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Abstract

Using a sample of 1708 team members in 292 team-based establishments, we examine the relationship between team member stress, and team autonomy in the form of team decision making, team leader appointment, and team responsibility. We also examine the relationship between stress, and intrateam interdependence in the form of team member interdependency and team-based job rotation. We further examine whether the relationships between team design and stress are mediated by team member job demands and job control. We find that an increase in job demands indirectly mediates the positive relationships between team decision making and team responsibility, and stress. We also find that a decrease in job demands indirectly mediates the negative relationship between team-based job rotation and stress. Our results suggest that the optimal design of a team, with respect to stress, is a team that has a low degree of autonomy and a high degree of intrateam interdependence.

Keywords

autonomy, control, demands, interdependence, job design, job rotation, multilevel, stress, team, teamwork

Introduction

Teams are a salient feature of modern organizations (Van Mierlo et al., 2007). However, the design of teams can vary dramatically across organizations depending on the particular

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preferences and objectives of management (Appelbaum and Batt, 1994; Berggren, 1992). The particular design of a team can affect a number of psychological outcomes. In a recent review, Rasmussen and Jeppesen (2006) suggest that teamwork is associated with a number of positive psychological variables. However, they identified but one study that examined the association between teams and stress (i.e. Crichton, 2005).

The limited research that has examined the association between teams and stress is not definitive regarding the relationship between the two. Recent research has found teams to be negatively associated with stress (e.g. Conti et al., 2006; Mohr and Zoghi, 2008). Older anecdotal case-based evidence suggests that teams are stressful (e.g. Parker and Slaughter, 1988), although not necessarily stressful enough to be considered detrimental to health (Adler and Cole, 1993). A potential explanation for conflicting findings with respect to stress is that different team design choices may have differential effects on stress.

Stress has been found to be associated with a number of undesirable outcomes for employees and employers, including increased absenteeism (Hardy et al., 2003), decreased loyalty (Boswell et al., 2004), increased job search (Boswell et al., 2004; Cavanaugh et al., 2000), intentions to quit (Boswell et al., 2004), decreased job satisfaction (Cavanaugh et al., 2000), decreased job performance (Hunter and Thatcher, 2007), and deviant behaviors (Penney and Spector, 2005; Vigoda, 2002). Thus, understanding how team design affects team member stress is an important step towards enhancing a number of important individual-level outcomes.

Our efforts to understand the relationship between team-level characteristics and team member stress is in line with recent research examining the link between team characteristics and individual job characteristics, and ultimately, psychological well-being (e.g. Van Mierlo et al., 2007). We use the job demands-control model (Karasek, 1979; Karasek and Theorell, 1990) to examine whether team autonomy, in the form of team decision making, team leader appointment, and team responsibility for specific products or services, is associated with team member job demands and job control, and ultimately, team member stress. We similarly explore whether intrateam interdependence, in the form of team member task or role interdependency and team-based job rotation, is associated with team member job demands and job control, and subsequently, team member stress. We rely on a multilevel data set encompassing 1708 team members in 292 team-based establishments to assess the impact of these team characteristics.

Theory and hypotheses

Job demands-control model

Karasek's (1979) original job demands-control model and later variants (e.g. Karasek and Theorell, 1990), is one of the most widely used stress models in occupational health psychology (De Lange et al., 2004). The model focuses on the interaction between individual job demands and individual job control as predictors of individual-level psychological job strain, or stress. Job demands include psychological stressors related to how hard an employee must work and work overload. Job control, also known as decision latitude, refers to how much freedom a worker has on the job, and consists of two elements: skill discretion and decision authority.

Team characteristics, team member job demands, and team member job control

Team design refers to the choices made by management regarding the purposes, structures, or organizational contexts of teams (Wageman, 2001). Two salient design choices to be made by management are how much autonomy teams should be granted (Cooney, 2004) and how much team members should be interdependent on one another (Cohen and Bailey, 1997). Much of the academic literature mirrors this interest in team autonomy and intrateam interdependence. With respect to the former, team decision making (e.g. Fucini and Fucini, 1990), team leader appointment (e.g. Babson, 1995), and team responsibility (e.g. Berggren, 1992) have all been extensively examined. They are all indicators of team autonomy in that they focus on ‘the internal self-regulation of the group and the autonomous self-control of work tasks, independent of management systems of supervision and control’ (Cooney, 2004: 684). Team member interdependency (e.g. Cohen and Bailey, 1997) and team-based job rotation (e.g. Rinehart et al., 1997) have also been extensively examined. These can be considered forms of intrateam interdependence because they suggest that team members must rely upon one another in order to complete a task or outcome (Wageman, 1995). We focus on these five team characteristics, their association with team member job demands and job control, and in turn, team member stress, because each of these team characteristics can apply to virtually any type of team in the workplace.

Team autonomy A number of factors can provide teams with increased autonomy, including team decision making, team leader appointment, and team responsibility for specific products or services. An assumption in the literature is that increased team autonomy increases team member autonomy (Liden and Tewksbury, 1995). Increased autonomy provided to team members through team decision making, team leader appointment, and team responsibility is likely to increase individual job demands and individual job control for team members.

Allowing a team to decide how its work is to be done, including who will lead the team, is likely to increase individual job demands owing to the need for consensus within the team (Robbins and Finley, 2000). When consensus must be reached, individuals have to choose among alternatives – a demanding task when preferences differ (Miller, 1989). For example, in their research at Mazda, Fucini, and Fucini (1990) found joint decision making required team members to reach a consensus on job scheduling, production goals, and quality standards. Beyond the time pressure caused by the need to make an increased number of decisions (Wellins et al., 1991), social interaction processes, such as participation, communication, negotiation, and persuasion, become more critical (Mohammed and Ringseis, 2001). The need to work through consensus building processes (e.g. selecting a team leader) are forms of job demands (Harris and Beyerlein, 2003) that employees in teams that do not engage in joint decision making can avoid.

Likewise, team responsibility for specific products or services may increase individual job demands. Godard (2004: 358) found that ‘team responsibility for a good or service was positively associated with work overload, role stress and after-work fatigue.’ The

most salient reason why team responsibility increases individual job demands is that it leads to greater accountability. There are fewer opportunities to shift blame to other individuals or teams when the team fails to fulfill its responsibility for the product or service. This results in greater pressure on individuals to succeed with the product or service. This can have a trickledown effect to members of the team because they are more accountable to one another. Accordingly, team responsibility can lead to a situation where peer pressure creates additional mental demands for individual team members (Barker, 1993; MacDuffie, 1995; Rinehart et al., 1997).

For these reasons, we expect that providing greater autonomy to team members by allowing the team to make its own decisions may increase the job demands of team members. Thus, we hypothesize:

Hypothesis 1a: Team decision making is positively associated with team member job demands.

Hypothesis 2a: Team leader appointment by team members is positively associated with team member job demands.

Hypothesis 3a: Team responsibility for specific products or services is positively associated with team member job demands.

Although team decision making, team leader appointment, and team responsibility may increase the job demands of team members, they may also increase job control (Wellins et al., 1991). For instance, the prototypical 'Swedish model' of work teams delegates daily responsibilities to work teams, allowing teams to decide such things as their own job rotation schedules and their own overtime hours (Adler and Cole, 1993; Appelbaum and Batt, 1994; Berggren, 1992). When team members select their own team leaders, they can opt for leaders who value team member participation in decision making. Participative decision making allows team members to have greater influence, including how much skill discretion and decision authority team leaders will grant them in their individual jobs (Glew et al., 1995). In contrast, teams led by management appointees are often forced to follow standard operating procedures that do not allow room for experimentation to find better work methods (Hackman, 2002). This results in decreased skill discretion and decision authority for team members in their individual jobs. We therefore hypothesize:

Hypothesis 1b: Team decision making is positively associated with team member job control.

Hypothesis 2b: Team leader appointment by team members is positively associated with team member job control.

Hypothesis 3b: Team responsibility for specific products or services is positively associated with team member job control.

Intrateam interdependence We next focus on intrateam interdependence, including team member task and outcome interdependency and team based job-rotation. Task

or outcome interdependency may be desirable when these are required to accomplish a task successfully (Rousseau et al., 2006; Wageman, 1995). Interdependency allows individual team members to contribute incrementally and share responsibility. For example, in teams where some members have mentally demanding jobs and others have physically demanding jobs, job rotation can allow team members to be relieved of the demands associated with a particular job. Indeed, Kuijer et al. (2004) found that job rotation between garbage truck drivers and collectors decreased the mental demands of drivers and the physical demands of collectors. While one could argue that one demand is being replaced by another, rotation reduces the likelihood that a team member endures the same type of demand on an ongoing basis. This is also important in the service sector where service organizations frequently mandate which emotions can and cannot be displayed (Rupp et al., 2008). Teams that include responsibilities that are service oriented could be mentally demanding for those members who have to fulfill the most service oriented roles. However, the demands of those positions could be diffused if team members in service roles can rotate periodically into non-service activities. Additionally, job rotation allows multiple individuals the opportunity to develop expertise in the team's different tasks, allowing for more opportunities to help those facing difficulties (Robbins and Finley, 2000). Thus, we hypothesize:

Hypothesis 4a: Team member interdependency is negatively associated with team member job demands.

Hypothesis 5a: Team-based job rotation is negatively associated with team member job demands.

Interdependency in work tasks, such as job rotation, can decrease team member job control because control of an outcome is distributed across a number of team members (Harris and Beyerlein, 2003). Not all research would agree with this. For example, Rissén and colleagues found that job rotation among supermarket cashiers led to increased perceptions of job control (2002). However, we believe that in most contexts, interdependency results in team members having less skill discretion and decision authority. Team members lose skill discretion because the number of skills that could be utilized is constrained by the activities of others. Team members also lose decision authority regarding such things as the pace at which they work and the order in which they undertake tasks because these job dimensions may be controlled in part by the pace and the order in which other team members do their jobs. Team members must coordinate accordingly (Morgan and Bowers, 1995). Thus, we hypothesize:

Hypothesis 4b: Team member interdependency is negatively associated with team member job control.

Hypothesis 5b: Team-based job rotation is negatively associated with team member job control.

Team member job demands, team member job control, and team member stress

The job demands-control model has been used in a number of empirical studies examining stress (e.g. Bradley, 2007), as well as related constructs, including anxiety-contentment (e.g. Wood, 2008), burnout (e.g. Pascual et al., 2003), fatigue (e.g. Van Yperen and Hagedoorn, 2003), and general psychological health (e.g. Noblet and Rodwell, 2009; Taris and Feij, 2004; Van Yperen and Snijders, 2000). While disagreements exist regarding the operationalization of stress (Cohen et al., 1995), these studies provide extensive support for the link between individual job demands, individual job control, and individual stress broadly defined. In line with this literature, we hypothesize:

Hypothesis 6a: Team member job demands are positively associated with team member stress.

Hypothesis 6b: Team member job control is negatively associated with team member stress.

Team characteristics and team member stress

Our theory development suggests a direct relationship between the team characteristics that are the focus of our study and team member stress. Team member job demands and team member job control may mediate these relationships. However, our theory development suggests that the relationships between the team autonomy characteristics, and team member job demands and control are all positive. We further hypothesize that the relationships between the intrateam interdependence characteristics, and team member job demands and control are all negative. We have no basis for predicting whether team member job demands or team member job control will be more salient to team members and subsequently increase or decrease stress. There is little empirical work in this area, and as a result, we do not offer any formal hypotheses regarding those direct and mediating relationships. We will explore these relationships empirically.

Method

Data and sample

To explore the relationships between team characteristics, team member job demands, team member job control, and team member stress, we drew a sample from the 2004 UK Workplace Employment Relations Survey (WERS; Department of Trade and Industry, 2005). WERS was designed to understand the state of employment relations and working life in Great Britain. As part of the study, managers completed an establishment-level survey on a range of key organizational characteristics. Employees in each establishment completed a separate survey about themselves, their jobs, and their workplace. We relied on the WERS manager survey for our measures of team characteristics and the WERS employee survey for our measures of team member job demands, control, and stress. The full WERS sample consisted of matched data for 22,451 employees in 2295 establishments. We restricted our sample to those establishments where managers indicated 100%

of the largest occupational work group worked in formally designated teams. We further restricted the employee sample to those employees who were identified as being non-supervisors and members of the largest occupational work group in these establishments. These two restrictions ensured that we had accurate information on team practices affecting the specific team members in those teams. We further restricted our sample to establishments that had at least three or more team members completing the individual survey. This ensured that we captured some within-establishment variance in team member job demands, team member job control, and team member stress. To enable us to compare models, we deleted all cases with missing data on the variables used in this study. Our final sample consisted of matched data for 1708 team members in 292 team-based establishments. The establishments in our sample ranged in size from 5 to 3560 employees, with a mean of 251 employees. The number of team members responding per establishment in our sample ranged from 3 to 16, with a mean of 6 team member respondents.

Measures

Stress The employee survey included Warr's (1990) measure of job anxiety-contentment. Team members were asked: 'Thinking of the past few weeks, how much of the time has your job made you feel each of the following?' Six response scales measured how often a team member felt tense, calm (reverse coded), relaxed (reverse coded), worried, uneasy, and content (reverse coded). Responses were measured on a five point Likert-scale ranging from 1 (Never) to 5 (All of the time) and responses were assumed to be bipolar. This means that responses to the negative affect items (i.e. tense, worried, uneasy) should be negatively, but highly correlated, to the positive affect items (i.e. calm, relaxed, and content). The correlations between the negative affect and positive affect items in our sample ranged from .30 for the pair worried-content to .52 for the pair tense-calm.

These results suggest that respondents did not interpret the positive and negative affect items as bipolar and that the relationship between the positive and negative items may be non-linear. Although it has been argued that random and nonrandom response error may mask bipolarity (Green et al., 1993), one can test whether the relationships between items are bipolar using Mokken scale analysis (Mokken, 1971). Mokken scale analysis is frequently used to assess unidimensionality and scale selection (Van der Ark, 2007; Van Schuur, 2003). For example, Segura and Gonzalez-Roma (2003) relied on Mokken scale analysis to demonstrate that respondents constructed response formats for the item pair tense-relaxed as bipolar, indicating unidimensionality and linearity. Following Segura and Gonzalez-Roma (2003) and Wood (2008), we conducted a Mokken scale analysis (Mokken, 1971) on our sample. We found that Warr's (1990) anxiety-contentment scale was best represented by two separate dimensions. One dimension consisted of the negative affect items and the second dimension consisted of the positive affect items. The negative affect scale satisfied all Mokken scale analysis criteria. Principal component analysis with varimax rotation and Kaiser normalization revealed the same pattern. This is consistent with Mäkikangas et al.'s (2007) confirmatory factor analysis of Warr's (1990) full 12-item scale, which suggested that measuring job-related affective well-being was best described by a model with four interrelated factors, with one of these factors being anxiety. Following others (e.g. Hardy et al.,

2003), we used the negative component, termed anxiety in the literature, as our dependent variable and indicator of stress.

Our use of anxiety as a measure of stress mirrors extant practice in the literature (cf. Ferris et al., 1996; Hardy et al., 2003; Hunter and Thatcher, 2007; Xie and Johns, 1995). Beyond the widespread use of anxiety as a measure of stress in the extant literature, anxiety is an appropriate measure of stress because it is one indicator of short-term stress (Xie and Johns, 1995). In a similar vein, Robinson and Clore's (2002: 199) research suggests that individuals use episodic emotion knowledge, or 'knowledge about one's emotions in a particular place at a particular time,' when reporting on their emotions over short periods of time. Warr's (1990) measure of job anxiety-contentment taps into this episodic emotion knowledge by asking team members how their jobs made them feel over the past few weeks. By focusing on a team member's state rather than traits, this reduces potential confounding effects of team member disposition. Cronbach's α for this scale was .83 ($M = 2.41$, $SD = 0.87$).

Team member job demands and team member job control Team member job demands were measured by how much team members agreed with the following statement: 'I never seem to have enough time to get my work done.' This statement captures time pressure and workload, both of which Karasek (1979) identified as key components of job demands. Time pressure or workload have been used in prior studies as a measure of individual job demands (e.g. Karasek, 1979; Taris and Feij, 2004; Van Jaarsveld et al., 2010; Van Yperen and Hagedoorn, 2003; Van Yperen and Snijders, 2000; Wood, 2008). Responses were measured on a five point Likert-scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The average team member indicated a moderate level of job demands ($M = 3.15$, $SD = 1.08$).

Following Wood (2008), we used five indicators of job control. Team members were asked to indicate how much influence they generally had over the following: 'What tasks you do in your job,' 'The pace at which you work,' 'How you do your work,' 'The order in which you carry out tasks,' and 'The time you start or finish your working day.' Responses were measured on a four point Likert-scale ranging from 1 (None) to 4 (A lot). Cronbach's α for this scale was .78. The average team member indicated a moderate level of job control ($M = 2.71$, $SD = 0.76$). We rely on an additive model of job demands and control, following evidence from the literature that suggests individual job demands and individual job control influence stress in an additive manner (see De Jonge and Kompier, 1997, and Van der Doef and Maes, 1999 for reviews).

Team characteristics Managers indicated whether team members were able to jointly decide how the work was to be done (0 = No, 1 = Yes), were able to appoint their own team leaders (0 = No, 1 = Yes), were given team responsibility for specific products or services (0 = No, 1 = Yes), depended on each other's work to be able to do their job (0 = No, 1 = Yes), and rotated tasks or roles (0 = No, 1 = Yes). Similar to the approach of Osterman (2000) and others, the questions are centered on the core employee group in the establishment. Half of the establishments indicated that team members jointly decided how the work was to be done (50%), a small number of establishments indicated that team members could appoint their own team leaders (5%), the majority of establishments

indicated that teams had responsibility for specific products or services and that team members depended on each other's work to be able to do their job (85% and 76%, respectively), and 69% indicated that tasks or roles rotated among members of the team.

Individual-level control variables (level 1) Similar to Wood's (2008) analysis of the WERS data in relation to job anxiety-contentment and job satisfaction, we controlled for several key demographic variables and job-related variables. We controlled for three demographic variables: gender, age, and education. We controlled for gender (reference group is male) because research, albeit mixed in regard to the direction of association, suggests that males and females may perceive different levels of stress (cf. Ferris et al., 1996; Lait and Wallace, 2002; Narayanan et al., 1999; Tai and Liu, 2007; Wood, 2008). Similarly, we controlled for age (0 = Less than 20 to 5 = 60 and above) because prior research, albeit mixed with regard to the direction of association, suggests that there may be an association between age and stress (cf. Ferris et al., 1996; Spell and Arnold, 2007; Warr, 1992; Wood, 2008). Research has also demonstrated that higher education levels are associated with higher stress (e.g. Warr, 1992; Wood, 2008). We controlled for education via two dummy variables. The first captures whether employees obtained their first degree (e.g. BSc, BA, BEd; 0 = No, 1 = Yes) and the second whether they obtained a Masters degree or higher (0 = No, 1 = Yes). The reference group is low education (below first degree).

We also controlled for several job-related characteristics, including managerial support, part-time or full-time status, tenure at the establishment, and union membership. The expanded job demands-control-support model (Karasek and Theorell, 1990), and associated empirical work, suggests that social support can affect perceptions of stress (Daniels and Guppy, 1994; Karasek and Theorell, 1990; Lait and Wallace, 2002). Following Wood (2008), we used six indicators of managerial support (WERS did not include indicators of team member support). Team members were asked to indicate the extent to which they agreed with six statements concerning managers at their workplace. Examples include: 'Can be relied upon to keep to their promises,' 'Are sincere in attempting to understand employees' views,' and 'Encourage people to develop their skills.' Responses were measured on a five point Likert-scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Cronbach's α for this scale was .93. The average team member indicated a moderate level of managerial support ($M = 3.31$, $SD = 0.93$).

We controlled for part-time status (0 = No, 1 = Yes) as there is some evidence that working more hours is associated with higher stress levels (e.g. Danford et al., 2008). Consistent with the UK context where the survey data was collected, we measured part-time status by whether team members worked less than 30 hours per week (Department of Trade and Industry, 2005). We controlled for tenure at the establishment (0 = Less than 1 year to 4 = 10 years or more) because longer organizational tenure has been found to be associated with lower levels of stress (Ferris et al., 1996). Lastly, we controlled for whether team members were union members (0 = No, 1 = Yes) as certain aspects of being a union member have been associated with role stressors and stress (e.g. Martin and Berthiaume, 1993; Nandram and Klandermans, 1993).

Establishment-level control variables (level 2) We controlled for establishment size (natural log of employees) because larger organizations have been associated with higher levels of employee stress (e.g. Conti et al., 2006; Lin et al., 2009).

Industry-level control variables (level 3) We controlled for industry in all of our analyses by creating 12 industry variables based on the 2003 UK Standard Industrial Classification of Economic Activities. The industries included 'manufacturing' (11%), 'electricity, gas, and water supply' (2%), 'construction' (1%), 'wholesale and retail trade; repair of motor vehicles, motorcycles, and personal and household goods' (10%), 'hotels and restaurants' (3%), 'transport, storage, and communication' (5%), 'financial intermediation' (7%), 'real estate, renting, and business activities' (7%), 'public administration and defense; compulsory social security' (14%), 'education' (16%), 'health and social work' (19%), and 'other community, social, and personal service activities' (5%). These 12 industry variables were treated as grouping variables at level 3; in the same way establishments are treated as grouping variables at level 2 (see below). The distribution of the industries in our reduced sample did not differ markedly from the distribution of industries in the full sample.

Data analysis

Owing to the nested nature of our data (i.e. team members, nested within team-based establishments, nested within industries), we used hierarchical linear modeling (Raudenbush and Bryk, 2002). Unlike traditional regression analysis, multilevel techniques permit us to decompose the variance in our outcome variables across the individual- (level 1), establishment- (level 2), and industry-levels (level 3). A 'null' model suggested 88% of the variance in stress occurred between team members within team-based establishments (i.e. at level 1), 11% occurred between team-based establishments within industries (i.e. at level 2), and 1% occurred between industries (i.e. level 3). All variables were grand-mean centered, the level-2 intercept equation's random error term was always set as random, and all level-2 slope random error terms were set as fixed.

Our theory development suggests that the relationships between team characteristics (our level 2 independent variables) and team member stress (our level 1 dependent variable) are mediated by team member job demands and team member job control (level 1 independent variables). This is a cross-level mediation – lower-level mediator model (Mathieu and Taylor, 2007). Mathieu and Taylor (2007) proposed a set of guidelines to test for mediation in this type of model, which mirrors those set forth by Baron and Kenny (1986). However, recent research suggests that Baron and Kenny's (1986) logic for testing whether a third variable mediates the relationship between an independent and dependent variable is flawed (Zhao et al., 2010). Specifically, Baron and Kenny (1986) argued that one requirement to demonstrate mediation is that there must be a significant direct effect between an independent and dependent variable without a mediating variable included in a model. The problem with this logic is that the 'total effect' of the independent variable on the dependent variable is mathematically equivalent to the sum of the 'direct effect' and the 'indirect effect' and the 'direct effect' test may fail if the 'direct effect' and the 'indirect effect' have opposite signs. In this instance, the 'total effect' can

be close to zero (Zhao et al., 2010). For this reason, Zhao et al. (2010) argued that (1) the strength of mediation should be measured by the size of the ‘indirect effect’ and not by the lack of a ‘direct effect,’ and (2) that the only requirement to demonstrate mediation is a significant ‘indirect effect’ by the Sobel test, or a more powerful bootstrap test (Preacher and Hayes, 2004, 2008).

Zhao et al.’s (2010) guidelines provide a correction to Baron and Kenny’s (1986) guidelines. We test for mediation using both Zhao et al.’s (2010) and Mathieu and Taylor’s (2007) guidelines, as the latter have been used more extensively in the literature.

Results

Table 1 presents the descriptive statistics for all of the variables used in this study. Table 2 presents the correlations between all of the variables used in this study. Individual-level variables were correlated at the individual level. Likewise, establishment-level variables were correlated at the establishment level. The correlations between individual- and establishment-level variables reflect the assignment of establishment values at the individual-level.

The correlations indicate that team member job demands are positively and significantly associated with team member stress, while team member job control is negatively and significantly associated with team member stress. Furthermore, team member job demands are positively correlated with the team autonomy characteristics (i.e. team decision making, team leader appointment, and team responsibility) and negatively correlated with the intrateam interdependence characteristics (i.e. team member interdependency and job rotation). Likewise, team member job control is positively correlated with the

Table 1 Descriptive statistics

Variable	Mean	Standard deviation
1. Stress	2.41	0.87
2. Team decision making	0.50	0.50
3. Team leader appointment	0.05	0.22
4. Team responsibility	0.85	0.36
5. Team member interdependency	0.76	0.43
6. Team-based job rotation	0.69	0.46
7. Job demands	3.15	1.08
8. Job control	2.71	0.76
9. Managerial support	3.31	0.93
10. Gender (female)	0.62	0.49
11. Age	2.55	1.26
12. First degree	0.16	0.37
13. Higher degree	0.06	0.25
14. Part time	0.28	0.45
15. Tenure	2.18	1.37
16. Union member	0.47	0.50
17. Size	250.94	423.52

Table 2 Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Stress																
2. Team decision making	.05*															
3. Team leader appointment	.04	.11														
4. Team responsibility	.04	.20**	.10													
5. Team member interdependency	.02	.14*	.13*	.06												
6. Team-based job rotation	-.07**	.09	.06	.14*	.23**											
7. Job demands	.39**	.10**	.05	.11**	-.04	-.09**										
8. Job control	-.11**	.10**	.03	.07**	-.01	-.06*	-.03									
9. Managerial support	-.29**	.11**	-.05*	.02	-.01	-.02	-.13**	.23**								
10. Gender (female)	-.03	.11**	-.13**	.03	-.06*	.02	.01	.04	.19**							
11. Age	-.03	.01	.03	.00	-.01	-.05*	.13**	.01	-.09**	-.04						
12. First degree	.12**	.10**	.01	.06*	-.05*	-.08**	.06**	.02	.04	-.01	-.07**					
13. Higher degree	.10**	.09**	.03	.06*	-.06*	-.11**	.11**	.06*	.06*	-.03	-.02	-.12**				
14. Part time	-.11**	.05*	-.04	-.01	.02	.06*	-.07**	-.05	.10**	.32**	.05*	-.03	-.05*			
15. Tenure	.06*	-.06**	.03	.03	.01	.02	.14**	.02	-.23**	-.06*	.41**	-.11**	-.09**	-.01		
16. Union member	.14**	-.03	.05	.12**	-.12**	-.13**	.17**	.02	-.16**	-.15**	.15**	.08**	.10**	-.13**	.30**	
17. Size (natural log)	.01	-.14*	.04	-.06	-.09	-.12*	-.05	-.06**	-.16**	-.17**	-.01	-.04	.08**	-.07**	.05*	.11**

* $p \leq .05$; ** $p \leq .01$

team autonomy characteristics and negatively correlated with the intrateam interdependence characteristics. This provides some evidence that team decision making, team leader appointment, and team responsibility are tapping the same latent construct of team autonomy, while team member interdependency and team-based job rotation are tapping the same latent construct of intrateam interdependence.

The results of our hierarchical linear modeling are presented in Table 3. Model 1 includes only our control variables. Model 2 tests our hypotheses regarding our team characteristics and team member job demands. Model 3 tests our hypotheses regarding our team characteristics and team member job control. Model 4 tests our hypotheses regarding team member job demands, team member job control, and team member stress. Model 5 tests if there are any direct relationships between our team characteristics and team member stress when team member job demands and team member job control are excluded from the model. Lastly, Model 6 tests whether team member job demands and team member job control mediate the relationships between our team characteristics and team member stress.

Table 3 HLM results of the relationships between team characteristics, team member job demands, team member job control, and team member stress

Variables	Stress	Demands	Control
	Model 1	Model 2	Model 3
<i>Level 1: Individual level</i>			
Control variables			
Gender (female)	0.09 (0.05)	0.11 (0.06)	0.03 (0.04)
Age	−0.04* (0.02)	0.06** (0.02)	−0.01 (0.02)
First degree	0.28** (0.06)	0.11 (0.07)	0.02 (0.05)
Higher degree	0.42** (0.09)	0.36** (0.11)	0.12 (0.08)
Part time	−0.14** (0.05)	−0.19** (0.06)	−0.06 (0.04)
Tenure	0.02 (0.02)	0.08** (0.02)	0.06** (0.02)
Union member	0.09** (0.05)	0.10 (0.06)	0.03 (0.04)
Managerial support	−0.30** (0.02)	−0.16** (0.03)	0.19** (0.02)
Mediating variables			
Job demands			−0.04* (0.02)
Job control		−0.07 (0.03)	
<i>Level 2: Est. level</i>			
Control variable			
Size (natural log)	−0.03 (0.02)	−0.07** (0.03)	−0.02 (0.02)
Independent variables			
Team decision making		0.14* (0.07)	0.12* (0.05)
Team leader appointment		0.14 (0.15)	0.12 (0.11)
Team responsibility		0.24* (0.10)	0.10 (0.07)
Team member interdependency		−0.03 (0.08)	0.00 (0.06)
Team-based job rotation		−0.21** (0.08)	−0.15** (0.05)
Deviance	4064.83** ^a	4860.80	3643.21

(Continued)

Table 3 (Continued)

Variables	Stress		
	Model 4	Model 5	Model 6
<i>Level 1: Individual level</i>			
Control variables			
Gender (female)	0.06 (0.04)	0.09* (0.05)	0.07 (0.04)
Age	-0.06** (0.02)	-0.05** (0.02)	-0.06** (0.02)
First degree	0.25** (0.05)	0.28** (0.06)	0.24** (0.05)
Higher degree	0.32** (0.08)	0.41** (0.09)	0.30** (0.08)
Part time	-0.11* (0.04)	-0.13** (0.05)	-0.11* (0.04)
Tenure	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)
Union member	0.06 (0.04)	0.09* (0.05)	0.06 (0.04)
Managerial support	-0.24** (0.02)	-0.30** (0.02)	-0.24** (0.02)
Mediating variables			
Job demands	0.26** (0.02)		0.25** (0.02)
Job control	-0.07** (0.03)		-0.07** (0.03)
<i>Level 2: Est. level</i>			
Control variable			
Size (natural log)	-0.02 (0.02)	-0.03 (0.02)	-0.02 (0.02)
Independent variables			
Team decision making		0.10* (0.05)	0.06 (0.05)
Team leader appointment		0.04 (0.12)	0.03 (0.10)
Team responsibility		0.04 (0.07)	-0.01 (0.06)
Team member interdependency		0.07 (0.06)	0.09 (0.05)
Team-based job rotation		-0.13* (0.06)	-0.08 (0.05)
Deviance	3866.10**b	4054.10 ^b	3858.45**c

* $p \leq .05$; ** $p \leq .01$.

Note: All variables are grand-mean centered. Standard errors are reported in parentheses.

^aCompared with 'null' model.

^bCompared with model 1.

^cCompared with model 5.

Control variables

In Model 1, we examine the relationships between our control variables and team member stress. We find older workers and part-time workers report significantly less stress. In support of the expanded job demands-control-support model (Karasek and Theorell, 1990), we find managerial support is associated with less stress. Consistent with Warr (1992) and Wood (2008), we find that workers with higher levels of education are significantly more stressed. We also find evidence that union membership is a source of stress. However, we find no significant relationships between gender or tenure, and team member stress. This model represented a significant improvement over the 'null' model ($\chi^2(9) = 234.72, p = .000$) and accounted for 8% of the individual-level variance in stress.

Team characteristics and team member job demands

In Model 2, we test our hypotheses regarding our team characteristics and team member job demands. In regard to the team autonomy characteristics, we find that team decision making and team responsibility for specific products and services are positively and significantly associated with team member job demands. We find no significant relationship between team leader appointment and job demands. Thus, Hypotheses 1a and 3a are supported, while Hypothesis 2a is not supported. In regard to intrateam interdependence, we find that both team member interdependency and job rotation are negatively associated with job demands. However, only the result for team-based job rotation is significant. Thus, Hypothesis 4a is not supported while Hypothesis 5a is supported. In summary, a higher degree of team autonomy, in the form of team decision making and team responsibility, is associated with increased job demands, while a higher degree of intrateam interdependence, in the form of team-based job rotation, is associated with decreased job demands. These results suggest that the optimal design of a team, with respect to team member job demands, is a team with a low degree of autonomy and high degree of intrateam interdependence.

Team characteristics and team member job control

In Model 3, we test our hypotheses regarding our team characteristics and team member job control. With regards to team autonomy, we find that team decision making is positively and significantly associated with team member job control. The relationships between team leader appointment by team members and job control, as well as team responsibility and job control, are not significant. Thus, Hypothesis 1b is supported, while Hypotheses 2b and 3b are not supported. With regards to intrateam interdependence, we find no significant relationship between team member interdependency and job control. However, team-based job rotation is negatively and significantly associated with team member job control. Thus, Hypothesis 4b is not supported while Hypothesis 5b is supported. In summary, a higher degree of team autonomy, in the form of team decision making, is associated with increased job control, while a higher degree of intrateam interdependence, in the form of team-based job rotation, is associated with decreased job control. In contrast to our findings for team member job demands, these results suggests that the optimal design of a team, with respect to team member job control, is a team with a high degree of autonomy and a low degree of intrateam interdependence.

Team member job demands, team member job control, and team member stress

In Model 4, we test Karasek's (1990) job demands-control model. In line with Hypotheses 6a and 6b, we find that team member job demands are positively associated with team member stress while team member job control is negatively associated with team member stress. This model represented a significant improvement over Model 1 ($\chi^2(2) = 198.73, p = .000$) and accounted for 20% of the individual-level variance in stress.

Team characteristics and team member stress

In Model 5, we explore the relationships between our team characteristics and team member stress without team member job demands and team member job control included in the model. Team leader appointment, team responsibility, and team member interdependency are not significantly associated with team member stress. However, team decision making is positively and significantly associated with team member stress, and team-based job rotation is negatively and significantly associated with team member stress. Thus, a higher degree of team autonomy, in the form of team decision making, is associated with increased stress, whereas a higher degree of intrateam interdependence, in the form of team-based job rotation, is associated with decreased stress. Based on our prior results, these results suggest that perceptions of increases or decreases in job demands are more salient to team members than their perceptions of increases or decreases in job control. We formally test for this in the next section.

Mediating roles of team member job demands and team member job control

As previously mentioned, we used two methods to test for multilevel mediation. First, we followed the guidelines set forth by Mathieu and Taylor (2007). In Model 1, there was still significant between-establishment variance in stress after controlling for level-1 and level-2 control variables ($\chi^2(279) = 472.64, p = .000$). The first condition to informally show full or partial mediation according to Mathieu and Taylor (2007) is that the independent variables of interest must be significantly associated with the outcome variable when the mediating variables are absent from the model. As demonstrated in Model 5, team decision making and team-based job rotation satisfied this condition. The second condition that must be satisfied is that the independent variables of interest must be significantly associated with the mediating variables. As we previously discussed, team decision making and team-based job rotation met this condition in Models 2 and 3. The third condition that must be satisfied is that the mediating variables must be significantly associated with the outcome variable without the independent variables of interest in the model. This condition was satisfied in Model 4. Like with mediation using ordinary least squares regression, the last condition to informally show full or partial mediation in a hierarchical model is that the mediating variables must be significantly associated with the outcome variable and the independent variables must fully or partially lose significance when mediating variables are included in the model. Model 6 provides the results when all our team characteristics and team member job demands and team member job control are included in the model. Both team member job demands and team member job control are significant. The significance level for team decision making and team-based job rotation became non-significant when team member job demands and team member job control were included in the model, indicating full mediation.

We performed the Sobel test to formally test for mediation. The Sobel test for team member job demands indicated that team member job demands fully mediated the relationship between team decision making and team member stress (Sobel = 1.98, $p = .048$), while the Sobel test for team member job control indicated that team member job control

did not mediate the relationship between team decision making and team member stress (Sobel = -1.67, $p = .094$). The Sobel test for team member job demands indicated that team member job demands fully mediated the relationship between team-based job rotation and team member stress (Sobel = -2.57, $p = .010$), while the Sobel test for team member job control indicated that team member job control did not mediate the relationship between team-based job rotation and team member stress (Sobel = 1.84, $p = .066$).

Because team responsibility was significantly associated with team member job demands, we tested whether team member job demands mediated the relationship between team responsibility and team member stress based on Zhao et al.'s (2010) recommendation noted earlier. Consistent with our theoretical framework, the Sobel test indicated that team member job demands mediated the relationship between team responsibility and team member stress (Sobel = 2.36, $p = .018$). These results also suggest it is unlikely that there is an omitted mediating variable between team decision making, team responsibility, team-based job rotation, and stress, respectively, because the non-significant paths in Model 6 indicate that the total effect of each of these relationships was explained by the sum of team member job demands, or the 'indirect effect,' and the respective team characteristic, or the 'direct effect' (Zhao et al., 2010). Our mediation findings reinforce our suggestion that perceptions of increases or decreases in job demands are more salient to team members than their perceptions of changes in job control.

Model 6 represented a significant improvement over Model 5 ($\chi^2(2) = 195.66$, $p = .000$) and accounted for 20% of the individual-level variance in stress and 63% of the establishment-level variance in stress. We also tested an interaction between team member job demands and team member job control in Model 6. Consistent with other studies, the interaction was not significant. Therefore, we did not explore the interaction as a mediating variable.

Discussion

This study demonstrated that team member job demands indirectly mediated the relationships between team autonomy, intrateam interdependence, and team member stress. We found that team member job demands indirectly mediated the positive relationship between team autonomy, in the form of team decision making and team responsibility, and team member stress. We also found that team member job demands indirectly mediated the negative relationship between intrateam interdependence, in the form of team-based job rotation, and team member stress. We believe these findings begin to fill important gaps in the team literature.

Implications

First and foremost, our results help clarify contradictory research findings regarding the relationship between teams and stress (cf. Adler and Cole, 1993; Conti et al., 2006; Mohr and Zoghi, 2008; Parker and Slaughter, 1988). Rather than looking at the team as a whole, we examined underlying team characteristics to provide a richer picture of the relationship between teamwork and stress. Taking a more fine grained approach to studying teamwork helps to not only inform the debate about teams and stress (cf. Adler and

Cole, 1993; Parker and Slaughter, 1988), but also broader research streams examining the benefits and costs of teamwork.

The team literature has indicated that teamwork has a variety of positive and negative consequences for team members. For example, there is debate as to whether teamwork increases or decreases team member job demands (Edwards et al., 2002). Using the WERS98 data, Harley (2001) found that teamwork was not significantly associated with job demands. However, other research suggests that teamwork does indeed increase team member job demands (e.g. Adler and Cole, 1993; Bacon and Blyton, 2003; Geary and Dobbins, 2001; Parker and Slaughter, 1988), although Adler and Cole (1993) argued that it is not high enough to be detrimental to employee health. In line with this research, our results suggest that teamwork increases team member job demands, but this increase only occurs when teams make their own decisions about how the work is to be done and when teams are responsible for specific products or services. On the other hand, our results suggest that teamwork can also decrease team member job demands if job rotation is present within the team. Like Geary and Dobbins' (2001) finding that teamwork has benefits and costs, we find that teamwork has benefits and costs in relation to team member job demands, and its subsequent impact on team member stress.

There is a similar debate as to whether teamwork increases or decreases team member job control (Edwards et al., 2002). Research suggests that teamwork does indeed increase team member job control. For example, Bacon and Blyton (2003) found that teamwork led to increased perceptions of control in the form of influence over quality and increased satisfaction levels related to control over work. Marchington (2007) argued that teamwork also increases team member job control through greater voice. In contrast, others are more pessimistic about teamwork's influence on team member job control (e.g. Barker, 1993; Benders, 2005; Parker and Slaughter, 1988; Vallas, 2003). For example, Parker and Slaughter (1988) argued that work practices at NUMMI (a joint venture between General Motors and Toyota), like teamwork, reduced the job control of employees. Again, our findings suggest that whether or not teamwork increases or decreases team member job control depends on choices made by management regarding the specific design of a team. Our results suggest that team decision making increases team member job control, whereas team-based job rotation decreases team member job control. In summary, our findings contribute to the debate surrounding the benefits and costs of teams by indicating that the benefits and costs of teams are partially a function of team design.

A further contribution of this research is to expand the job demands-control model both conceptually and methodologically. First, the job demands-control model (Karasek, 1979; Karasek and Theorell, 1990) has traditionally been used as an additive model or interactive model (e.g. Bradley, 2007; Pascual et al., 2003; Van Yperen and Hagedoorn, 2003; Van Yperen and Snijders, 2000; Wood, 2008). Like a few others (e.g. Rahkonen et al., 2006; Van Mierlo et al., 2007), we found that individual job demands can have an important mediating effect in addition to its traditional role as a main effect or moderator. Second, there are few studies that examine the job demands-control model in a multi-level context (for an exception, see Totterdell et al., 2006). Our study demonstrates that the job demands-control model (Karasek, 1979) can be fruitfully explored in a multilevel context, with associated implications for cross-level theory building.

Since teams are a salient feature of modern organizations (Van Mierlo et al., 2007), the results of this study have a number of managerial implications. First and foremost, if managers are designing teams with team member stress in mind, this study suggests that managers may want to consider seriously making team members interdependent on one another by rotating jobs within the team. Although we found that team-based job rotation is negatively associated with team member job control, the decrease in team member job demands seems to be more salient to team members than the corresponding decrease in job control. The net result is lower stress. However, our results suggest that managers may want to think carefully about the role of team autonomy as our results suggest that team decision making and team responsibility for goods and services are associated with increased stress. The perceived increase in the job demands of team members that may be caused by team decision making and team responsibility seem to outweigh the perceived increase in job control resulting from team decision making.

Limitations and directions for future research

There are several limitations of this study. By collecting team-level data at the establishment-level, the team characteristic measures sacrificed richness for generalizability. Although the team characteristics measures can arguably apply to any type of team, managers did not indicate the specific types of teams that were utilized in their respective workplaces. Thus, we could not determine whether the teams in our study were work teams, project teams, parallel teams, management teams, or any of a number of other types of teams. This may be one reason why we did not find significant results for some of our hypotheses. Teams working within and between organizations are very different from one another and the definition of what a team is can vary accordingly (Appelbaum and Batt, 1994). Greater precision in how managers are asked about teams would enable researchers to capture potentially important dimensions of team variation within and across establishments and ensure consistency in how managers understand the questions. Furthermore, because of sample size limitations, we were not able to examine how industry and other contextual variables may influence the relationships in our study, nor were we able to assess whether our findings are driven in part by occupational differences in how team work is structured.

A second limitation of our study is that we were limited in the number of characteristics we could examine. There are other variables that could play important roles. For example, a team's climate has been shown to predict the mental health of team members (e.g. Carter and West, 1998). Future research could examine whether team climate moderates the relationships between team characteristics and stress. Consistent with our findings, prior research has found that social support from supervisors can influence stress (e.g. O'Driscoll and Beehr, 1994). However, we were unable to capture another form of support, namely, that provided by team leaders and team members. Future research might examine whether these other forms of social support moderate the relationships between team characteristics and stress.

A third limitation pertains to some of the measures utilized in this study, as alluded to in our team leader support discussion. First, only Warr's (1990) job anxiety-contentment

scale was included in WERS. Prior research has operationalized stress in a variety of ways (Cohen et al., 1995; Kahn and Byosiore, 1992) that may capture different indicators of stress, such as burnout (e.g. Pascual et al., 2003; Pisanti et al., 2003), fatigue (e.g. Van Yperen and Hagedoorn, 2003), and general psychological health (e.g. Noblet and Rodwell, 2009; Taris and Feij, 2004; Van Yperen and Snijders, 2000). Future research should examine a broader set of indicators of stress in teams, including both physical and psychological indicators. Likewise, although time pressure and workload demands were captured in this study by one statement, they are not the only types of demands that team members experience in their jobs. Future research might attempt to capture a greater variety of job demands experienced by team members by using a variety of different measures (e.g. job content measures).

Finally, our use of cross-sectional data limited our ability to establish causality. Longitudinal data would allow researchers to identify whether changes in team characteristics lead to altered levels of team member job demands, team member job control, and subsequently, team member stress. Another limitation related to our sample rests in the fact that it consists solely of employees and establishments in the UK. Glazer and Beehr (2005) found evidence that some work factors predicting employee stress had similar effects on the stress levels of nurses in America, the UK, Hungary, and Italy. However, other studies have found national differences. For example, Liu et al. (2007) found that American employees were more likely to report a lack of job control and direct interpersonal conflict as sources of stress, whereas Chinese employees reported that indirect conflict was an important driver of stress. Exploring the relationships between team characteristics, team member job demands, team member job control, and team member stress in different cultures may present another avenue for fruitful inquiry.

Conclusion

Our study shows, via multilevel modeling, that team characteristics are significantly associated with team member perceptions of job demands, job control, and stress. Specifically, our results suggest that the optimal design of a team, with respect to team member stress, is a team with a low degree of autonomy and a high degree of intrateam interdependence. By examining the specific design of a team, our study not only helps clarify the debate about the relationship between teams and stress, but more broadly contributes to the debate about the benefits and costs of teams.

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