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When Does Teamwork Translate Into Improved Team Performance? A Resource Allocation Perspective

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Abstract

Drawing on resource allocation theory, the authors examined boundary conditions for the positive effects of two aspects of teamwork (backing up behavior and performance monitoring) on team performance. Participants were 276 undergraduate business students who were organized into 69 teams and who worked on a computer simulation across multiple performance episodes. Approximately half the teams experienced a workload distribution problem. Results indicated that performance monitoring had positive effects on team performance when teams experienced a workload distribution problem. Backing up behavior had positive effects only when teams had both a workload distribution problem and during early performance episodes. The findings of this study suggest that resource allocation theory can provide insights regarding when members should devote and coordinate their own individual resources to assist others in teams. The implications of these findings for future theory and practice regarding teamwork are discussed.

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Teamwork is the collective behaviors of team members that engender a sharing of information and a coordination of activities (Dickinson & McIntyre, 1997). Although previous research largely suggests that teamwork is positively related to team effectiveness (e.g., Marks, Sabella, Burke, & Zaccaro, 2002), this research is not without at least three important limitations. First, despite the increased interest in the teamwork construct, there are multiple and divergent conceptualizations of teamwork. Second, there is uncertainty about teamwork's dimensionality. As a result of these two limitations, we know little about how to theoretically and empirically distinguish different aspects of teamwork from one another. A third limitation stems from the somewhat limited perspective the extant literature has taken regarding the teamwork–team performance relationship. Much of this work suggests that teamwork has unambiguously positive effects on team performance (Mathieu, Gilson, & Ruddy, 2006). To date, little research has explored the boundary conditions under which certain types of teamwork might have less positive effects, no effects, or even negative effects on team performance (Mathieu, Maynard, Rapp, & Gilson, 2008; Porter et al., 2003).

In this article, we address these limitations by examining teamwork from a resource allocation perspective (Kanfer & Ackerman, 1989). Doing so acknowledges that team members have scarce resources to devote to their teams' tasks (Barnes et al., 2008), and suggests that some situations may be more appropriate than others for team members to devote their limited resources to engaging in teamwork. We focus specifically on two types of teamwork, namely backing up behavior and performance monitoring. Backing up behavior is the discretionary provision of resources and task-related effort to another member of one's team that is intended to help that team member obtain the goals as defined by his or her role (Porter et al., 2003). Performance monitoring is the observation and awareness of the activities and performance of other team members (Dickinson & McIntyre, 1997). We examine the role of legitimacy of need (i.e., an objective situation in which a team member requires the assistance of other members of the team that arises because of factors beyond the control of the team member who needs assistance, Porter et al., 2003) as a boundary condition for the effects of teamwork on team performance. Following Porter et al., we examine the existence of a workload distribution problem in teams as one indicator of legitimacy of need. However, we extend their work by suggesting that

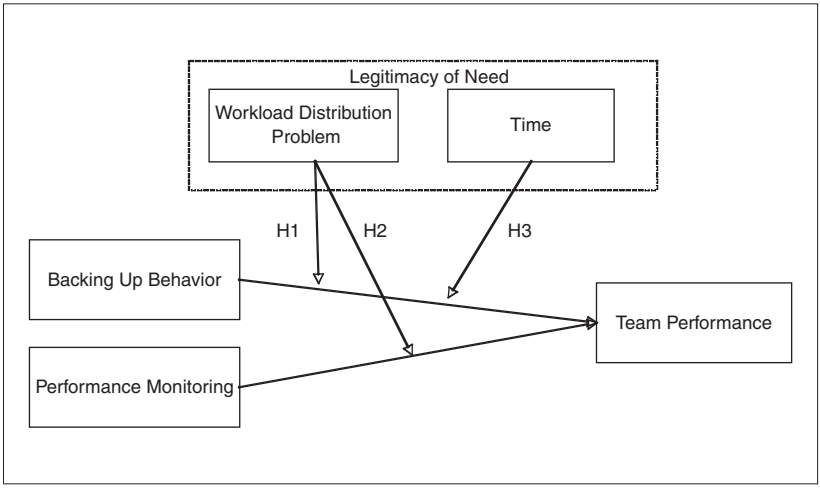

Figure 1. The moderating role of legitimacy of need on the effects of backing up behavior and performance monitoring on team performance

legitimacy of need can also be thought of in terms of time and in this way, we take an episodic perspective (Marks, Mathieu, & Zaccaro, 2001) to explore time as a boundary condition of the teamwork–team performance relationship. As such, our study addresses Marks et al.'s call for researchers to consider teams' temporal rhythms in the measurement and evaluation of teamwork processes.

Figure 1 depicts our conceptual model. Below, we develop the hypotheses implied by the model and test them among a sample of teams composed of undergraduate business students who worked on a computerized, decision-making task in a laboratory setting. The task was characterized by high levels of task and outcome interdependence. Members worked together in a common room where, although they could not see each other's computers, they could verbally communicate with one another. In this way, the teams used in our study were similar to the same-time, same-place meeting virtual project teams that are used by a number of contemporary work organizations (e.g., military, financial, and technology teams; Mittleman & Briggs, 1999). Our teams were randomly assigned to one of two conditions; groups either experienced a workload distribution problem or they did not. Groups then worked on the task over two separate performance episodes, which allowed us to compare the effects of their engaging in the teamwork processes on their team performance across the performance episodes.

Teamwork: Backing Up Behavior and Performance Monitoring

Scholars have proposed many teamwork taxonomies (e.g., Dickinson & McIntyre, 1997; McIntyre & Salas, 1995). Marks et al. (2001) provided the most recent and comprehensive taxonomy. What they refer to as action processes (i.e., monitoring progress toward goals, system monitoring, coordination, performance monitoring, and backing up behaviors) are the activities in which teams engage that are directly related to goal accomplishment. Thus, they are especially important in teams. For example, Marks et al. argued that performance monitoring and backing up behavior are especially critical to team effectiveness because "if teammates are not looking out for, or willing to help out, each other, the team will fail when any one member fails" (p. 367). These specific action processes are also important because they enable teams to continuously improve and adapt to the unexpected (Kozlowski & Ilgen, 2006).

Backing up behavior and performance monitoring have been found to be positively related to social and task performance in teams (Marks et al., 2002; Marks & Panzer, 2004; Porter, 2005; Porter et al., 2003). Backing up behavior has positive effects on team performance because it helps other members develop role-relevant knowledge and skills and because when team members engage in backing up behavior they help correct mistakes that other members have made (Porter, 2005). When teams engage in performance monitoring, members observe the actions of their teammates and watch for errors or performance discrepancies (Marks & Panzer, 2004). Thus, performance monitoring helps members prevent other members from making mistakes that may negatively affect the team's performance as a whole. In addition, performance monitoring helps members anticipate each other's needs and learn each other's strengths and weaknesses which should, in turn, provide opportunities for members to help each other learn how to better perform their individual tasks.

Similarities and Differences Between Backing Up Behavior and Performance Monitoring

Backing up behavior and performance monitoring are similar in that both are focused on others' performance (Kozlowski & Ilgen, 2006; Marks et al., 2001). Although backing up behavior and performance monitoring may be positively related, they are not always associated with each other. For example, members may make a point to monitor each other's performance; however, they may not do anything to actually help another member who is struggling.

In some cases, teams may make a conscious decision to let a struggling member fend for him or herself. Alternatively, members may not provide assistance even when they are aware of a team member's need for it because of an inability to help or a lack of time due to unwillingness to neglect other tasks, including their own. Similarly, members can provide backing up behaviors with or without performance monitoring. Backing up behavior may be initiated because members are monitoring each other's performance and recognize that one of them is struggling. However, it may also be provided simply because a team member requests it. Backing up behavior may also be provided when members simply want to be helpful or have the ability to assist another member yet that member has little need for assistance. Marks et al. (2001) suggested that the latter situation is likely to leave a team susceptible and vulnerable.

Of particular importance here is that backing up behavior and performance monitoring are different because they each require different types and amounts of resources. Backing up behavior requires that members have an awareness of other members' roles and be willing and able to provide and seek assistance. Backing up behavior therefore requires team members to allocate both cognitive and behavioral resources to each other (Marks et al., 2001). Performance monitoring, on the other hand, involves regular observation and a concern with the performance of teammates (Serfaty, Entin, & Johnston, 1998). As such, it requires team members to devote only cognitive resources to each other (Marks et al., 2001). For example, when teams engage in performance monitoring, members use cognitive resources to stay informed about others' performance. When teams engage in backing up behavior, members actually intervene and help one another perform their individual tasks (Porter et al., 2003), thus devoting cognitive and physical resources to each other.

Consistent with Figure 1, of particular interest here are contingencies (i.e., moderators) of the effects of these two types of teamwork on team performance. As such, we neither make specific predictions about their direct effects on team performance, nor do we make specific predictions about the direct effects of our moderators on team performance. Instead, we develop predictions regarding potential moderators of the effects of backing up behavior and performance monitoring by first framing the decision to engage in each as a resource allocation decision.

Reframing Backing Up and Performance Monitoring as Resource Allocation Decisions

Resource allocation theory (Kanfer & Ackerman, 1989) proposes that individuals have limited (i.e., scarce) amounts of attentional resources to devote

to a task (i.e., resource limitations). According to the theory, a task is resource-limited when increases or decreases in the amount of attention devoted to that task result in changes in objective task performance. With resource-limited tasks, as resources are allocated toward performing one function, fewer resources will be available and allocated to other functions.

A number of scholars have extended Kanfer and Ackerman's (1989) resource allocation theory to the team level, primarily to make the distinction between *taskwork* and *teamwork* (e.g., Bowers, Braun, & Morgan, 1997). Taskwork is "a team's interactions with tasks, tools, and machines and includes those efforts traditionally associated with individual task performance" (Bowers et al., 1997, p. 90). Taskwork is critical for all team tasks as members need a certain amount of requisite skills for their team to perform well. Teamwork refers to the "interpersonal interactions among individual team members that are necessary for exchanging information, developing and maintaining communication patterns, and coordination" (Bowers et al., 1997, p. 90). In other words, taskwork refers to *what* teams are doing and teamwork refers to *how* they are doing it (Marks et al., 2002).

Extending resource allocation theory, scholars have suggested that teams are resource-limited because they often have finite resources and capacities to perform their taskwork and teamwork roles (Barnes et al., 2008). In other words, team settings usually require team members to allocate their limited resources between taskwork and teamwork. For example, Bowers et al. (1997) suggested that team performance environments are dual paradigms in which efforts devoted toward teamwork must be balanced with efforts devoted toward taskwork (see also Glickman et al., 1987 and Morgan, Salas, & Glickman, 1993, who provided empirical evidence supporting both the distinction between taskwork and teamwork and their competing nature). When team members devote attention to teamwork, they must divert attention from taskwork. Indeed, if team members are unskilled at coordinating their efforts, they will be forced to devote increased attention to teamwork, which drains from the pool of resources that could be devoted to taskwork. In addition, team members' inability to effectively coordinate their efforts could potentially create a distraction in the team, thus decreasing attention devoted to taskwork.

Consistent with this extension of resource allocation theory, we propose that as a team's members devote more of their resources to teamwork, they will have fewer resources available to devote to taskwork. Following Porter et al. (2003), we recognize that because work activities and demands often vary across individuals within a team and because teams vary on the extent to which coordinated effort is required of team members, teams also

vary on the extent to which teamwork is necessary to successfully perform. We therefore suggest that teams can and should make decisions regarding how much of their resources they devote to teamwork. Next, we discuss two potential moderators of the effects of our two teamwork processes on team performance—moderators that we believe capture the extent to which there is an objective need to devote their resources to teamwork and what we collectively refer to as a *legitimate need for teamwork*.

Legitimacy of Need for Teamwork

Teams are, by nature, collections of interdependent individuals who share responsibility for specific outcomes (Sundstrom, De Meuse, & Futrell, 1990). Therefore, team members typically rely on one another for successful goal accomplishment; the higher their levels of task interdependence, the more likely they are to engage in teamwork and other forms of cooperation (Allen, Sargent, & Bradley, 2003; Katz-Navon & Erez, 2005). However, even among highly interdependent tasks, there may be a more or less legitimate need for engaging in teamwork. Schwartz and Fleishman (1978) defined legitimacy of need as the specific nature of a need that affects helping behavior. Porter et al. (2003) extended this definition to team settings and suggested that legitimacy of need can be defined as an objective situation that requires assistance from other members of one's team and that arises because of factors beyond the control of the team member who needs the assistance. Somewhat related, Tyler (2006) defined legitimacy as a "property of an authority, institution or social arrangement that leads those connected to it to believe that it is appropriate, proper and just" (p. 375), which suggests that legitimacy of need can be conceptualized as either subjective or objective. Following Porter et al. (2003), we conceptualize legitimacy of need as an objective property and we explore the potential moderating role of two indicators of legitimacy of need on the teamwork–team performance relationship.

Workload Distribution Problem as Legitimacy of Need

The individual workloads placed on members within a team can take various forms. In some situations, individual team members' workloads are identical; however in other situations, individual team members' workloads may vary. Porter et al. (2003) explicitly focused on situations in which members of the same team have different workloads and suggested that teams face a workload distribution problem (and thus a legitimate need for teamwork) when one of their members has individual demands that exceed his or her individual

resources. Teams have no such problem (and thus no legitimate need for teamwork) when members have sufficient or excess resources to meet disproportionately heavy individual task demands. Porter et al. found that workload distribution problems were associated with higher levels of backing up in teams. Somewhat related, Barnes et al. (2008) found that workload distribution problems in teams were negatively related to team performance. We therefore predict that when teams have a workload distribution problem, engaging in teamwork should increase team performance. We do not expect to see the same benefits from engaging in teamwork when teams do not have a workload distribution problem. This suggests the following two hypotheses:

Hypothesis 1: The relationship between backing up behavior and team performance will be moderated by workload distribution problems such that there will be a more positive effect for backing up behaviors on team performance when there is a workload distribution problem than when there is no workload distribution problem.

Hypothesis 2: The relationship between performance monitoring and team performance will be moderated by workload distribution problems such that there will be a more positive effect for performance monitoring on team performance when there is a workload distribution problem than when there is no workload distribution problem.

Time as Legitimacy of Need

Among the many calls that have been made to team scholars, perhaps no other has remained as unanswered as the call for their models of team behavior to explicitly consider the role of time (Mathieu et al., 2008; McGrath, 1990). In their review, Kozlowski and Bell (2003) discussed how few theoretical models currently exist that make serious efforts to incorporate time. Indeed, much of the empirical work on teams has tended to include data collected at one point in time, thus prohibiting a better understanding of how the effects of teamwork may differ from one performance episode to another (Marks et al., 2001; Mathieu et al., 2008). In this study, we take an episodic perspective (e.g., DeChurch & Haas, 2008; Marks et al., 2001), and examine the possibility that teamwork behaviors that are functional during early performance episodes may prove to be less functional during later performance episodes.

We expect that teamwork should help compensate for a lack of taskwork skills during early performance episodes. However, we also believe that as taskwork skills increase as one might expect they should over time, the redundancy that teamwork creates in the presence of increased taskwork skills will

attenuate the relationship between teamwork and team performance. In other words, when team members continue to devote their individual resources to other team members whose taskwork skills have improved over time, the team members who are providing their individual resources to others may be forced to neglect their own roles and responsibilities. When these team members neglect their own roles and responsibilities it can hurt their team's performance. Therefore, we expect that compared with early performance episodes, the effects of teamwork on team performance during later performance episode may be less positive.

It is important to recall that compared with performance monitoring, backing up behavior is a more costly type of teamwork because backing up behavior requires the provision of both cognitive and physical resources whereas performance monitoring is primarily a cognitive activity and only requires cognitive resources (Marks et al., 2001). Over time, we expect that the high levels of cognitive and physical resources required for teams to engage in backing up behavior will come at the expense of resources that could be devoted to taskwork. We do not expect that engaging in performance monitoring will drain resources that could be devoted to taskwork to the same extent as engaging in backing up behavior. Therefore, we predict that the relationship between backing up behavior and team performance should decrease over time, but this will not be the case for performance monitoring. Because we do not want to hypothesize a null effect for time as it relates to performance monitoring, we make only the following and final hypothesis:

Hypothesis 3: The interactive effects of backing up behavior and workload distribution problems will depend on time such that there will be a less positive effect for backing up behaviors on team performance for teams with a workload distribution problem over time.

Method

Participants

Participants were 276 undergraduate business students at a southern university who were enrolled in a management course; students were divided into 69 teams consisting of 4 students each. A total of 59.8% of the participants were women. In all, 15.9% of the participants were seniors, 83.7% were juniors, and 0.4% were sophomores. Most of the participants (87.3%) were White/Caucasian. Participation in the study was voluntary and participants received

extra course credit in addition to the opportunity to win a $100 cash prize based on their team's task performance.

Research Task

Participants worked on a modified version of the Distributed Dynamic Decision-Making (DDD) Simulation developed for the Department of Defense for research and training purposes (Miller, Young, Kleinman, & Serfaty, 1998). The version of the simulation used in this study could be worked on by participants with little to no military experience yet it was still relatively complex (Hollenbeck et al., 2002; Porter, 2005). DDD simulates a military command and control situation in which team members work interdependently to protect an on-screen geographic area (i.e., a no-fly zone) from enemy targets (i.e., tracks). The no-fly zone is partitioned into two areas, each of which is restricted; however, one of the areas is more highly restricted than the other. The two restricted areas are each further partitioned into four sections, or quadrants, and each team member is assigned primary responsibility for one of these quadrants.

During the task, a number of tracks enter the no-fly zone and attempt to travel through its restricted and highly restricted areas. Teams are instructed to protect their restricted areas by disabling (i.e., destroying) enemy tracks that enter the restricted areas while at the same time avoiding the destruction of any friendly tracks. To accomplish their mission, teams are given several resources (i.e., tanks, helicopters, jets, and radar planes) to help them monitor and protect the restricted areas; the allocation of these resources in this study is described below under Workload Distribution Problem. Each team member controlled a base, which was located in the center of his or her quadrant, from which he or she could deploy individual resources. These resources, along with the base, were used to detect the presence or absence of tracks. Once tracks were detected, members used their base and resources to identify the tracks (i.e., determine whether the track was friendly or enemy and determine which resources were necessary to destroy any enemy tracks). Members then used their resources to destroy any enemy tracks that were in the restricted areas, hence the defensive nature of the task. To defend the entire area, members had to verbally communicate and discuss the location of the tracks on the screen (no one team member could see all of the screen and all of the tracks), make decisions regarding which tracks to destroy or ignore, and coordinate their resources; hence there were high levels of task interdependence among team members. To the extent that the teams made accurate decisions regarding whether or not to destroy potentially threatening tracks and

executed those decisions quickly, they received higher scores on the task (see Hollenbeck et al., 2002, for a more complete description of the task).

Procedures

On entering the laboratory, participants were randomly assigned both to a four-person work team and one of the four computer stations (i.e., the DM1, DM2, DM3, or DM4 station). Each team was then randomly assigned to one of two experimental conditions—workload distribution problem or no workload distribution problem. Participants then received declarative and procedural training that lasted for approximately 1 hour. At the end of the training, teams were allowed to practice on the task for 10 minutes. Participants then worked on two similar 30-minute trials (i.e., during each task teams encountered and had to deal with the same number and type of tracks). Backing up behavior and team performance were measured during each of the two tasks. Performance monitoring was measured at the end of each of the two tasks. On completion of the second task and the second administration of the performance monitoring measure, team members were debriefed and dismissed.

Manipulations and Measures

Workload distribution problem. All of the teams worked in a task environment in which only DM2 had a disproportionately heavy share of the team's workload. We ensured this by programming the task such that the restricted and highly restricted areas for which DM2 had primary responsibility were the ones in which the majority of the enemy tracks entered the screen. Thus, although all team members had to monitor their restricted airspace and prevent enemy tracks from entering the restricted areas by detecting the presence of tracks, identifying them as friendly or enemy, and destroying enemy tracks when necessary, DM2 had considerably more of these tracks to detect, identify, and destroy. Consistent with our conceptualization of a workload distribution problem as the intersection of task demands and the availability of resources to manage those demands, we manipulated the presence or absence of a workload distribution problem by varying the allocation of resources within the teams—resources that varied in terms of power and capabilities. In the workload distribution problem (WDP) condition, DM2 was given the same resources as his or her teammates (one tank, one helicopter, one jet, and one radar plane). Thus, while experiencing a high workload (i.e., excess demands) relative to his or her teammates, DM2s in the WDP

condition did not have the necessary resources to manage their workloads. In the no workload distribution problem (No WDP) condition, DM2 was given all four tanks, which were the most powerful of the team's resources. Therefore, even though a DM2 in this condition had excess demands relative to his or her teammates, he or she also had the resources necessary to manage this workload effectively without assistance. It should be noted, however, that regardless of the condition our teams were randomly assigned into, every team had a total of 16 resources and every team member had 4 resources. Thus, the only difference between the teams assigned to the two conditions was the allocation of the types of resources among the teams' members. Our conceptualization and operationalization of WDP was consistent with Porter et al. (2003) who also examined WDPs in teams. We dummy-coded our experimental conditions 0 for No WDP and 1 for WDP; this experimental manipulation was a between-team factor.

Team performance. Team performance was measured by the computer simulation and was based on the teams' defensive performance consistent with the task mission. Each team began each task with 50,000 defensive points and lost 1 point for each second that any enemy track was in the restricted areas and 2 points for each second that any enemy track was in the highly restricted areas. Because of the nature of the task, high defensive performance scores at the end of the 30-minute tasks were indicative of higher levels of performance. Team performance was measured during both performance episodes (i.e., at Time 1 and Time 2) and, as such, was a within-team factor.

Backing up behavior. Backing up behavior was measured objectively at the team level using the same procedure employed in Porter et al. (2003) and captured the extent to which team members other than DM2 provided assistance in terms of clearing enemy tracks from the DM2 quadrant. For instance, if DM1, DM3, or DM4 attacked and cleared an enemy track that was residing in either the restrictive or highly restrictive areas that were the primary responsibility of DM2, it was counted as an instance of backing up behavior. Backing up behavior was measured during both performance episodes (i.e., at Time 1 and Time 2) and was a within-team factor.

Performance monitoring. Performance monitoring was measured with a five-item scale created for this study and measured the extent to which team members monitored each other's performance during the task. All the items were measured on a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*). The items were as follows: "The members of my team monitored each other's performances," "The members of my team were aware of what other team members were doing," "The members of my team knew how other team

members were performing," "The members of my team inquired into how each other were doing," and "The members of my team made a point to check on each other." Mean scores were used to aggregate team members' performance monitoring to the team level of analysis. As with team performance and backing up behavior, performance monitoring was also measured at Time 1 and Time 2 and was a within-team factor. Because our performance monitoring items were based on a referent-shift composition model (Chan, 1998), we calculated $r_{wg(j)}$, ICC(1), ICC(2), and F tests (ICC = intraclass correlation coefficient) to determine whether there was justification for aggregating individual performance monitoring perceptions to the team level. Results of these analyses revealed high levels of within-team agreement and reliability in addition to more between team variance than within team variance on this variable both for Time 1, $r_{wg} = .83$, ICC(1) = .28, ICC(2) = .61, $F(68, 207) = 2.56$, $p < .01$ and Time 2, $r_{wg} = .84$, ICC(1) = .35, ICC(2) = .69, $F(68, 207) = 3.20$, $p < .01$. Table 1 presents an overview of each of the variables and their method of measurement.

Results

Table 2 presents the means, standard deviations, and zero-order correlations for all the study variables. Although positive as expected, the correlation between backing up behavior and performance monitoring was not significant at either Time 1, $r = .18$, p = nonsignificant (ns), or Time 2, $r = .14$, p = ns. It is also worth noting that almost half of our teams were structured so that they might better manage their workload distribution whereas the rest were not. Accordingly, this attenuated the relationship between WDP and team performance in the zero-order correlation table.

Tables 3 and 4 present the results of the two hierarchical regressions used to test Hypotheses 1 through 3. Table 3 presents the results at Time 1. Table 4 presents the results at Time 2. Support for our hypotheses would be demonstrated if we found evidence of a significant two-way interaction between backing up behavior and WDP at Time 1 but not at Time 2, and if we found evidence of a significant two-way interaction between performance monitoring and WDP at both Time 1 and Time 2.

Turning first to the results at Time 1, as can be seen in Step 1 of Table 3, there were significant effects on team performance for both backing up and performance monitoring, $\beta = .27$, $p < .10$ and $\beta = .32$, $p < .01$, respectively. As can be seen in Step 2, a WDP had a negative effect on team performance, $\beta = -.38$, $p < .01$. Finally, as can be seen in Step 3 of Table 3, there was a marginally significant two-way interaction between backing up behavior

Table 1. Summary of Study's Variables and Method of Measurement and/or Manipulation

Variable	Definition	When Measured/Manipulated: Manipulated at Study Onset	When Measured/Manipulated: Measured at Time 1	When Measured/Manipulated: Measured at Time 2	How Measured/Manipulated
Team performance	The teams' outcomes or outputs; the acceptability of outcomes by customers within or outside of the organization (Hackman, 1987)		×	×	Objectively by the Distributed Dynamic Decision-Making (DDD) task
Backing up behavior	The discretionary provision of resources and task-related effort to another member of one's team that is intended to help that team member obtain the goals as defined by his or her role (Porter et al., 2003)		×	×	Objectively by the DDD task
Performance monitoring	The observation and awareness of the activities and performance of other team members (Dickinson & McIntyre, 1997)		×	×	Subjectively by survey responses
Workload distribution problem	The existence of individual demands that exceed a team member's individual resources (Porter et al., 2003)	×			Experimentally manipulated by varying resource allocations within the teams

Table 2. Means, Standard Deviations, and Zero Order Correlations

	M	*SD*	1	2	3	4	5	6
1. Team performance (Time 1)	35719.91	5353.66						
2. Team performance (Time 2)	39339.75	4028.17	.70**					
3. Workload distribution problem (WDP)[a]	0.51	0.50	–.10	–.19				
4. Backing up behaviors (Time 1)	13.94	4.33	.27*	.09	.57**	—		
5. Backing up behaviors (Time 2)	14.68	4.33	.01	–.06	.76**	.76**	—	
6. Performance monitoring (Time 1)	3.69	0.60	.35**	.28*	.11	.18	.18	—
7. Performance monitoring (Time 2)	3.87	0.52	.27*	.33**	.06	.16	.14	.88**

Note: $N = 69$.
a. Workload distribution problem was dummy coded 0 = *no workload distribution problem* and 1 = *workload distribution problem*.
*$p < .05$. ** $p < .01$.

Table 3. Moderated Regression Analyses: Predicting Team Performance at Time 1

	Time 1 Team Performance			
Step and Variables	β	R^2	ΔR^2	ΔF
Step 1				
Backing up behavior	0.27*	.21**	.18	6.60***
Performance monitoring	0.32***			
Step 2				
Workload distribution problem (WDP)	–0.38***	.26	.08	8.55***
Step 3				
Backing up behavior × WDP	1.03*	.33	.07	2.88*
Performance monitoring × WDP	1.16*			

Note: $N = 69$.
*$p < .10$. **$p < .05$. ***$p < .01$.

and WDP, $\beta = 1.03$, $p < .10$ and between performance monitoring and WDP, $\beta = 1.16$, $p < .10$, as expected.

Turning next to the results at Time 2, we ran the same hierarchical regression as we did for Time 1 but with the data collected at Time 2. As can be seen in Step 1 of Table 4, only performance monitoring had a significant effect on

Table 4. Moderated Regression Analyses: Predicting Team Performance at Time 2

Step and Variables	Time 2 Team Performance			
	β	R^2	ΔR^2	ΔF
Step 1				
Backing up behavior	–0.11	.12**	.12	4.59***
Performance monitoring	0.35***			
Step 2				
Workload distribution problem (WDP)	–0.30***	.16	.04	3.05*
Step 3				
Backing up behavior × WDP	–0.71	.23	.07	2.62*
Performance monitoring × WDP	1.95**			

$N = 69$.
*$p < .10$. **$p < .05$. ***$p < .01$.

team performance at Time 2, β = .35, $p < .01$. As can be seen in Step 2, a WDP again had a significant negative effect on team performance, β = –.30, $p < .01$. As seen in Step 3, as expected, we did not find evidence of a two-way interaction between backing up behavior and WDP, β = –.71, p = ns, but we did find evidence of a two-way interaction between performance monitoring and WDP, β = 1.95, $p < .05$.

We plotted the interactions from our hierarchical regressions following Cohen, Cohen, West, and Aiken's (2003) suggested use of regression slopes for low (−1 standard deviation) and high (+1 standard deviation) levels of the predictors around their means. We also conducted a test of the simple slopes following Aiken and West (1991) to further analyze the nature of the interactions. Figure 2 depicts our findings regarding backing up behavior. For teams with a WDP, as backing up behavior increased, so did team performance at Time 1. Backing up behavior had no effects on team performance when teams did not have a WDP as also seen in the top half of the figure. Our results regarding the role of time clarify this two-way interaction. As seen in the bottom half of the figure, backing up behavior had virtually no effect on team performance at Time 2, regardless of whether or not teams had a WDP. Thus, the interactive effect of backing up behavior and WDP depended on time as suggested by Hypothesis 3. The results of the simple slope test revealed that there was, in fact, a significant difference between the effects of backing up behavior and team performance among teams with a WDP at Time 1 and the effects of backing up behavior and team performance among teams with a WDP at Time 2, $t(134) = –2.24$, $p < .05$.

Also as hypothesized, performance monitoring followed a very different pattern as can be seen in Figure 3. Performance monitoring had a more

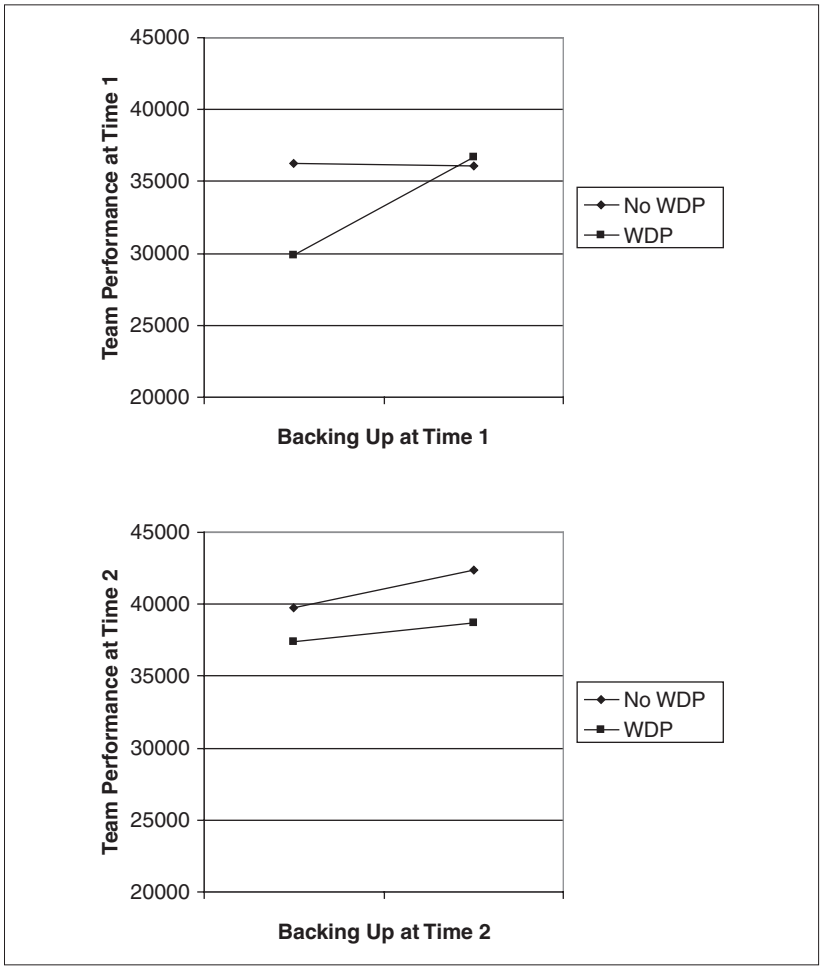

Figure 2. Interactive effects between backing up behavior and workload distribution problem (WDP) on team performance over time

positive effect on team performance when teams had a WDP than when teams did not have a WDP at Time 1 as seen in the top half of Figure 3. As seen in the bottom half of Figure 3, the positive effects of performance monitoring on team performance among teams with a WDP at Time 2 were consistent with those found at Time 1, therefore time had no influence on the effects of performance monitoring. The simple slope test revealed no significant differences between the effects of performance monitoring on team

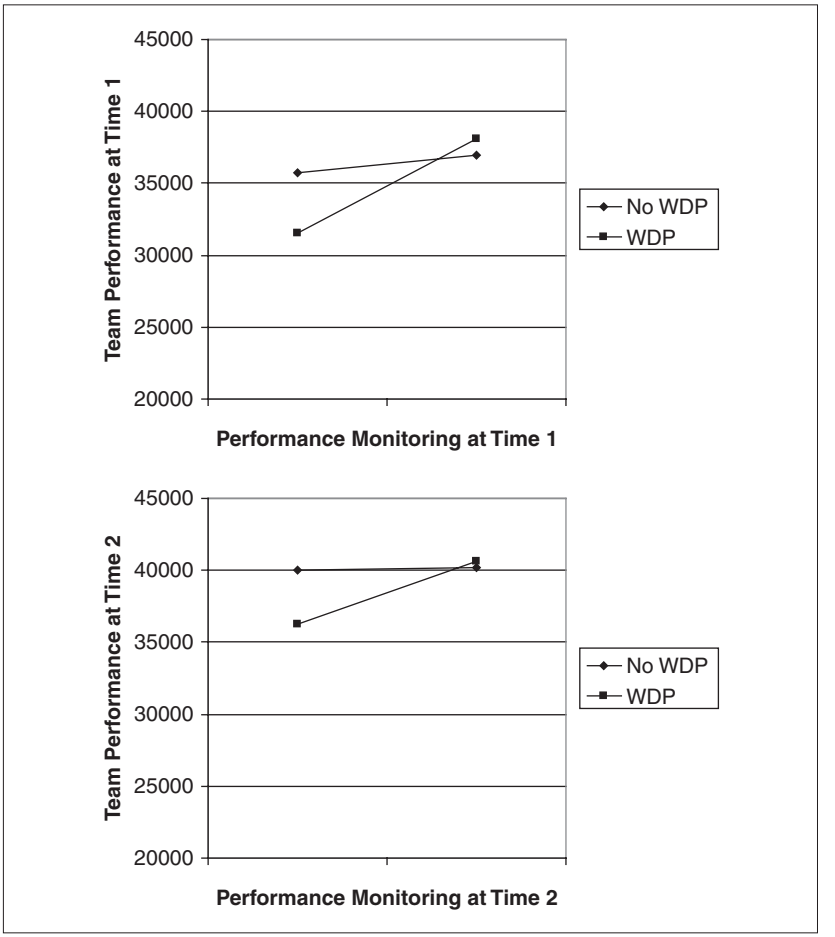

Figure 3. Interactive effects between performance monitoring and workload distribution problem (WDP) on team performance over time

performance for teams with a WDP at Time 1 compared with Time 2, $t(134) = -.74$, $p = \text{ns}$.

Supplemental Analysis

To provide a more direct test of our hypotheses regarding time, we also ran a repeated measures regression, which was appropriate because the research

design we employed was based on both between-team (i.e., workload distribution problem) and within-team (i.e., backing up behavior, performance monitoring, and team performance) factors (see Table 1). To conduct this analysis, we created an additional variable that represented time, which was dummy coded 0 for Time 1 and 1 for Time 2.

The results of the supplemental analysis can be seen in Table 5. Backing up behavior and performance monitoring (Step 1) explained a significant amount of variance in team performance, $\Delta R^2 = .15$, $F(2, 135) = 11.68$, $p < .01$. Time (Step 2) also had a positive effect on team performance, $\beta = .30$, $p < .01$, indicating that team performance increased over time. The two two-way interactions between time and our teamwork variables (Step 3) did not explain a significant portion of the variance in team performance, $\Delta R^2 = .02$, $\Delta F(2, 132) = 2.09$, $p =$ ns, even though the interaction of backing up behavior and time was significant, $\beta = -.56$, $p < .01$. Experiencing a WDP had a negative effect on team performance, $\beta = -.34$, $p < .01$, as seen in Step 4.

Of particular interest is Step 5, where it can be seen that as a set our three two-way interactions explained a significant portion of the variance in team performance, $\Delta R^2 = .04$, $\Delta F(3, 128) = 2.94$, $p < .05$. The interaction between backing up behavior and WDP was not significant, $\beta = .47$, $p =$ ns, nor was the interaction between time and WDP, $\beta = .08$, $p =$ ns. However, the interaction between performance monitoring and WDP was, $\beta = 1.36$, $p < .01$.

Also of particular interest is Step 6, which tested our hypothesis that the two-way interaction between backing up behavior and WDP would be further explained by time. Although we also included an additional three-way interaction representing the interaction between performance monitoring, WDP, and time, we did not predict that this interaction would be significant. Adding this interaction provided a more complete regression and it also served as a comparison to the three-way interaction that included backing up behavior. As can be seen in Step 6, as a set the two three-way interactions did not explain a significant amount of variance in team performance, $\Delta R^2 = .01$, $\Delta F(2, 126) = 1.44$, $p =$ ns. However, the interaction among backing up behavior, WDP, and time was marginally significant, $\beta = -1.48$, $p < .10$. As expected, the three-way interaction between performance monitoring, WDP, and time was not significant, $\beta = .24$, $p =$ ns. These results are completely consistent with our hypotheses and hierarchical regressions.

Discussion

The main purpose of this study was to examine the moderating role of WDPs and time—which we argued both serve as indicators of legitimacy of need

Table 5. Results of Repeated Measures Regression: Predicting Team Performance

Step and Variables	β	R^2	ΔR^2	ΔF
Step 1				
Backing up behavior	0.09	.15	.15***	11.68***
Performance monitoring	0.36***			
Step 2				
Time	0.30***	.24	.09***	15.64***
Step 3				
Backing up behavior × Time	–0.56**	.26	.02	2.09
Performance monitoring × Time	–0.05			
Step 4				
Workload distribution problem (WDP)	–0.34***	.32	.06***	12.19***
Step 5				
Backing up behavior × WDP	0.47	.37	.04**	2.94**
Performance monitoring × WDP	1.36***			
Time × WDP	0.08			
Step 6				
Backing up behavior × WDP × Time	–1.48*	.38	.01	1.44
Performance monitoring × WDP × Time	0.24			

$N = 138$.
*$p < .10$. **$p < .05$. ***$p < .01$.

for teamwork—on the commonly assumed positive effects of backing up behavior and performance monitoring on team performance. We drew from resource allocation theory to both distinguish between these two types of teamwork and to develop predictions regarding the moderating role of each indicator of legitimacy of need. In this way, our study fills several gaps in the teamwork literature, which has devoted limited empirical attention to distinguishing among the various types of teamwork, assumed that teamwork has unambiguously positive effects on team performance, and failed to systematically explore how the effects of teamwork on team performance may change over time (Mathieu et al., 2008).

The results of this study suggest that the legitimacy of need for teamwork is an important factor that should be considered in making predictions about when engaging in different types of teamwork behaviors will benefit teams the most. In this study, when teams were not faced with a legitimate need for teamwork in terms of a WDP neither backing up behaviors nor performance monitoring had effects on team performance. When teams were faced with a WDP, monitoring each other's performance was positively associated with

increased team performance. The findings regarding backing up behavior were more complex. Backing up behavior was positively associated with team performance when teams were faced with a WDP, but this was only the case during early performance episodes. The results lend support to our contention that as teams work together over time, which presumably increases members' taskwork skills, backing up behaviors become less functional. The results are consistent with those of Mathieu, Goodwin, Heffner, Salas, and Cannon-Bowers (2000), who examined team processes and showed that although team processes generally improved over time, team performance did not. The results of our study suggest that even though teams may engage in certain teamwork processes over time, those processes will not necessarily improve team performance.

The results also support our contention that the decision to engage in teamwork is ultimately a resource allocation decision by which members must decide how to best allocate their limited resources, either toward taskwork or toward teamwork. Moreover, the findings lend support to the notion that taskwork and teamwork may be somewhat supplementary skills. In this regard, our study makes a significant contribution to the team literature that has generally assumed that taskwork and teamwork skills are relatively complementary, so much so that the distinction between the two may diminish over time (Bowers et al., 1997; Morgan et al., 1993). We would argue that during early performance episodes, teamwork may compensate for a lack of taskwork skills among a team's members. However, as teams perform over time and across multiple episodes, some teamwork behaviors may have more limited effects on overall team performance when there is an increase in members' taskwork skills.

Finally, our study provides insights regarding the dimensionality of the teamwork construct. Scholars have proposed a number of teamwork taxonomies (e.g., Marks et al., 2001; McIntyre & Salas, 1995). These taxonomies vary in the extent to which they distinguish between the different aspects of teamwork. For example, the taxonomy proposed by Marks et al. (2001) suggests that performance monitoring and backing up behavior are conceptually similar and Marks and her colleagues lump the two behavioral processes together into a single operational definition. The results of this study suggest that although conceptually similar, different types of teamwork can and should be distinguished from one other in future theory and research.

Practical Implications

Our findings suggest a number of practical implications, in particular for highly interdependent project teams. Because we found that legitimacy of

need is an important factor determining when teamwork behaviors have their intended effects on team performance, we recommend that managers and team leaders encourage employees to carefully consider whether engaging in higher levels of different types of teamwork will ultimately result in better team performance. Related to this recommendation, high levels of interdependence imply that engaging in at least some teamwork is required. However, we argued that members' decisions to engage in different types of teamwork and at different levels is a conscious decision. Our findings suggest that these decisions have performance implications. Although limited, there is at least some evidence suggesting that managers and team leaders can intentionally staff their teams so that they will be more likely to make better decisions about when to request and when to provide certain forms of teamwork. For example, Porter et al. (2003) reported that high levels of conscientiousness and emotional stability were associated with a decreased tendency to receive backing up behavior from others when there was not a legitimate need for it. They also found that low levels of emotional stability were associated with members' failure to provide backing up behavior even when there was a legitimate need for it. Thus, it appears that managers and team leaders might be able to use personality characteristics to staff teams that will make more prudent decisions regarding whether or not to engage in increased levels of teamwork.

Another potential leverage point for ensuring that teams make appropriate decisions about when to engage in greater levels of teamwork is team training. We recommend against simplistic teamwork training that promotes the idea that engaging in greater levels of teamwork is always the most appropriate means for teams to overcome obstacles. We are not arguing against teamwork training or teamwork skills training. On the contrary, such training is especially important given our findings, but these findings suggest several requirements that managers and team leaders should look for in this training. Teamwork training should focus specifically on helping team members recognize legitimate needs for teamwork. It should also clarify the varying costs of different types of teamwork. Finally, teamwork training should also make clear the potential negative implications of engaging in various types of teamwork behaviors on members' own individual ability to engage in taskwork and the implications of providing too much assistance to others in their teams (e.g., social loafing or not providing sufficient opportunities for other team members to develop their own taskwork skills).

Related to this, our findings also suggest an additional benefit of ensuring that team members are trained together in addition to being trained individually. Previous work on the development of transactive memory systems in

teams has suggested that it is team training, as opposed to individual training, that is critical for effectiveness because it is through team training that members learn who knows what (Liang, Moreland, & Argote, 1995; Moreland & Myaskovsky, 2000). By training members together, members learn who has deficiencies in terms of individual expertise that might be needed for the team to be successful. Such training therefore has the potential to help members develop a better sense of whether or not there will be a legitimate need for teamwork once the team begins working together.

Limitations

Despite the insight our study provides, there are some limitations that should be kept in mind. One limitation is the fact that the participants were undergraduate students. Although the participants were relatively young, it should be recalled that they were similar in terms of both age and education to those who actually perform this very same task in military teams, which is one type of team and setting we noted our results could generalize. Our use of a laboratory context is another limitation of our study. It would be ideal to see our ideas tested in the field using real teams. Finally, because of their working in close proximity, their commitment to only one team and one team task at a time, and the fact that they had a considerable amount of knowledge about each others' roles and responsibilities, team members in this study were likely more able to recognize WDPs within their teams. Not all teams in real organizations are structured such that WDPs would be so easily recognizable (e.g., some geographically dispersed virtual teams, project teams in which members are assigned to multiple teams, or when members are unwilling to disclose resource deficiencies). Any of these situations may give rise to instances in which the existence of a WDP may not be as clear as was the case in our study.

Future Research Directions

Our findings clearly indicate that more attention should be devoted to understanding when teams have a more or less legitimate need for teamwork. Admittedly, there are other aspects of legitimacy of need for teamwork that we did not consider, but that are ripe for research. For example, teams may have a more legitimate need for teamwork when new team members replace more senior team members, when they face a new and unfamiliar task, or when their task environment changes substantially. Teams may continue to have a legitimate need for teamwork over time when team members fail to

develop increased taskwork skills. We suggest that future effort toward theory development be aimed at providing a broader, more complete understanding of legitimacy of need as it relates to teamwork.

We also suggest that future research explore WDPs more broadly. We focused specifically on one type of WDP where one team member had a disproportionately heavy share of their team's overall workload yet did not have the resources necessary to manage this excess workload. However, because WDPs arise whenever individual team members have task demands that exceed the resources they individually possess, there are other situations that also lead to WDPs in teams. For example, a newly added team member who lacks the skills and/or experience to handle his or her share of an evenly shared team workload could create a WDP for a team. Thus, future research needs to explore other types of WDPs in teams and how teams can best respond to them.

We should also mention that the task used in this study was one in which across the two performance episodes, the demands placed on teams were held constant. As a result, there were no significant differences in the task from Time 1 to Time 2 so it is reasonable to conclude that generally members' taskwork skills increased over time. Although this is consistent with many actual teams in real organizations, it is likely that our results would not hold with teams working on tasks that are constantly changing or when, over time, team members are continuing to develop new taskwork skills. Future research should examine the teamwork–team performance relationship over time across a broad range of team tasks including those in which task demands are not held constant. Somewhat related, as teams develop very high levels of taskwork skills, they may be able to devote attention toward teamwork without taskwork suffering. This implies that it may be the case that teamwork and taskwork are both complementary and supplementary over time. This would also be an interesting area for future research; however, research of this nature would require much longer periods of time to study.

Finally, researchers seeking to explore these and related questions should make specific attempts to use methodologies that are not prone to social desirability effects. Although concerns such as these are almost always an issue with self-report data, given the popularity of teams and the extent to which contemporary organizations invest in creating team environments, it is easy to imagine a situation in which respondents report high levels of any teamwork behavior regardless of the extent to which it was actually demonstrated. This reporting could lead to erroneous conclusions about the relationship between those behaviors and team performance. Future research should use a variety of methods and measures for studying teamwork behaviors and devote specific attention to developing and validating measures that have

utility across different types of teams that work on different types of tasks. For example, although our backing up behavior measure provided us with a precise count of the help team members provided a fellow team member that had a disproportionately heavy share of the team's workload, backing up behavior could be measured in other ways (e.g., the nature of the resources or the amount of time devoted to assisting other team members).

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