e.g., Wageman, 1995) suggests that the design of the work that people do and the types of feedback that they receive may well converge over time. For example, group members experiencing mismatches between the levels of task and goal interdependence may change their task interdependence in order to reduce the degree of incongruence. Longitudinal studies of the transitions from one stage of matched or mismatched interdependence to another in actual field settings may be particularly fruitful in this light.

An important challenge for organizations is to create work groups in which the employees are satisfied with their job and team. In keeping with our results and many job redesign strategies (cf. Slocum & Sims, 1980), it is best to group employees who perform jobs with comparable levels of task interdependence into a common work team that is clearly differentiated from other work teams. Furthermore, the significant interactions reported here suggest that intervention effort to foster greater task interdependence between individual group members should also take the potentially facilitative effects of group goals and group feedback into consideration. Supervisors should provide highly task interdependent team members with high levels of goal interdependence in order to maintain the highest possible levels of job and team satisfaction.

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