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A Multiple-Goal, Multilevel Model of Feedback Effects on the Regulation of Individual and Team Performance

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When working as a member of a team, individuals must make decisions concerning the allocation of resources (e.g., effort) toward individual goals and team goals. As a result, individual and team goals, and feedback related to progress toward these goals, should be potent levers for affecting resource allocation decisions. This research develops a multilevel, multiple-goal model of individual and team regulatory processes that affect the allocation of resources across individual and team goals resulting in individual and team performance. On the basis of this model, predictions concerning the impact of individual and team performance feedback are examined empirically to evaluate the model and to understand the influence of feedback on regulatory processes and resource allocation. Two hundred thirty-seven participants were randomly formed into 79 teams of 3 that performed a simulated radar task that required teamwork. Results support the model and the predicted role of feedback in affecting the allocation of resources when individuals strive to accomplish both individual and team goals.

One of the hallmarks of the changing nature of work is the increasing shift to the use of teams as the basic organizing unit. This shift has implications for training that is designed to enhance both individual and team performance. Although a number of team training principles have been developed, many important questions remain largely unanswered (Salas, Dickinson, Converse, & Tannenbaum, 1992). For instance, how do you train members of a team to allocate cognitive and behavioral resources between individual and team tasks to maximize both individual and team performance? How do you structure goals and feedback during training to improve team effectiveness? What are the critical individual differences that either aid or hinder a team as it attempts to learn and perform complex tasks? Given the increasing centrality of teamwork in organizations and the increasing research devoted to understanding and improving team performance, the relative lack of research on the basic cognitive processes responsible for team performance is both surprising and disturbing. Without a clear understanding of the cognitive processes responsible for team learning and performance, it is virtually impossible to predict the effects of training interventions designed to develop high-performing teams.

At the individual level, it is well known that providing goals and performance feedback are two of the most effective interventions available to improve learning and task performance (Locke & Latham, 1990). A natural extension of this robust finding is to examine the effectiveness of goals and feedback when teams perform tasks. However, the application of individual-level principles to teams has proven difficult, leading to conflicting findings (e.g., Nadler, 1979). Two limitations in the existing literature on team goals and feedback are substantial contributors to this ambiguity. First, the vast majority of existing research examines either the effect of team goals and team feedback on individual-level outcomes—ignoring the fact that individuals are functioning in a team context—or the effect of team goals and team feedback on team-level outcomes—ignoring the impact of the manipulations on the individuals nested within the teams. Second, there is no existing model of how goals and feedback operate in team settings. In other words, how do individual-level goals and feedback combine with team-level goals and feedback to affect individual- and team-level outcomes?

Understanding learning in a team context necessitates a multiple-goal, multilevel perspective that examines the influences of individual characteristics, situational factors, and team characteristics on processes that unfold at both the individual and team levels. Therefore, the purpose of this research is to present a preliminary multilevel model that describes the process through which goals and performance feedback, operating at both the individual and team levels, affect learning and performance. We then evaluate this model by examining alternative methods for providing feedback suggested by the literature to team members in a team-training context.

To begin, we adopt Salas's definition of a team as a set of two or more people who interact dynamically, interdependently, and adaptively toward a common and valued goal, each having specific roles or functions to perform and a limited life-span of membership (Salas et al., 1992). We assume that all cognition originates within the individual. Therefore, to understand team processes, it is important to understand the ways in which being a member of a team affects individual cognitive processes. This research focuses

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specifically on the impact of being a member of a team on the feedback and goal-setting process. We also assume that unique variables and processes emerge at the team level from the dynamic interaction of team members that do not exist at the individual level of analysis, despite arising from cognition that occurs within the individuals (Kozlowski & Bell, 2003; Kozlowski & Klein, 2000). Finally, we restrict attention in this presentation to interdependent tasks in which team performance is a weighted function of actions taken by team members to accomplish both individual and team tasks (Shiflett, 1979; Steiner, 1972).

How does being a member of a team affect the process of setting goals and the use of feedback to achieve the goals? As a member of a team, individuals must strive to achieve multiple, often conflicting, goals. As specified in the definition of a team above, team members have different functions in the team that necessitate different individual goals, and yet they should also share a common set of team goals. Depending on the structure of the team and the nature of the task, the goals at the individual and team levels may be independent, complementary, or even contradictory. Deciding how to best allocate limited cognitive and behavioral resources across the multiple goals is a fundamental requirement that team members must continuously evaluate. Moreover, making good decisions about allocating limited resources is critically dependent on knowing where one stands with respect to the desired goal states. Investing limited resources toward the achievement of individual goals may not represent a good decision if there are large discrepancies between the team goals and actual team performance. Therefore, knowledge concerning the results of behavior, or feedback, is a critical component of regulating behavior to accomplish goals.

Team Goal Setting and Feedback

Goal Setting in Teams

Unfortunately, there is very little research on the functioning of multiple goals in team settings, and even less on the effects of different types of feedback. Mitchell and Silver (1990) examined the effect of providing individual goals, group goals, or both individual and group goals to groups working on an interdependent tower-building task. They found that providing only individual goals resulted in worse group performance than the other two goal conditions, as a result of the use of competitive strategies. However, groups given only individual goals were never instructed to consider themselves to be a team, making the generalizability of this result unclear. Crown and Rosse (1995) investigated the effects of assigning individual goals, "groupcentric" goals (individual goals that focus on contributions to team performance), team goals, both individual and team goals, and both groupcentric and team goals on a sentence-construction task in which individual performance, individual contributions to team performance, and team performance could be assessed. They found that having both groupcentric and group goals resulted in substantially higher performance than any other combination of goals, and that the other goal combinations did not result in appreciably different levels of team performance. Unfortunately, these results are based on a single trial and participants did not receive performance feedback. As a result, it is unclear how this type of goal assignment would function over time as a result of learning from feedback. Virtually all of the remaining literature on the functioning of goals in teams has investigated the effects of either providing only individual or providing only team goals on team performance (e.g., H. J. Klein & Mulvey, 1995; O'Leary-Kelly, Martocchio, & Frink, 1994; Weingart, 1992). The absence of both individual and team goals in this research severely limits its generalizability to many team performance settings.

Feedback in Teams

In contrast to the well-known effects of individual-level feedback (Ammons, 1956; Guzzo, Jette, & Katzell, 1985; Ilgen, Fisher, & Taylor, 1979; Kluger & DeNisi, 1996), the effects of feedback on team processes and performance are not nearly as well understood (Hinsz, Tindale, & Vollrath, 1997; Nadler, 1979; Pritchard, Jones, Roth, Stuebing, & Ekeberg, 1988). For individuals, feedback is known to direct attention toward aspects of the task on which feedback is available and to affect subsequent goal setting (Kluger & DeNisi, 1996). Given this, how should feedback be provided to individuals when they function as a team to accomplish work? Should the feedback remain targeted at the individual team member? Should the feedback be targeted at the team as a whole? Should both individual and team level feedback be provided? Unfortunately, there are no clear answers to these questions in the literature on team performance. Some research has shown that team feedback results in improved outcomes relative to individual feedback (Berkowitz & Levy, 1956), whereas other research has indicated that individual feedback remains the most beneficial for team outcomes (Jentsch, Navarro, Braun, & Bowers, 1994; Zajonc, 1962). Almost without exception, the existing literature has compared the effects of providing either individual or team feedback to team members as they perform a task. The absence of a condition that incorporates both individual and team feedback is particularly surprising, as Zajonc (1962) specifically concluded that this combination of feedback resulted in the best team performance.

In a review of the literature on team feedback, Nadler (1979) concluded that team-level feedback resulted in improved attitudes toward the team, whereas individual-level feedback resulted in performance improvements for the individuals in the team. Virtually none of the studies included in Nadler's review incorporated a condition in which both individual and team feedback were provided. One exception is the research conducted by Zander and Wolfe (1964), who provided both types of feedback and found that subjects receiving both types of feedback had the highest level of individual performance. More recently, Tindale, Kulik, and Scott (1991) provided subjects with both individual and team feedback and showed that they could independently motivate individual performance, but that the increased performance at the individual level did not necessarily result in improved team performance. Finally, Hinsz et al. (1997) reviewed the literature on teams from an information-processing perspective and concluded that substantial questions concerning the functioning of feedback in team settings—such as the ambiguous effects of team feedback on team performance, team information processing, and team dynamics like social loafing and process loss—remain unanswered. None of the studies reviewed by Hinsz et al. (1997) included both individual and team feedback when examining team learning and performance.

Multiple Goals and Multiple Levels

The ambiguity in the team feedback literature stems, in part, from the absence of a model of how individual team members use feedback to improve individual and team performance. Understanding the role of feedback in team performance, requires recognizing that working in a team requires the regulation of individual behavior with respect to multiple goals. That is, regulatory processes in the team context are multilevel in nature. Thus, in explicating our theoretical approach, we first develop a conceptualization of the influence of multiple goals—individual and team—on feedback loops underlying the regulation of individual attention and behavior allocation in a team learning and performance context. Second, we extrapolate the self-regulatory implications to develop a multilevel model that captures regulatory processes at both levels. Here, we explicate the regulatory process at the individual level, and then extend that model to team level. Because the team-level constructs have their origins in individual cognition and behavior and emerge as team members work together over time in an interactive task context, we posit that team members will develop shared perceptions of key regulatory constructs that reference the team level, constructs that are linked by similar theoretical processes. Thus, we specify (a) that the team-level constructs will exhibit composition (i.e., sharing or homogeneity) and (b) that the theoretical processes linking constructs are parallel or functionally equivalent at the individual and team levels, thereby satisfying the two theoretical requirements for a homologous multilevel model (Kozlowski & Klein, 2000; Morgeson & Hofmann, 1999; Rousseau, 1985).

Self-Regulation Around Multiple Goals and Feedback in the Team Context

Drawing on Carver and Scheier's (1998) theory of self-regulation, Figure 1 presents a model of how interdependent feedback loops can result in the regulation of behavior with respect to both individual and team goals. In this model, two feedback loops have distinct individual and team goals that compete for control of the individuals' behavior. The feedback loop for the individual goal monitors individual-level discrepancies between current performance and goal states and activates behavioral outputs needed to reduce the discrepancy. The team feedback loop operates similarly on the individuals' team goals to activate behavioral outputs needed to reduce team-level discrepancies. The behavioral output from each of the feedback loops affects the performance levels being regulated by the other feedback loop, such that reducing discrepancies for one of the feedback loops often results in increased discrepancies on the other feedback loop. The dashed line connecting feedback to goals highlights that, in response to feedback, an individual may change the individual and team goals in addition to, or instead of, changing behavior. Finally, the initial characteristics of the situation and subsequent changes in the situation may result in increased discrepancies or increased salience of discrepancies on one or both of the feedback loops. As a result, initial aspects of the situation and changes in the situation may bias the control of behavior toward reducing discrepancies at either the team or individual level.

When individual and team goals are completely congruent, the feedback loops suggest similar behavioral outputs, and both individual and team-level discrepancies can be reduced simultaneously. For example, in a purely additive team task, contributions to individual goals also make direct contributions to team objectives. However, when the individual and team goals cannot be simultaneously accomplished, as is often the case in actual team settings, then a choice must be made between the behaviors activated by the two feedback loops (Miller, Galanter, & Pribram, 1960). A number of factors may influence this sometimes conscious and sometimes unconscious choice. First, the relative size of the individual and team-level discrepancies may determine

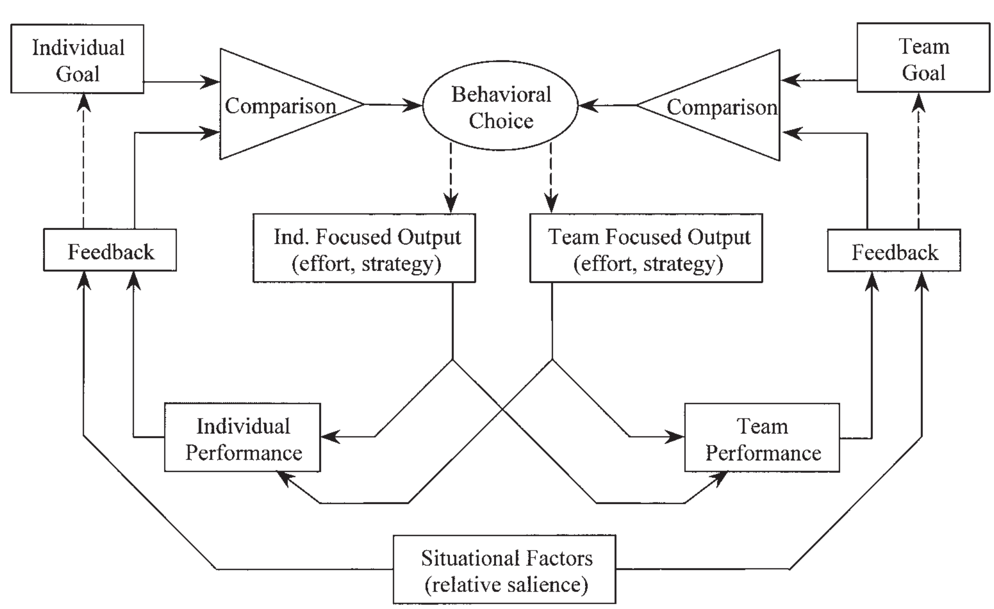

Figure 1. Concurrent functioning of individual (Ind.) and team feedback loops.

which of the feedback loops gains behavioral control (Kernan & Lord, 1990). For instance, if the discrepancy at the team level is small and the discrepancy at the individual level is large, then the individual may decide to focus on reducing the larger discrepancy at the individual level by allowing the individual-level feedback loop to have behavioral control until the discrepancy is reduced to an acceptable limit. Attention can then be shifted to reducing discrepancies at the team level through a process of goal scheduling and prioritization (Dodge, Asher, & Parkhurst, 1989; Simon, 1967). Second, if one goal is clearly more important than the other, then the feedback loop responsible for minimizing the discrepancy for the more important goal will likely gain control of the behavioral output (Locke & Latham, 1990; Terborg & Miller, 1978). This often happens through the functioning of reward systems in organizations that encourage team performance but reward individual performance (e.g., Geber, 1995; Naresh, 1998; Sisco, 1992). Third, different feedback loops may have different tolerance levels for discrepancies (Carver & Scheier, 1998). So, if the team-level feedback loop allows larger discrepancies before action is required than the individual feedback loop, the individual feedback loop will most likely gain behavioral control until large discrepancies occur at the team level.

The focus of the present research is on another method that affects which of the feedback loops acquires behavioral control. As indicated in Figure 1, situational characteristics, such as feedback sources in the environment, can determine which feedback loop acquires behavioral control by making one of the discrepancies more or less salient to the individual. This perspective is consistent with a great deal of theory suggesting that individuals resolve conflicts between multiple goals by using situational cues such as feedback to prioritize the feedback loops (e.g., Kernan & Lord, 1990; Taylor, Fisher, & Ilgen, 1984). From an empirical perspective, it has been shown that team-level feedback can shift cognitive processes to focus on the team level (Hinsz et al., 1997). Although there is a great deal of theoretical support and some limited empirical support for this perspective, much more research is needed to address this critical self-regulatory process.

A Multilevel Process Model of Individual and Team Regulation

How does the joint functioning of the two feedback loops in Figure 1 result in resource tradeoffs between team and individual tasks that affect team and individual performance? Figure 2 presents a multilevel process model for the effects of feedback and individual and team differences on the regulation of individual and team behavior. At the individual level, the regulatory process is reasonably well researched and understood. Situational factors such as performance feedback and individual difference factors such as personality and goal orientation have both direct and interactive effects on the formation of intentions that influence the regulatory processes (Phillips & Gully, 1997; VandeWalle, Brown, Cron, & Slocum, 1999). Common intentions that result from situational and personal factors are self-set goals (Bandura & Jourden, 1991), commitment to the goals (H. J. Klein, Wesson, Hollenbeck, & Alge, 1999), and efficacy for achieving the goals (Bandura & Jourden, 1991; Nease, Mudgett, & QuiZones, 1999). Once the intentions have been formed, they affect performance by increasing the effort expended and the development of strategies (Austin & Vancouver, 1996; Bandura, 1997; Locke & Latham, 1990) needed to implement the intentions and achieve the goals. This process evolves dynamically over time such that a person may form intentions, act on those intentions through the investment of goal-directed effort (actions), receive either formal or informal feedback on the effectiveness of the behavior, and adapt either the intentions or the behavior (e.g., increase effort) in response to the goal-relevant feedback (Carver & Scheier, 1998).

Although there is much less research support for the process shown in Figure 2 at the team level, we conceptualize the regulatory process constructs as isomorphic and their linkages as func-

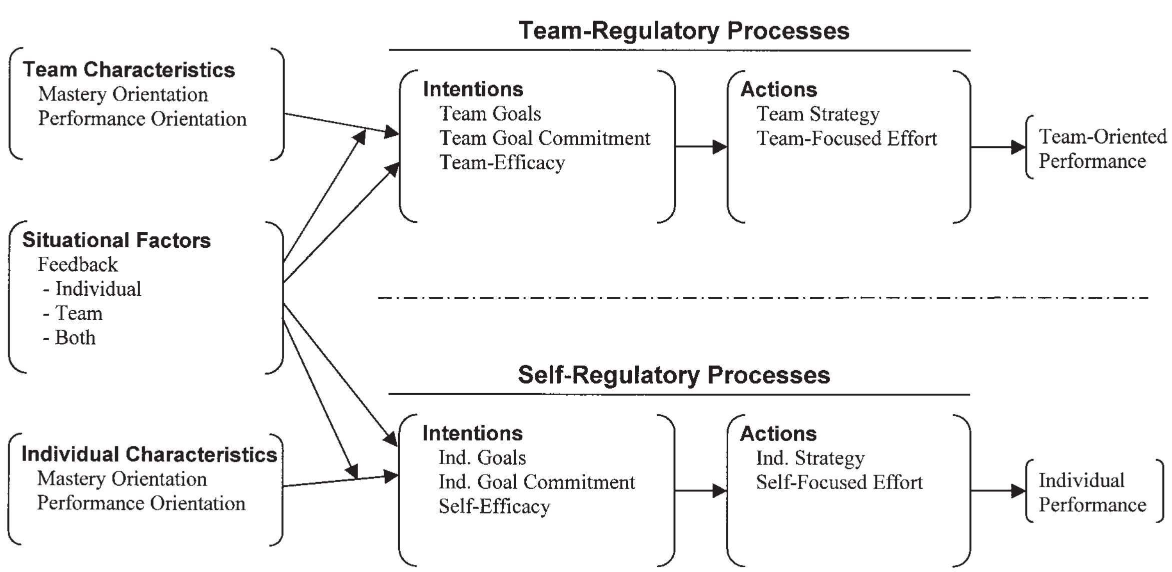

Figure 2. Multilevel individual (Ind.) and team performance process model. Constructs above the dashed line represent team-level constructs. Constructs below the dashed line represent individual-level constructs.

tionally equivalent. That is, the constructs at the team level are analogous, and the theoretical mechanisms linking them are similar in nature, to the individual level (Kozlowski & Klein, 2000; Morgeson & Hofmann, 1999). For example, numerous authors have demonstrated that providing feedback to a team results in the spontaneous setting of team goals (Locke & Latham, 1990; Zander & Medow, 1965; Zander & Newcomb, 1967). Similarly, Tindale et al. (1991) and Prussia and Kinicki (1996) demonstrated that team-level feedback affected the collective efficacy of the team. The remaining links in the model are not well established at the team level of analysis. The relationship between team-level feedback and the collective commitment to goals is unclear. Some research suggests that teams with challenging goals and high levels of commitment to the goals invest more effort into learning and performance and develop better strategies to utilize the invested effort (Crown & Rosse, 1995; Weingart, 1992; Weldon, Jehn, & Pradhan, 1991). As is the case at the individual level of analysis, increased team effort and strategy development is presumed to result in improved team performance during training and transfer situations (Weingart, 1992; Weldon et al., 1991). However, none of the team-level studies have incorporated all of these linkages. By examining a more comprehensive multilevel process model of individual and team regulation, we expect to establish the functional equivalence of central aspects of the regulatory processes, better reveal the unique antecedents of individual and team regulation, and begin to identify implications for influencing individual and team performance.

Clearly, the process model in Figure 2 addresses behavior that occurs over a larger time frame than the moment-to-moment shifts in the allocation of resources between individual and team goals depicted in Figure 1. We view the multiple-goal regulation model in Figure 1 as a theory-driven heuristic of the moment-to-moment allocation of resources that has strong implications for the general patterns of resource allocation that should occur over time, as indicated in Figure 2. The purpose of the present research, then, is to evaluate the implications of the resource shifts suggested by the heuristic model of multiple-goal behavioral regulation illustrated in Figure 1 with respect to the general process model depicted in Figure 2. Therefore, we do not focus on the microanalysis of moment-to-moment shifts in resources between individual and team goals.

Summary and Research Predictions

The multiple-goal regulation model presented in Figure 1 describes the process of regulating behavior around both individual and team goals on interdependent tasks and highlights the important role of feedback in determining which of the feedback loops dominates the control of behavior. However, the model does not provide clear predictions about whether feedback should be targeted at the individual or the team level, or whether both individual and team feedback should be provided to simultaneously maximize both individual and team performance. Therefore, the two purposes of this research are to establish that isomorphic constructs and functionally equivalent processes are responsible for individual and team performance in the early stages of task performance (i.e., multilevel homology), and to examine how commonly recommended feedback configurations influence individual and team regulatory processes and performance on an interdependent task.

As discussed above, our research predictions are depicted in Figure 2. At the individual level, our predictions are largely consistent with previous research demonstrating that individual-level feedback and individual differences such as ability and goal orientation, particularly mastery goal orientation, affect the setting of goals, commitment to the goals, and efficacy for achieving the goals. On the basis of prior discussion, we hypothesize that

> H1A: Feedback targeted at the individual will result in higher individual goals, stronger commitment to individual goals, and higher levels of self-efficacy for achieving the individual goals.

> H1B: Individuals with high levels of mastery goal orientation will set higher individual goals, have stronger commitment to individual goals, and have higher levels of self-efficacy for achieving the individual goal.

> H1C: The interaction of individual feedback with high levels of mastery orientation will result in the highest levels of individual goals, stronger commitment to individual goals, and higher levels of self-efficacy for achieving the individual goal.

Finally, as individuals gain experience with the task and receive repeated feedback on their performance, we also expect the individual-oriented intentions to increase over time. Specifically, we hypothesize that

> H1D: Individual goals, commitment to the individual goals, and the efficacy for achieving the individual goals will increase over time.

At the individual level of analysis, it is well established that motivational intentions result in goal-oriented behaviors. Therefore, we hypothesis that

> H2: Individual-oriented intentions (e.g., self-set goals, self-efficacy, and individual goal commitment) will result in increased individual goal-oriented effort and strategy development.

If the intentions result in the expected changes in actions, then it is expected that performance at the individual level will increase in direct proportion to the individual-oriented actions. Therefore, we hypothesize that

> H3: Individual-oriented actions (e.g., goal-oriented effort and strategy) will result in increased individual performance.

For this model to hold at the team level, we must first evaluate the necessary condition that team-level analogs of the individual-level variables of goal orientation, goal commitment, efficacy, goal setting, effort, strategy, and performance can be composed from individual-level perceptions and actions. Assuming that adequate representations of these constructs can be established, then we expect a functionally equivalent process to influence team performance as a function of team feedback during the early stages of skill acquisition on an interdependent task. Specifically, we hypothesize that

> H4A: Feedback targeted at the team will result in higher team goals, stronger commitment to team goals, and higher levels of team efficacy for achieving the team goal.

> H4B: Teams having high levels of team mastery goal orientation will set higher team goals, have stronger commitment to team goals, and have higher levels of team efficacy for achieving the team goal.

> H4C: The interaction of team feedback with high levels of team mastery orientation will result in the highest levels of team goals, stronger commitment to team goals, and higher levels of team efficacy for achieving the team goal.

Similar to the individual level processes, we further hypothesize that

> H5: Team-oriented intentions (e.g., self-set team goals, team efficacy, and team goal commitment) will result in increased team goal-oriented effort and strategy development.

As at the individual level, we expect team-oriented actions to result in improved team performance. Specifically, we hypothesize that:

> H6: Team-oriented actions (e.g., team goal-oriented effort and strategy) will result in increased team performance.

Given that the multilevel process model hypothesized in Figure 2 can be supported for both individual and team-level variables, the final research question addresses how different types of feedback that are commonly suggested in the literature influence resource allocation, regulatory processes, and individual and team performance. Two general predictions are possible, but on the basis of the current state of the research literature, the most viable research prediction is unclear. First, if individual team members have the capabilities required to either simultaneously work on individual and team tasks or to rapidly switch between individual and team tasks, then making both feedback loops salient by providing both individual and team feedback should result in the highest levels of team performance. Both forms of feedback should provide the most information to the individual concerning the relative needs at the individual and team level and allow the individual to make optimal choices concerning the allocation of resources between individual and team tasks. This is consistent with the general finding that individuals can improve performance with respect to both quantity and quality goals and that there is no necessary performance tradeoff between the two goals (DeShon, Brown, & Greenis, 1996; Locke & Latham, 1990). Providing only team-level feedback may be too ambiguous to provide diagnostic information to the team members on how to change their specific behaviors to improve team performance (Dyer, 1984). It is for this reason that Zajonc (1962) recommended that both individual and team level feedback be provided to all team members.

Conversely, if the concurrent demands of the individual tasks and the team tasks exceed the individuals' capabilities, then either one or both aspects of performance will likely suffer. Irrespective of the specific theoretical mechanism thought to be responsible for dual-task performance, the empirical pattern of task performance clearly shows that individuals are frequently unable to maximize performance on more than one task at a time (Allport, 1989; Pashler, 1994). Providing multiple sources of feedback may overwhelm the team members' capacity and result in suboptimal performance on one or more of the team members' tasks. If individuals are not able to use both individual and team feedback to simultaneously improve individual and team performance, then we expect team feedback to result in better team performance and individual feedback to result in better individual performance.

Method

Participants

Two hundred thirty-seven undergraduate psychology students were randomly formed into 79 teams of 3. Trainees received partial course credit for their participation. Ninety percent were under the age of 22. Fifty-six percent were women. Seventy-seven percent of the participants were Caucasian. Eleven percent of the teams had no women, 26% had 1 woman, 48% had 2 women, and 15% had 3 women.[1]

Task Overview

The task used in this research was TEAMSim (Team Event-Based Adaptive Multilevel Simulation). TEAMSim is a PC-based simulation of a radar-tracking task (Kozlowski & DeShon, 2004). Three-person teams were seated at simulated radar consoles where contacts with different priorities and patterns of movement appeared. Team members communicated freely with one another on a closed communication system. Participants needed to learn how to "hook" contacts on the radar screen, collect information to classify their characteristics, and render an overall decision (take action or clear) for each contact. Participants also needed to learn skills involved in preventing contacts from crossing two perimeters located on the radar screen, including determining which contacts were of higher priority.

As a team, participants were responsible for working interdependently to identify contacts, make decisions, and prevent perimeter intrusions. The task incorporated both additive and discretionary interdependencies that compiled to team performance. Each team member was primarily responsible for one of three sectors designated on the display, but each had discretion to monitor and work in their teammates' sectors. Workload was equalized across sectors. However, the task was designed to unpredictably—but systematically—overload team members. This interdependence created discretionary opportunities for other members to shift their priorities and strategies, coordinate effort, and contribute to team performance. Although collective effort contributed to team performance, team members working outside their primary sector could not simultaneously work toward accomplishing individual goals. Thus, consistent with the multiple-goal model, overloads were designed to prompt resource allocation choices toward team or individual goals.

Participants completed multiple trials and set both individual and team performance goals before each trial. Because we were interested in the effects of feedback on the allocation of resources across individual and team tasks, we did not provide standards for performance. At the conclusion of each trial, participants were provided with individual, team, or both individual and team feedback in the form of total points for that trial. Point

[1] Although the ratio of men to women varied across teams, no direct or interactive effects of sex composition were observed. Moreover, treating sex composition as a control variable did not alter the results.

totals were based on additions for correct decisions and subtractions for incorrect decisions, penetration of the perimeters, and risk incurred when contacts spent time within these perimeters.

Feedback Manipulation

As illustrated in Figures 1 and 2, the focus of this research is on resource allocation influenced by outcome feedback on current performance relative to goals. Thus, on completion of each trial, individuals received one of three forms of feedback. The first form of feedback provided participants only with information about their own performance (e.g., individual score). Twenty-six teams (78 participants) were assigned to this individual feedback condition. The second form of feedback provided trainees only with information about their team's overall performance (e.g., team score). Twenty-seven teams (81 participants) were assigned to this team feedback condition. Finally, the third form of feedback provided trainees with information about both their own performance and their team's overall performance (e.g., individual score, team score). Twenty-six teams (78 participants) were assigned to this both-feedback condition.

Procedure

Prior to beginning the experimental task, teams were given a 10-min overview session on the basic operation and objectives of the task along with information on how performance would be scored. Team members were provided with a 3-min, semistructured exercise designed to familiarize them with the other members of their team. After this team-building exercise, team members were instructed on how to use a closed-circuit headset system to communicate with each other during the experiment. The importance of communication for performance on the task was emphasized to all team members, and team members were able to communicate via the headsets during the entire performance period of the experiment (approximately 180 min of the 210-min duration of the experiment). Immediately following the overview session, teams completed a 5-min practice trial to gain further familiarity with the task. Performance feedback—consistent with the experimental condition—was provided after the team members completed the practice trial so that they would be able to calibrate initial performance goals for the subsequent experimental trial. After the practice trial, the initial set of questionnaire response data was collected.

Participants then began the actual experiment and completed three blocks of two trials each. Each trial consisted of a cycle of study/preparation, goal setting, task performance, and feedback. During the 3-min study/preparation period that preceded task performance, participants could consult a task manual, which included all the information they would need to learn to perform the task proficiently, as they continued to communicate with the other team members using the headsets. Teams then engaged in a 10-min performance period. Immediately following performance, feedback was provided according to the assigned feedback condition. Team-referenced and individual process measures were collected at the conclusion of each block of two trials. The only time during the experiment when the headsets were removed and team members were not allowed to communicate with each other was during the completion of questionnaires. The entire experimental procedure lasted 3.5 hr for each team.

Individual-Level Measures

Cognitive Ability

Cognitive ability was assessed for use as a control variable in all individual-level analyses. At the beginning of the study, subjects reported either their ACT or SAT scores. Scores were placed on a common metric so that they could be compared. Specifically, ACT and SAT scores were both converted to z scores by means of their respective national normative data.

Mastery Goal Orientation

Mastery goal orientation was measured with the six-item mastery goal orientation scale developed by Button, Mathieu, and Zajac (1996). Individuals responded on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5). Factor analysis provided support for a one-factor solution. Coefficient alpha was .75 for this scale.

Performance Goal Orientation

Performance goal orientation was measured with the six-item performance goal orientation scale developed by Button et al. (1996). Individuals responded on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5). Factor analysis provided support for a one-factor solution. Coefficient alpha was .75 for this scale.

Individual Goals

Prior to each trial, each subject was asked to set a performance goal for his or her individual score. Subjects indicated their goals by typing them into the computer.

Individual Goal Commitment

The extent to which trainees were committed to their individual performance goals was assessed prior to Trials 3 and 6 with a six-item measure adapted from Hollenbeck, Williams, & Klein (1989). Individuals responded on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5). Factor analysis indicated a one-factor solution. Coefficient alpha for this scale ranged from .83 to .89 for the two administrations.

Self-Efficacy

Self-efficacy was assessed with an eight-item scale developed to assess task-specific self-efficacy (Kozlowski et al., 2001). This measure was administered at three points during training, following each block of two trials. Individuals responded on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5). Factor analysis indicated a one-factor solution. Coefficient alpha for this scale was .95, .96, and .96 at Blocks 1, 2, and 3, respectively.

Strategy

Strategy was assessed via the extent to which individuals monitored their situation by utilizing a task feature known as "zooming." By default, the radar screen only displayed a limited portion of the task space that allowed a trainee to see only targets close to the inner perimeter. However, performing well also necessitated identifying and processing targets near the outer perimeter. Monitoring the outer perimeter required "zooming out" to get a view of contacts further from the center of the screen, but that view came at the expense of being able to see contacts near the inner perimeter. Thus, a fundamental task strategy was to frequently zoom in and out to allow monitoring of both the inner and outer perimeters. The total number of times participants zoomed in and out was used as a measure of strategy use. The mean for strategy was 23.72 (SD = 18.49), 30.47 (SD = 20.97), and 38.23 (SD = 27.03) at Blocks 1, 2, and 3, respectively.

Self-Focused Effort

Self-focused effort indicated the number of contacts that trainees processed within their own assigned sector. Both correctly and incorrectly processed contacts were included in this variable. In addition, because trainees were informed that the algorithms used to calculate team and individual scores meant that this type of activity would have a larger impact on individual score than team score, this variable represents effort directed toward one's individual performance goals. The mean for self-focused effort was 11.47 (*SD* = 4.06), 13.81 (*SD* = 4.04), and 15.49 (*SD* = 4.26) at Blocks 1, 2, and 3, respectively.

Individual Performance

The algorithm for individual performance added 1,000 points for every correctly processed target in the individual's assigned sector, deducted 1,000 points for every incorrectly processed target in the individual's assigned sector, deducted 200 points for each target that penetrated the outer perimeter in the assigned sector and 1 point for every second the target remained in the perimeter until it was processed, and deducted 50 points for each target that penetrated the inner perimeter in the assigned sector and 5 points for every second the target remained in the perimeter. Individuals did not receive points on their individual score for processing contacts outside their assigned sector. Rather, these points contributed to the team score, as described below.

Team-Level Measures

When examining the relationships involving team-regulatory processes and team performance, multilevel issues with respect to measurement must be addressed. The regulatory processes hypothesized to influence team performance exist at the individual level of analysis, with all team members having unique values on each of the regulatory process variables. However, to simply examine these constructs at the individual level of analysis does not provide information regarding the functioning of the team as a collective. In order to examine these relationships at the team level of analysis and, in so doing, represent the functioning of trainees as part of an intact and interacting team, one must compose the individual-level variables to the team level by aggregation. In addition, team performance is fundamentally a compilational construct that does not exist at the individual level of analysis. The statistical analyses available to examine relationships with team performance necessitate that the individual level constructs be aggregated and represented at the team level of analysis (Kozlowski & Klein, 2000).

The referent-shift model was used to justify aggregation for team-level constructs that were based on individual-level questionnaire responses.[2] Our basic strategy entailed first assessing team-level analogs of the fundamental processes involved by obtaining responses from individual team members to team-referent versions of the constructs of interest. Next, we examined the appropriateness of representing these measures at the team level by examining their intraclass correlation, referred to as ICC(1) (Bliese, 2000; James, 1982). ICC(1) compares variance in responses within teams to the variance in responses between teams to index the extent to which team membership contributes to an individual's responses. James reported a median ICC(1) of .12 in the context of climate perceptions. Bliese suggested that the James estimate was likely an overestimate and suggested that ICC(1) values between .05 and .20 are typical and that values greater than .30 are very unusual. We use this range of ICC(1) values, coupled with statistical significance tests, to justify aggregation of measures to the team level of analysis. For the sake of completeness, we also report the effect size η^2 for all significance tests of the ICC(1).

Team Ability

As in the individual-level analyses, cognitive ability was assessed for use as a control variable in all team-level analyses. Because individuals were randomly assigned to teams, we made no assumption that team ability was a homogeneous construct. Rather, team ability was treated as a variable (Bliese, 2000) that was represented as the sum of individual team members' cognitive ability (i.e., additive composition model; Chan, 1998; see also Barrick, Stewart, Neubert, & Mount, 1998). Thus, teams with higher ability members possessed higher values for team ability.

Team Mastery Goal Orientation

Team mastery goal orientation was measured with a modified version of the six-item mastery goal orientation scale developed by Button et al. (1996). The modification entailed changing the referent from individual to team. Because this study used ad hoc teams with no prior history, it was necessary to allow the team to have substantial interaction prior to administering this measure. Thus, this measure was administered at the conclusion of the study. Team members indicated, on a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5), the extent to which their team views opportunities to do challenging work as important, tries harder after failure, prefers tasks that require learning new skills, views opportunities to learn new things as important, does its best when working on a difficult task, and enjoys trying different approaches to difficult tasks. Factor analysis provided support for a one-factor solution. Coefficient alpha was .91 for this scale. Finally, the ICC(1) for this measure was .26 (η^2 = .51), $F(76, 153) = 2.07$, $p < .01$, which justifies aggregating this measure to the team level of analysis by calculating the average value within teams.

Team Performance Goal Orientation

Team performance goal orientation was measured with a modified version of the six-item performance goal orientation scale developed by Button et al. (1996). The modification entailed changing the referent from individual to team. Because this study used ad hoc teams with no prior history, it was necessary to allow the team to have substantial interaction prior to administering this measure. Thus, this measure was administered at the conclusion of the study. Team members indicated, on a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5), the extent to which their team enjoys most what they do best, feels smart when they do something without making mistakes, likes to work on tasks that they have done well on in the past, feels smart when they can do something better than most other teams, views the opinions of others concerning the team's performance as important, and likes to be fairly confident that they can successfully perform a task before they attempt it. Factor analysis provided support for a one-factor solution. Coefficient alpha was .88 for this scale. Finally, the ICC(1) for this measure was .29 (η^2 = .53), $F(76, 153) = 2.25$, $p < .01$, which justifies aggregating this measure to the team level of analysis by calculating the average value within teams.

Team Efficacy

Team efficacy was assessed with the eight-item scale based on the self-efficacy scale developed by Kozlowski et al. (2001). The items were modified such that the team served as the referent, rather than the individual. This measure was administered at three points during training, following each block of two trials. Team members indicated, on a 5-point Likert

[2] Two primary methods are used for representing shared or isomorphic team-level constructs that have been measured at the individual level—the direct consensus and the referent-shift models (Chan, 1998). The direct consensus model uses individual self-referenced measures (e.g., "I am committed to achieving my goal") and assumes that individual team member responses converge. It thus examines restricted within-group variance on the measure in question prior to aggregation. However, several scholars have asserted that direct consensus measures, which reference the individual perspective, may not appropriately capture the higher level construct (K. J. Klein, Conn, Smith, & Sorra, 2001). In contrast, the referent-shift model shifts the frame of reference—individuals rate the team rather than themselves (e.g., "My team is committed to achieving its goal"). The individual ratings are then evaluated for within-group homogeneity to establish convergence, which justifies aggregation to represent the team-level construct.

scale ranging from *strongly disagree* (1) to *strongly agree* (5), the extent to which their team can meet the challenges of the simulation, understands how information cues are related to decisions, can deal with decisions under ambiguous conditions, can manage the requirements of the task, will fare well if the workload is increased, can cope with the simulation if it becomes more complex, can develop methods to handle changing aspects of the task, and can cope with task components competing for their time. Factor analysis indicated a one-factor solution. Coefficient alpha for this scale was .96, .96, and .97 at Blocks 1, 2, and 3, respectively. ICC(1) obtained at Block 1 (.21, $\eta^2 = .47$), $F(76, 158) = 1.80$, $p < .01$; Block 2 (.19, $\eta^2 = .46$), $F(76, 154) = 1.71$, $p < .01$; and Block 3 (.32, $\eta^2 = .55$), $F(76, 154) = 2.46$, $p < .01$, provided justification for aggregating this measure to the team level of analysis by calculating the average value within teams.

Team Goals

Prior to each trial, participants were asked to set a performance goal for their team score. Participants indicated their goals by typing them into the computer. Although the ICC(1) was small and nonsignificant at Block 1 (.02, $\eta^2 = .37$), $F(75, 138) = 1.07$, $p = .36$, a large team effect was found for Blocks 2 (.60, $\eta^2 = .74$), $F(75, 149) = 5.52$, $p < .01$; and 3 (.60, $\eta^2 = .73$), $F(75, 149) = 5.46$, $p < .01$. Given the large team effect for Blocks 2 and 3, along with the conceptual justification for the team nature of this variable, the decision was made to aggregate this measure to the team level of analysis, which was accomplished by calculating the average value within teams.

Team Goal Commitment

The extent to which teams were committed to their goals was assessed prior to Trials 3 and 6 with a six-item measure adapted from Hollenbeck et al. (1989). The scale was modified such that the team served as the referent, rather than the individual. Trainees indicated, on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5), the extent to which their team cares if they achieve the goal or not, is strongly committed to pursuing the goal, would be likely to abandon the goal, thinks that the goal is a good goal to shoot for, and is willing to put in a great deal of effort to achieve the goal. Factor analysis indicated a one-factor solution. Coefficient alpha for this scale ranged from .83 to .89 for the two administrations. ICC(1) obtained at Block 1 (.21, $\eta^2 = .48$), $F(78, 158) = 1.84$, $p < .01$; Block 2 (.17, $\eta^2 = .47$), $F(76, 154) = 1.64$, $p < .01$; and Block 3 (.31, $\eta^2 = .55$), $F(76, 154) = 2.47$, $p < .01$, provided justification for aggregating this measure to the team level of analysis by calculating the average value within teams.

Team Strategy

The extent to which teams actively discussed and formed task-relevant strategies for accomplishing its goals was assessed with a five-item scale developed for this study. This measure was administered at three points during training, following each block of two trials. Individuals indicated, on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5), the extent to which their team consciously or actively planned one or more strategies to accomplish its goals; selected, identified, or used one or more strategies to accomplish its goals; evaluated one or more strategies to accomplish its goals; adapted or changed one or more strategies to accomplish its goals; and reflected on how to improve its performance on the task. Factor analysis indicated a one-factor solution. Coefficient alpha for this scale was .90, .90, and .94 at Blocks 1, 2, and 3, respectively. ICC(1) obtained at Block 1 (.18, $\eta^2 = .45$), $F(78, 158) = 1.66$, $p < .01$; Block 2 (.12, $\eta^2 = .41$), $F(76, 154) = 1.40$, $p < .05$; and Block 3 (.14, $\eta^2 = .42$), $F(76, 154) = 1.48$, $p < .05$, provided justification for aggregating this measure to the team level of analysis by calculating the average value within teams.

Team-Focused Effort

Team-focused effort indicates the number of contacts that trainees processed outside their own assigned sector. Both correctly and incorrectly processed contacts were included in this variable. In addition, because trainees were informed that, as a result of the algorithms used to calculate team and individual scores, this type of activity would only impact the team score but would not improve their individual score, this variable represents effort directed toward the teams' goals. The mean for team-focused effort was 2.39 ($SD = 2.38$), 3.60 ($SD = 2.83$), and 3.90 ($SD = 2.96$) at Blocks 1, 2, and 3, respectively. ICC(1) obtained at Block 1 (.12, $\eta^2 = .41$), $F(76, 154) = 1.43$, $p < .05$; Block 2 (.37, $\eta^2 = .58$), $F(76, 154) = 2.74$, $p < .01$; and Block 3 (.31, $\eta^2 = .53$), $F(74, 150) = 2.33$, $p < .01$, provided justification for aggregating this measure to the team level of analysis, which was accomplished by calculating the average value within teams.

Team Performance

To evaluate the resource allocation implications of the multiple goal model, we had to distinguish performance directed toward individual goals and performance directed toward team goals. Thus, the task incorporated both additive (individual goal) and discretionary (team goal) interdependencies. The additive component was represented by individual performance in the assigned sector, as previously described. The discretionary component was represented by behavior directed toward the team when individuals processed contacts outside of their sector. Team-oriented performance directly contributed to the team score only; it did not contribute to any individual's score. These two components of overall team performance enabled the necessary distinction between performance directed toward individual or team goals. Overall team performance was represented by an additive combination of the two components.

To be consistent with prior feedback research, we provided team members in the appropriate conditions with feedback on their overall team performance. On the basis of pilot testing, the discretionary component was given double weight in this combination to compensate for differential time allocations with respect to periods of overload (discretionary behavior directed toward the team) relative to periods of normal load (individual goal-directed behavior). This helped to ensure that team-oriented performance could make an equivalent contribution to overall team performance when individuals directed performance toward team goals. It is important to note that team members were unaware of this score adjustment and that it is of no consequence for analyses.[3]

Results

Preliminary Analyses

Evaluation of the resource allocation implications of the multiple-goal model necessitated a distinction between performance directed toward individual goals and performance directed toward team goals. Thus, primary analyses focused on individual performance and team-oriented performance, which, in combination, reflect team members' resource allocation decisions. The correlations among the individual-level and team-level variables across the three time periods included in this research are presented in Tables 1 and 2, respectively. The first three variables in

[3] The pattern of results is virtually identical whether team-oriented performance is double or single weighted in analyses.

Table 1
Means, Standard Deviations, and Intercorrelations Among Individual-Level Variables

Variable	*n*	*M*	*SD*	1	2	3	4	5	6
1. Individual feedback	237	0.33	0.47						
2. Team feedback	237	0.35	0.48	−.51**					
3. Individual & team feedback	237	0.33	0.47	−.48**	−.51**				
4. Ability	227	0.43	0.79	−.02	.03	−.02			
5. Trait mastery goal orientation	237	3.96	0.46	.07	−.03	−.04	.19**		
6. Trait performance goal orientation	237	4.09	0.52	−.13*	.09	.04	−.18**	.06	
7. Individual goal (Wave 1)	221	5,613.00	8,292.00	.23**	−.30**	.07	.11	.03	−.04
8. Individual goal (Wave 2)	228	10,924.00	9,242.00	.26**	−.37**	.11	.15*	−.04	−.10
9. Individual goal (Wave 3)	227	14,529.00	10,128.00	.19**	−.31**	.12	.06	−.01	−.12
10. Goal commitment (Wave 1)	237	3.91	0.55	.08	−.09	.01	.12	.28**	.14*
11. Goal commitment (Wave 2)	231	4.00	0.61	−.00	−.02	.02	.03	.25**	.15*
12. Goal commitment (Wave 3)	231	4.06	0.65	−.11	.08	.03	.13	.24**	.03
13. Self-efficacy (Wave 1)	237	3.87	0.66	.05	−.09	.04	.24**	.29**	.03
14. Self-efficacy (Wave 2)	231	4.08	0.67	−.11	.08	.04	.11	.18**	.00
15. Self-efficacy (Wave 3)	231	4.20	0.62	−.05	.08	−.02	.11	.16*	.05
16. Individual strategy (Wave 1)	226	23.72	18.49	.23**	−.06	−.18**	.11	.03	.05
17. Individual strategy (Wave 2)	230	30.47	20.97	.13*	−.08	−.05	.02	.02	−.00
18. Individual strategy (Wave 3)	230	38.23	27.03	.19**	−.06	−.14*	−.00	−.06	−.02
19. Self-focused effort (Wave 1)	231	18.47	6.04	.13	−.05	−.08	.14*	−.08	−.07
20. Own-sector attempts (Wave 2)	231	18.84	5.86	.15*	−.11	−.04	−.00	−.10	−.09
21. Own-sector attempts (Wave 3)	225	19.70	6.09	.28**	−.21**	−.07	.06	−.04	−.05
22. Individual performance (Wave 1)	231	3,415.00	11,515.00	−.00	−.02	.02	.34**	−.11	−.06
23. Individual performance (Wave 2)	231	8,581.00	8,859.00	.04	.00	−.04	.34**	−.07	−.15*
24. Individual performance (Wave 3)	225	10,741.00	8,628.00	.14*	−.08	−.06	.37**	.01	−.10

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

each of these tables, representing the feedback conditions, are dummy codes that compare the specified feedback condition to the other two feedback conditions. Dummy codes comparing a specific feedback condition to the average of the other two feedback conditions are used in these preliminary analyses to provide an overview of the pattern of results. However, focused contrasts comparing specific feedback levels are used in the primary analyses to address the research hypotheses.

Table 2
Means, Standard Deviations, and Intercorrelations Among Team-Level Variables

Variable	*n*	*M*	*SD*	1	2	3	4	5	6
1. Individual feedback	79	0.33	0.47						
2. Team feedback	79	0.35	0.48	−.51**					
3. Individual & team feedback	79	0.33	0.47	−.48**	−.51**				
4. Team ability	79	0.42	0.43	−.01	.03	−.02			
5. Team mastery goal orientation	77	3.86	0.46	−.14	.24*	−.10	.15		
6. Team performance goal orientation	77	3.84	0.48	−.13	.16	−.03	.18	.84**	
7. Team goals (Wave 1)	76	8,017.00	11,223.00	.53**	−.30**	−.24*	.15	.08	.04
8. Team goals (Wave 2)	77	18,304.00	14,172.00	.61**	−.31**	−.30**	.16	.09	.11
9. Team goals (Wave 3)	76	22,984.00	14,245.00	.40**	−.13	−.27*	.11	.34**	.32**
10. Team goal commitment (Wave 1)	79	3.83	0.43	.02	−.06	.04	.43**	.52**	.50**
11. Team goal commitment (Wave 2)	77	3.99	0.43	−.09	.03	.06	.22*	.68**	.63**
12. Team goal commitment (Wave 3)	77	4.06	0.50	−.08	.08	.00	.25*	.62**	.58**
13. Team efficacy (Wave 1)	79	3.88	0.42	.04	−.12	.08	.36**	.60**	.63**
14. Team efficacy (Wave 2)	77	4.08	0.44	−.10	.10	.00	.18	.72**	.69**
15. Team efficacy (Wave 3)	77	4.18	0.50	−.00	.09	−.09	.19	.78**	.74**
16. Team strategy (Wave 1)	79	3.66	0.47	.04	−.09	.06	.26*	.31**	.35**
17. Team strategy (Wave 2)	77	3.76	0.46	−.22	.32**	−.10	.01	.35**	.27*
18. Team strategy (Wave 3)	77	3.88	0.51	−.19	.24*	−.04	.04	.35**	.38**
19. Team-focused effort (Wave 1)	77	5.01	2.65	−.28*	.12	.16	.06	.35**	.33**
20. Team-focused effort (Wave 2)	77	7.51	3.96	−.13	.13	−.01	.04	.35**	.35**
21. Team-focused effort (Wave 3)	75	8.23	3.64	−.29*	.29*	.01	.06	.44**	.32**
22. Team-oriented performance (Wave 1)	77	3,381.00	7,472.00	−.06	.05	.01	.27*	.15	.24*
23. Team-oriented performance (Wave 2)	77	11,759.00	11,134.00	−.10	.28*	−.17	.27*	.27*	.25*
24. Team-oriented performance (Wave 3)	75	12,462.00	9830.00	−.17	.28*	−.11	.29*	.40**	.29*

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

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
.49**																
.41**	.52**															
.15*	.10	.18**														
−.02	.06	.07	.63**													
−.04	−.01	.13	.58**	.66**												
.17*	.23**	.23**	.48**	.46**	.46**											
−.00	.13	.18**	.34**	.46**	.51**	.62**										
.07	.17*	.24**	.34**	.42**	.54**	.59**	.77**									
.20**	.24**	.14*	.11	.05	−.00	.10	.01	.07								
.14*	.15*	.14*	.10	.06	.07	.08	.14*	.14*	.42**							
.06	.17*	.14*	.06	.08	.07	.07	.06	.07	.41**	.62**						
.25**	.37**	.26**	.01	.05	.04	.17**	.04	.09	.25**	.19**	.25**					
.11	.22**	.21**	−.10	.02	−.11	−.09	.02	.05	.22**	.16*	.20**	.35**				
.13	.28**	.37**	−.01	−.00	.01	.12	.07	.23	.26**	.16*	.21**	.32**	.47**			
.18**	.25**	.19**	.02	.01	.07	.23**	.13*	.16*	.23**	.14*	.16*	.35**	.16*	.26**		
.18**	.25**	.31**	.06	.06	.15*	.23**	.31**	.32**	.25**	.13*	.18**	.31**	.51**	.37**	.54**	
.17*	.29**	.40**	.15*	.11	.20**	.27**	.27**	.39**	.28**	.11	.20**	.25**	.35**	.63**	.49**	.70**

At the individual level of analysis, it is interesting to note that individuals receiving individual feedback set higher individual goals, those receiving team feedback set lower individual goals, and those receiving both types of feedback did not set individual goals that differed from the other two conditions. Individuals receiving individual feedback also tended to engage in more individual-oriented strategy development and invested more effort into the task when compared to the other two feedback conditions.

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
.56**																
.41**	.48**															
.34**	.21	.29*														
.05	.15	.35**	.63**													
.05	.16	.39**	.60**	.81**												
.27*	.30**	.45**	.61**	.67**	.63**											
.08	.11	.36**	.45**	.70**	.62**	.71**										
.11	.17	.38**	.46**	.72**	.63**	.67**	.81**									
.18	.27*	.22	.40**	.40**	.38**	.46**	.28*	.32**								
.10	−.01	.18	.31**	.38**	.43**	.22	.42**	.32**	.53**							
−.03	.02	.11	.18	.42**	.44**	.25*	.39**	.40**	.60**	.78**						
−.10	−.10	.15	.11	.30**	.28*	.29*	.39**	.34**	.04	.30**	.31**					
.08	.10	.32**	.24*	.30**	.43**	.38**	.31**	.41**	.30**	.44**	.36**	.45**				
−.16	−.10	.18	.21	.34**	.42**	.25*	.38**	.37**	.20	.44**	.35**	.49**	.57**			
.04	.12	.27*	.10	.33**	.35**	.39**	.20	.25*	.40**	.15	.26*	.47**	.37**	.28*		
.03	.10	.28*	.11	.26*	.37**	.30**	.28*	.36**	.16	.20	.25*	.31**	.64**	.26*	.47**	
.05	.07	.32**	.23*	.39**	.49**	.29*	.36**	.40**	.30*	.36**	.39**	.32**	.47**	.61**	.52**	.53**

Further, trainees receiving individual feedback had higher levels of individual performance by the final wave of training. Mastery goal orientation appears to be related to both goal commitment and self-efficacy across time. Finally, as expected, individuals who set higher goals, engaged in more strategy development, and invested more effort into the task had higher levels of performance.

As in the individual-level correlation matrix, the first three variables in Table 2 are dummy codes that compare the specific feedback condition to the other two feedback conditions for the team-level variables. At the team level of analysis, it is interesting to note that teams that received individual feedback set substantially higher team goals than the other two feedback groups. The correlations also indicate that teams receiving individual feedback invested less team-focused effort. These descriptive findings are examined further in a later section. Teams receiving team feedback had higher strategy development and team-oriented performance in all but the first wave of data collection. Team mastery and performance orientation are related to virtually all other variables, including team goal commitment, team efficacy, team strategy development, team-focused effort, and team-oriented performance. Team goals at Waves 1 and 2 were inconsistently related to team effort and strategy development but were related to team goal commitment, team efficacy, team effort, and team-oriented performance at Wave 3. Finally, there were strong patterns of correlation among team goal commitment, team strategy, team-focused effort, and team-oriented performance across all time periods.

The process model depicted in Figure 2 highlights that the effect of individual characteristics, team characteristics, and situational factors on actions is hypothesized to occur through the intervening intention variables and that individual and team-focused actions result in individual and team-oriented performance. A process model such as this is often analyzed by means of the mediational techniques developed by Baron and Kenny (1986) and James and Brett (1984). However, recent research by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002) demonstrated that those techniques are not statistically optimal. Therefore, to evaluate the process model in Figure 2, we adopted the joint significance method recommended by MacKinnon et al. (2002) for experimental investigations of intervening variable models.

The first step in evaluating the process model depicted in Figure 2 was to assess the direct effect of feedback on both individual and team-oriented performance, controlling for cognitive ability. At the individual level, a contrast between the performance of participants who received individual feedback (M = 12,749.00) and those receiving the other two types of feedback (M = 9,998.39) indicated that trainees receiving individual feedback exhibited greater individual performance by the end of training, $t(208) = 2.38$, $p < .01$, $R^2 = .03$. Similarly, at the team level of analysis, a contrast between teams receiving team-level feedback (M = 16,326.00) versus teams receiving the other two types of feedback (M = 10,529.41) indicated that team feedback resulted in the highest level of team-oriented performance by the end of training, $t(71) = 2.53$, $p < .05$, $R^2 = .08$. These results indicate that various modes of feedback directed trainees' attention toward different aspects of task performance. Although some of the research reviewed previously proposes that individuals can often simultaneously regulate behavior around multiple goals without any necessary tradeoff in performance (e.g., DeShon et al., 1996; Locke & Latham, 1990)—which suggests that providing individuals with both individual and team feedback will result in performance gains in each without any necessary tradeoff—these results indicate that this was not the case in this team context. Rather, feedback led to superior performance on the aspect of the task to which the feedback was directed; individual feedback led to the highest levels of individual performance, whereas team feedback led to the highest levels of team-oriented performance. Thus, as expected, the form of feedback provided to trainees appears to have cued individuals to prioritize their activities with respect to the two goals: individual performance and team-oriented performance.[4] The analysis of the general process model presented next provides a deeper understanding of the effects of feedback and individual and team differences on individual and team regulatory processes and performance.

Individual-Level Analyses

Effects of Feedback and Goal Orientation on Self-Regulatory Intentions

The data in this experiment consist of multiple levels of analysis (team and individual). Because all individuals were members of teams, the clustering of individuals within teams must be incorporated into the analysis to avoid inflated Type I errors (Bryk & Raudenbush, 1992). The mixed procedure in SAS was used to implement hierarchical linear models (see Singer, 1998 for details). The focus of this research is on tests of the fixed effects, controlling for the biasing effects of dependency caused by the clustering of responses within teams. To aid interpretation, these results may be thought of as the result of performing a repeated measures regression controlling for the multilevel aspects of the data structure. Individual differences in ability were included as a covariate in all analyses. Interactions between the study variables and ability were investigated to identify potential Aptitude × Treatment interactions. None of the Aptitude × Treatment interactions were significant in any examined analyses. The denominator degrees of freedom for the F tests in these analyses were calculated with the Satterthwaite (1946) formula. Although there were no specific hypotheses concerning performance goal orientation, it was included in all analyses so that the goal orientation construct could be adequately represented. The results of these analyses are summarized in Table 3 and elaborated on below.

Individual goals. The control variable, cognitive ability, had a marginally significant positive relationship with individual goals, $F(1, 199) = 3.66$, $p = .06$, $R^2 = .02$. Consistent with Hypothesis 1A, feedback had a significant effect on individual goals, $F(2, 75) = 13.74$, $p < .01$, $R^2 = .16$, such that individual goals were highest among trainees receiving individual feedback only (M = 13,167), followed by both individual and team feedback (M = 11,621), and were lowest for those receiving only team feedback (M = 5,969). Thus, providing individual feedback led trainees to strive for greater levels of individual performance. Counter to

[4] Although the logic of the multiple-goal model necessitates a clear distinction between performance directed toward individual goals and performance directed toward team goals, it is important to note that an analysis of the effects of feedback on overall team performance (which combines both the additive individual and discretionary team components) yields identical conclusions.

Table 3
Relationships Between Antecedents and Self-Regulatory Intentions

Model	Num *df*	Den *df*	*F*	*p*	R^2
Individual goals					
Step 1					
Ability	1	199	3.66	.057	.02
Wave	2	419	94.41	< .001	.18
Feedback	2	75	13.74	< .001	.16
PGO	1	199	0.46	.498	.00
MGO	1	191	0.29	.589	.00
Step 2					
Feedback × Time	4	410	0.75	.556	.00
PGO × Feedback	2	194	0.78	.460	.00
MGO × Feedback	2	182	2.72	.069	.01
Individual goal commitment					
Step 1					
Ability	1	207	0.03	.857	.00
Wave	2	434	6.60	.002	.01
Feedback	2	75	0.06	.940	.00
PGO	1	205	2.33	.129	.01
MGO	1	201	19.98	< .001	.09
Step 2					
Feedback × Time	4	426	3.28	.002	.01
PGO × Feedback	2	199	3.93	.021	.02
MGO × Feedback	2	191	0.76	.470	.00
Self-efficacy					
Step 1					
Ability	1	209	1.30	.255	.01
Wave	2	434	42.66	< .001	.09
Feedback	2	75	0.34	.711	.00
PGO	1	208	0.09	.769	.00
MGO	1	205	16.40	< .001	.07
Step 2					
Feedback × Time	4	426	4.59	.001	.01
PGO × Feedback	2	202	1.02	.363	.01
MGO × Feedback	2	195	0.96	.386	.00

Note. Num = numerator; Den = denominator; PGO = performance goal orientation; MGO = mastery goal orientation.

expectations (Hypothesis 1B), neither mastery goal orientation, $F(1, 191) = 0.29$, $p < .05$, $R^2 = .00$, nor performance orientation, $F(1, 199) = 0.46$, $p < .05$, $R^2 = .00$, had direct effects on individual goals. Consistent with Hypothesis 1C, there was a marginal interaction between mastery goal orientation and feedback, $F(2, 182) = 2.72$, $p = .07$, $R^2 = .01$, such that mastery orientation had minimal influence on the goals set by participants in the individual-feedback-only condition, a modest positive influence on goals among those receiving both individual and team feedback, and a larger positive influence on the individual goals set by those in the team-feedback-only condition. Finally, consistent with Hypothesis 1D, there was a significant increase in individual goals over the trials, $F(2, 419) = 94.41$, $p < .01$, $R^2 = .18$.

Individual goal commitment. The control variable, cognitive ability, was not significantly related to individual goal commitment, $F(1, 207) = 0.03$, $p > .05$, $R^2 = .00$. Contrary to Hypothesis 1A, there was no feedback effect on goal commitment. However, there was a significant Feedback × Time interaction, $F(4, 426) = 3.28$, $p < .01$, $R^2 = .01$, such that individual feedback led to greater commitment to individual goals early in training. However, those receiving team feedback only, as well as those receiving both individual and team feedback, demonstrated increases in goal commitment as training progressed, and ultimately reported greater commitment by the end of training than did those receiving only individual feedback. As expected (Hypothesis 1B), mastery goal orientation was positively related to individual goal commitment, $F(1, 201) = 19.98$, $p < .01$, $R^2 = .09$. Unexpectedly, mastery goal orientation did not interact with feedback (Hypothesis 1C), and there was a significant performance goal orientation interaction with feedback, $F(2, 199) = 3.93$, $p < .05$, $R^2 = .02$, such that higher performance orientation was associated with greater goal commitment for trainees receiving individual feedback only and those receiving both individual and team feedback. In contrast, a high performance orientation resulted in decreased commitment to the individual goals among trainees receiving team feedback only. The lack of individual feedback in the team-only condition restricted the opportunity for trainees who were highly concerned with demonstrating performance to do so with respect to individual performance. No significant interaction was observed between mastery orientation and feedback, $F(2, 191) = 0.76$, $p > .05$, $R^2 = .00$. Consistent with Hypothesis 1D, there was an increase in goal commitment across the experimental trials, $F(2, 434) = 6.60$, $p < .05$, $R^2 = .01$.

Self-efficacy. Cognitive ability was not significantly related to self-efficacy, $F(1, 209) = 1.30$, $p > .05$, $R^2 = .00$. As with goal commitment, there was no direct feedback effect on self-efficacy, and so Hypothesis 1A was not supported. However, a significant Feedback × Time interaction was observed, $F(4, 426) = 4.59$, $p < .01$, $R^2 = .01$. Individual feedback—either by itself or in combination with team feedback—led to higher initial levels of self-efficacy, which remained relatively stable for the duration of the study. In contrast, team feedback only resulted in initially lower levels of self-efficacy that increased over time, resulting in the highest levels of self-efficacy by the end of training. Consistent with expectations (Hypothesis 1B), mastery goal orientation was positively related to self-efficacy, $F(1, 205) = 16.40$, $p < .01$, $R^2 = .07$. No direct effect for performance goal orientation was found, $F(1, 208) = 0.09$, $p > .05$, $R^2 = .00$. Hypothesis 1C was not supported, as neither mastery orientation nor performance orientation interacted as expected with the feedback manipulation. Consistent with Hypothesis 1D, there was a significant increase in self-efficacy across the trials, $F(2, 434) = 42.66$, $p < .01$, $R^2 = .09$.

Effects of Self-Regulatory Intentions on Self-Regulatory Actions

The influence of self-regulatory intentions on self-regulatory actions was examined by means of a hierarchical linear model that incorporated time-varying covariates. In contrast to the analyses described above, wherein the influence of constant or unchanging independent variables (feedback and trait goal orientations) were examined on dependent variables observed at multiple points throughout training, the analyses described in this section examine relationships between independent and dependent variables that were both observed at multiple points throughout training. Time-varying covariate analyses are ideally suited to this data structure. Essentially, they allow one to examine how changes in one variable over time are related to changes in another variable over time. Like the analyses described above, this model makes it possible to control for the biasing effects of dependency caused by clustering of individuals within teams. The results of these analyses are summarized in Table 4.

Strategy. Cognitive ability was not significantly related to individual strategy, $F(1, 200) = 0.00$, $p > .05$, $R^2 = .00$. Consistent with Hypothesis 2, individual goals were positively related to strategy such that those who set higher goals used more strategic actions than did those with lower goals, $F(1, 620) = 13.91$, $p < .01$, $R^2 = .02$. Also consistent with Hypothesis 2, self-efficacy was also positively related to strategy, $F(1, 636) = 10.93$, $p < .01$, $R^2 = .02$, such that individuals with greater confidence in their ability to competently perform the task engaged in greater strategic action. However, goal commitment was not found to be significantly related to strategy, $F(1, 628) = 0.14$, $p > .05$, $R^2 = .00$.

Self-focused effort. The control variable, cognitive ability, was not significantly related to self-focused effort, $F(1, 178) = 1.41$, $p > .05$, $R^2 = .01$. As expected (Hypothesis 2), individual goals were positively related to self-focused effort, $F(1, 626) = 8.43$, $p < .01$, $R^2 = .02$. Consistent with research on goal setting, trainees who set higher individual goals invested greater effort toward the attainment of those goals, as reflected by their effort toward own-sector activities and performance. In addition (Hypothesis 2), self-efficacy had a positive relationship with self-focused effort, $F(1, 538) = 25.47$, $p < .01$, $R^2 = .04$. Again, goal commitment was not significantly related to self-focused effort, $F(1, 538) = 2.60$, $p > .05$, $R^2 = .00$.

Effects of Self-Regulatory Actions on Individual Performance

Time-varying covariate analyses were used to examine the relationship between self-regulatory actions and individual performance. These analyses are summarized in Table 5. Cognitive ability was significantly related to individual performance, $F(1, 193) = 62.23$, $p < .01$, $R^2 = .24$. Consistent with Hypothesis 3, both self-regulatory actions examined in this study exhibited significant and unique relationships with individual performance. Trainees who exhibited more strategic actions demonstrated greater individual performance, $F(1, 641) = 172.32$, $p < .01$, $R^2 = .21$. Likewise, self-focused effort was positively related to individual performance, $F(1, 552) = 17.77$, $p < .01$, $R^2 = .03$.

Table 4
Relationships Between Self-Regulatory Intentions and Actions

Model	Num *df*	Den *df*	*F*	*p*	R^2
Strategy					
Ability	1	200	0.00	.955	.00
Feedback	2	77	4.30	.017	.05
Goals	1	620	13.91	< .001	.02
Goal commitment	1	628	0.14	.713	.00
Self-efficacy	1	636	10.93	.001	.02
Self-focused effort					
Ability	1	178	1.41	.237	.01
Feedback	2	76	3.61	.032	.05
Goals	1	626	8.43	.004	.02
Goal commitment	1	538	2.60	.108	.00
Self-efficacy	1	553	25.47	< .001	.04

Note. Num = numerator; Den = denominator.

Table 5
Relationship Between Self-Regulatory Actions and Individual Performance

Model	Num *df*	Den *df*	*F*	*p*	R^2
Individual performance					
Ability	1	193	62.23	< .001	.24
Strategy	1	641	17.77	< .001	.03
Self-focused effort	1	641	172.32	< .001	.21

Note. Num = numerator; Den = denominator.

Team-Level Analyses

Effects of Feedback and Goal Orientation on Team-Regulatory Intentions

Team goals. As can be seen in Table 6, the control variable, team ability, was not significantly related to team goals, $F(1, 70) = 2.19$, $p > .05$, $R^2 = .03$. As predicted in Hypothesis 4A, feedback had a significant effect on team goals, $F(1, 70) = 31.52$, $p < .01$, $R^2 = .31$. However, the effect of feedback on team goals was not consistent with expectations. Team goals were highest among

Table 6
Relationships Between Antecedents and Team-Regulatory Intentions

Model	Num *df*	Den *df*	*F*	*p*	R^2
Team goals					
Step 1					
Ability	1	70	2.19	.143	.03
Wave	2	149	46.03	< .001	.24
Feedback	2	70	31.52	< .001	.31
TPGO	1	69	0.20	.653	.00
TMGO	1	70	2.34	.131	.03
Step 2					
Feedback × Time	4	141	1.14	.339	.01
TPGO × Feedback	2	64	0.81	.451	.01
TMGO × Feedback	2	65	0.62	.541	.01
Team goal commitment					
Step 1					
Ability	1	71	7.32	.009	.09
Wave	2	152	16.30	< .001	.10
Feedback	2	71	1.55	.220	.02
TPGO	1	71	1.28	.262	.02
TMGO	1	71	13.34	< .001	.16
Step 2					
Feedback × Time	4	144	0.37	.826	.00
TPGO × Feedback	2	66	0.87	.422	.01
TMGO × Feedback	2	66	4.38	.016	.06
Team efficacy					
Step 1					
Ability	1	71	3.60	.062	.05
Wave	2	152	32.46	< .001	.18
Feedback	2	71	2.52	.088	.03
TPGO	1	71	5.91	.018	.08
TMGO	1	71	19.15	< .001	.21
Step 2					
Feedback × Time	4	144	1.89	.116	.01
TPGO × Feedback	2	66	2.50	.090	.04
TMGO × Feedback	2	66	2.94	.060	.04

Note. Num = numerator; Den = denominator; TPGO = team performance goal orientation; TMGO = team mastery goal orientation.

teams receiving individual feedback only (M = 26,352), followed by teams that received both individual and team feedback (M = 12,023), and were lowest for those receiving only team feedback (M = 10,722). At first look, this pattern of team goals across the levels of feedback appears surprising. However, given that trainees receiving only individual feedback obtained no information regarding the appropriateness of their team goals or their progress toward them, they likely set and retained unrealistically high team goals. Stated differently, team goals for those receiving just individual feedback were likely poorly calibrated and not bounded by the reality of team performance.

To examine this possibility, we calculated discrepancies between team goals and subsequent overall team performance and compared them across the feedback levels. A strong effect of feedback on goal-performance discrepancies was found, $F(2, 22) = 39.37$, $p < .01$, $R^2 = .64$. Teams receiving only individual feedback set goals that exceeded their performance by an average of 18,005 points. That is, although on average they set team goals of 26,352, their actual performance was on average 18,005 points less than these goals; actual team performance was only approximately one third of their goal level. In contrast, for teams receiving both individual and team feedback, goals exceeded performance by only 3,481.52 points, whereas the performance of teams receiving team feedback only actually exceeded their goals by an average of 242.39 points. These results present support for the notion that the team goals of those receiving only individual feedback were miscalibrated and unrealistically high. The consequences of such unrealistic goal setting, particularly in the absence of feedback revealing this inflation, are addressed in further analyses and discussions below.

Counter to expectations (Hypothesis 4B), team-level mastery orientation was not significantly related to team goals, $F(1, 70) = 2.34$, $p > .05$, $R^2 = .03$. Similarly, Hypothesis 4C was not supported because no interaction between the feedback conditions and team mastery goal orientation was found, $F(2, 65) = 0.62$, $p > .05$, $R^2 = .01$. Finally, Hypothesis 4D was supported by the finding of a strong increase in team goals over time, $F(2, 149) = 46.03$, $p < .01$, $R^2 = .24$. The team goal means for this analysis are in Table 2.

Team goal commitment. Team ability was significantly related to team goal commitment, $F(1, 71) = 7.32$, $p < .01$, $R^2 = .09$. Contrary to Hypothesis 4A, feedback was not related to team goal commitment, $F(1, 71) = 1.55$, $p > .05$, $R^2 = .02$. However, Hypothesis 4B was supported by the finding of a significant relationship between team mastery goal orientation and team goal commitment, $F(1, 71) = 13.34$, $p < .01$, $R^2 = .16$. Teams with a higher focus on learning were more committed to team goals. Further, team mastery goal orientation and feedback interacted in their effects on team goal commitment, $F(2, 66) = 4.38$, $p < .01$, $R^2 = .06$, which supports Hypothesis 4C. The nature of this interaction was such that team mastery orientation had a stronger positive effect for teams receiving team feedback and both individual and team feedback than for teams receiving individual feedback only. The weaker relationship between mastery orientation and team goal commitment among teams receiving only individual feedback was likely due to the restricted ability of these teams to monitor their progress and improvements with respect to team performance; they had no referent by which to gauge and direct their attempts at mastering this aspect of the task, making the pursuit of team goals a less viable means of developing or attaining task mastery. Team performance goal orientation was not significantly related to team goal commitment, $F(1, 71) = 1.28$, $p > .05$, $R^2 = .02$. Finally, Hypothesis 4D was supported by an increase in team goal commitment over time, $F(2, 152) = 16.30$, $p < .01$, $R^2 = .10$. The means for this analysis may be found in Table 2.

Team efficacy. The covariate of team ability had a marginally significant relationship with team efficacy, $F(1, 71) = 3.60$, $p = .06$, $R^2 = .05$. Partial support for Hypothesis 4A was provided by a marginally significant effect of feedback on team efficacy, $F(2, 71) = 2.52$, $p < .10$, $R^2 = .03$, with means that are consistent with the expected effects of feedback on team regulatory intentions. Hypothesis 4B was supported with a significant positive main effect for team mastery orientation, $F(1, 71) = 19.15$, $p < .01$, $R^2 = .21$. A significant positive main effect was also found for team performance orientation, $F(1, 71) = 5.91$, $p < .05$, $R^2 = .08$. Consistent with Hypothesis 4C, team mastery orientation and feedback interacted in their relationship with team efficacy, $F(2, 66) = 2.94$, $p < .05$, $R^2 = .04$, such that a high team mastery orientation had a stronger relationship with team efficacy among teams receiving team feedback, either by itself or in combination with individual feedback. As with team goal commitment, teams that have a high mastery goal orientation are focused on learning and developing their skills, but the lack of team feedback disrupts the regulation of team skills and performance, resulting in decreased team efficacy. A marginally significant interaction was observed between team performance orientation and feedback, $F(2, 66) = 2.50$, $p < .10$, $R^2 = .04$, such that a high team performance orientation had a positive relationship with team efficacy for teams in all feedback conditions, but this relationship was weaker for teams receiving both individual and team feedback. Finally, Hypothesis 4D was supported by a significant increase in team efficacy over the course of the experiment, $F(2, 152) = 32.46$, $p < .01$, $R^2 = .18$.

Effects of Team-Regulatory Intentions on Team-Regulatory Actions

Strategy. The influence of team-regulatory intentions on team-regulatory actions was examined by means of the time-varying covariate analyses presented in Table 7. Given the pattern of team

Table 7
Relationships Between Team-Regulatory Intentions and Actions

Model	Num *df*	Den *df*	F	p	R^2
Strategy					
Ability	1	75	0.07	.794	.00
Feedback	2	76	1.05	.354	.01
Goals	1	184	0.41	.523	.00
Goal commitment	1	211	3.59	.051	.02
Team efficacy	1	211	40.75	< .001	.16
Team-focused effort					
Ability	1	77	0.37	.547	.00
Feedback	2	82	9.36	< .001	.10
Goals	1	212	16.56	< .001	.07
Goal commitment	1	210	0.56	.454	.00
Team efficacy	1	211	7.12	.008	.03

Note. Num = numerator; Den = denominator.

goals resulting from the unrealistic goals set in the individual feedback-only condition, feedback condition was included as a covariate in these analyses but did not account for significant variance in team strategy, $F(2, 219) = 1.18$, $p > .05$, $R^2 = .00$. Team ability did not exhibit a significant relationship with team strategy, $F(1, 75) = 0.07$, $p > .05$, $R^2 = .00$. Consistent with Hypothesis 5, team efficacy and team goal commitment significantly predicted team strategy. Team efficacy was positively related to strategy such that teams with greater confidence in their ability to master the task strategized more than did teams with lower efficacy, $F(1, 211) = 40.75$, $p < .01$, $R^2 = .16$. Team goal commitment was also positively related to strategy, $F(1, 211) = 3.59$, $p = .05$, $R^2 = .02$, such that teams with greater commitment to the team goal engaged in more strategizing. Team goals were not found to be significantly related to strategy, $F(1, 184) = 0.41$, $p > .05$, $R^2 = .00$.

Team-focused effort. Feedback condition was again included as covariate in this analysis, accounting for significant variance in team-focused effort, $F(2, 206) = 10.68$, $p < .01$, $R^2 = .05$. Team ability was not significantly related to team-focused effort, $F(1, 77) = 0.37$, $p > .05$, $R^2 = .00$. Consistent with Hypothesis 5, team goals were positively related to team-focused effort, $F(1, 212) = 16.56$, $p < .01$, $R^2 = .07$, as teams that set higher team goals devoted greater effort toward team performance. Also supporting Hypothesis 5, team efficacy was also positively related to team-focused effort such that teams with greater confidence in their ability to master the task invested greater effort toward out-of-sector activities and performance, $F(1, 211) = 7.12$, $p < .01$, $R^2 = .03$. However, counter to expectations, team goal commitment, $F(1, 210) = 0.56$, $p > .05$, $R^2 = .00$, was not significantly related to team-focused effort.

Effects of Team-Regulatory Actions on Team Performance

Time-varying covariate analyses were used to examine the relationship between team-regulatory actions and team-oriented performance, and these results are presented in Table 8. Team ability had a marginally significant positive relationship with team-oriented performance, $F(1, 77) = 3.26$, $p = .08$, $R^2 = .04$. Consistent with Hypothesis 6, both team-regulatory actions examined in this study exhibited significant relationships with team performance. Teams that strategized more demonstrated greater team-oriented performance, $F(1, 212) = 9.64$, $p < .01$, $R^2 = .04$. Likewise, team-focused effort was positively related to team-oriented performance, $F(1, 221) = 154.16$, $p < .01$, $R^2 = .41$.[5]

Table 8
Relationship Between Team-Regulatory Actions and Team-Oriented Performance

Model	Num *df*	Den *df*	*F*	*p*	R^2
Team performance					
Ability	1	75	3.26	.075	.04
Strategy	1	212	9.64	.002	.04
Team-focused effort	1	221	154.16	< .001	.41

Note. Num = numerator; Den = denominator.

Multilevel Homology

Two key characteristics are necessary to establish multilevel homology: (1) composition of constructs assessed at the lower level to the higher level to ensure construct parallelism and (2) functional equivalence of the relations linking parallel constructs (Kozlowski & Klein, 2000; Morgeson & Hofmann, 1999; Rousseau, 1985). Restricted within-group variance provides the statistical justification supporting construct composition at the team level (James, 1982; Kozlowski & Hattrup, 1992) and was established in the Measures section. Functional equivalence is established by examining the pattern of significant and nonsignificant relations for constructs at both levels of analysis, searching for parallelism or configural invariance in relations between similar constructs (Chen, Webber, Bliese, Mathieu, Payne, Born & Zaccaro, 2002; Widaman, 2000).[6] Information relevant to establishing the functional equivalence of construct relations is contained in Tables 3–8.

Antecedents to regulatory intentions. Relations for the antecedents of ability, feedback, time, and goal orientation and the interactions for effects on goals, goal commitment, and efficacy are shown in Tables 3 and 6. Relations for time, feedback, and both mastery and performance goal orientations exhibited parallelism. Patterns across levels for ability were also fairly consistent (mostly nonsignificant), although average ability did have a significant effect on team goal commitment that was not mirrored at the individual level. The interactions were parallel for goals and mostly for efficacy (Feedback × Time was significant for self- but not team efficacy), whereas relations with goal commitment were not parallel. Feedback interacted with time for individual, but not team, goal commitment; with performance goal orientation for individual, but not team, goal commitment; and with mastery goal orientation for team, but not individual, goal commitment. Thus, the direct effects tended to exhibit good functional equivalence, whereas the interactions evidenced departures from parallelism for goal commitment using significance as the criterion. When considering the parallelism of individual and team results, it is important to remember that there is substantially more power to detect significant effects at the individual level than at the team level of analysis. However, the effect sizes for the observed relations at both levels demonstrate substantial similarity, even in the cases where the significance tests diverge.

Regulatory intentions and actions. Relations for influences (ability, feedback, goals, goal commitment, and efficacy) on the regulatory actions of strategy and effort are shown in Tables 4 and 7. Relations for effort exhibited functional equivalence across levels, whereas relations for strategy were mixed. Ability had

[5] It is important to note that the multilevel model is consistent with the multiple-goal distinction between individual and team-oriented characteristics. However, conclusions remain identical when the analysis is conducted with collective team variables that combine both individual and team aspects.

[6] This research used the most widely endorsed procedure for establishing homologous relations in the multilevel literature. However, it should be noted that Chen et al. (2002) have developed more restrictive criteria for establishing functional equivalence by extrapolating techniques proposed by Widaman (2000) that were intended to establish invariance in relations across time within a sample or in relations across different samples.

nonsignificant effects on strategy at both levels, and efficacy had significant effects on strategy at both levels. However, feedback and goals had significant effects only on individual-level strategy, whereas goal commitment had significant effects only at the team level. Thus, relations for effort exhibited functional equivalence, but relations for strategy supported parallelism only for ability and efficacy. Part of the issue here may be due to qualitative differences in the manifestation of individual-level strategy as a resource allocation process, and team-level strategy as a process that also involves communication, cooperation, and coordination.

Regulatory actions and performance. Relations for the effects of regulatory actions on performance are shown in Tables 5 and 8. In general, this link exhibited good functional equivalence. Ability effects were somewhat inconsistent, having a significant effect on individual performance but only a marginal effect on team-oriented performance. On the other hand, the effects for strategy and effort were parallel across levels.

Summary

Overall, there is good support for the functional equivalence of relations for the multilevel, multiple-goal model of regulation. Seventy-nine percent of hypothesized effects exhibited parallelism across the individual and team levels (15 parallel linkages of 19 predicted), and 74% of all relationships reported in Tables 3–8 did so (27 parallel linkages of 37 examined). Primary departures from parallelism involved interaction effects on goal commitment and the effects of intentions on strategy. Given the prior support for the composition of constructs across levels, and these results for functional equivalence, we conclude that there is good preliminary support for the homology of our multiple-goal, multilevel model of regulation.

Discussion

Findings and Implications

The purposes of this research were two-fold. First, because prior research examining feedback and goal setting in team performance contexts has generally not recognized that such contexts present the individual with multiple goals that may not be complementary across multiple levels of analysis, we sought to apply a multilevel, multiple-goal perspective in understanding the effects of feedback on self-regulatory processes. That is, team performance contexts present individuals with the challenge of regulating their intentions and actions in ways that contribute to both individual and team effectiveness. Furthermore, prior research in this area has also generally not recognized that team performance contexts are multilevel in nature. That is, individual intentions and actions are nested within teams, but those intentions and actions can emerge to represent a functionally equivalent or homologous team-regulatory process. Thus, the present research was predicated on examining the nature of regulation around multiple goals at multiple levels of analysis to better understand learning and performance for both individuals and teams. This purpose was intended to extend a model of self-regulation to individuals in a team context, and to teams as distinct entities.

Results were generally supportive of this contribution. The multiple goal perspective allowed us to formulate a multilevel model of individual and team regulation. Key constructs assessed at the individual level of analysis composed to the team level. That is, we were able to theoretically and statistically justify team-level analogues of critical regulatory constructs. Analyses indicated that, for the most part, key linking processes were functionally equivalent (Kozlowski & Klein, 2000; Morgeson & Hofmann, 1999), exhibiting similar patterns of significant and nonsignificant relations among parallel constructs at both levels of analysis (Chen et al., 2002; Widaman, 2000). Thus, we found good overall support for the homology of the multilevel model that extended the individual-level multiple-goal model to individuals in the team context and to the team level.

Second, on the basis of our multiple-goal, multilevel model of regulation, we sought to understand the effects of individual characteristics, situational factors, and team characteristics on regulatory processes that unfold at both the individual and team levels. Specifically, we focused on how individual and team goal orientation, performance feedback level, and their interactions over time affected individual and team regulatory processes (intentions and actions) and performance. With respect to feedback effects, our purpose was to determine how performance feedback levels addressed in prior research—individual, team, or both—influenced resource allocation and, in particular, whether individuals could optimally regulate their intentions and actions when given feedback regarding progress around these multiple goals, relative to individuals given feedback on one goal or the other.

Results supported the predicted role of feedback in affecting the allocation of resources when individuals strive to accomplish both individual and team goals. Team members who received only individual feedback focused their attention and effort on individual performance, which resulted in the highest level of individual performance by the end of training. Conversely, team members who received only team-level feedback were more likely to focus on team performance, which resulted in the highest team-oriented performance by the end of training. It is also important to note that, in contrast to existing recommendations in the team feedback literature, team members who received both individual- and team-level feedback were unable to optimally capitalize on the multiple-goal feedback. The highest levels of individual and team-oriented performance occurred when team members received a single, focused source of feedback. In general, the effects of feedback on performance were consistent with the process model presented in Figure 2. However, the results suggest that the impact of performance outcome feedback on the resource allocation process is somewhat more complex than predicted, necessitating care when drawing on these findings for recommendations as to what type of feedback to provide to team members.

At the individual level of analysis, team members who received only individual-level feedback set the highest individual performance goals, and had initially the highest commitment to individual goals and the highest self-efficacy. However, by the end of training, team members in the other feedback conditions (team-level and both) had higher levels of commitment to individual goals and self-efficacy. Individual-level mastery orientation affected individual goal commitment and self-efficacy but did not affect the setting of individual-level goals. Individual-level performance orientation was only related to commitment to individual goals. Team members who set higher individual-level goals and had higher self-efficacy for achieving the goals invested more effort into individual-level activities and used more individual-level strategies. As expected, team members who invested more effort into individual-oriented activities and used more individual-level strategies had the highest individual performance.

At the team level of analysis, the results are generally consistent with the process model presented in Figure 2. The results for goal setting were unexpected, although not surprising. Teams receiving only individual-level feedback set the highest team goals. Essentially, analyses showed that team members who received no team-level feedback could not effectively calibrate team-level goals and, as a result, set completely unrealistic team-level goals.

With the exception of the goal-setting findings, the majority of the team-level results were consistent with findings at the individual level. Differences in feedback type resulted in differences in team efficacy. Feedback affected team goal commitment such that teams receiving both individual and team feedback and team feedback only were most committed to the team goal; teams receiving individual-level feedback were least committed to the team goal. Team mastery orientation was positively related to team goal commitment, and both team mastery and performance orientations were positively related to team efficacy. In turn, team goals and team efficacy resulted in more team-focused effort. Team strategy use was affected by team efficacy and team goal commitment, but not team goals. The lack of a team goal effect is most likely due to the miscalibrated goals for teams receiving individual feedback only. As was the case with individual performance, teams that used more team strategies and invested more effort into team-oriented tasks had the highest levels of team-oriented performance.

One issue that should be highlighted is the important effects of goal orientation on regulatory processes at both the individual and team levels of analyses. At the individual level of analysis, mastery orientation was positively related to both goal commitment and self-efficacy. Performance orientation interacted with feedback type on commitment to individual goals, such that trainees who were not provided with individual feedback, alone or in combination with team feedback, reported reduced commitment to individual goals. At the team level of analysis, team mastery orientation was positively associated with both commitment to the team goals and team efficacy. In addition, these relationships were moderated by feedback type such that the positive effects of team mastery orientation were stronger among teams receiving team feedback, alone or in combination with individual feedback. Team performance orientation was positively related to team efficacy but had no other significant direct or interactive effects. Thus, taken as a whole, mastery orientation tended to exhibit beneficial effects on regulatory intentions at both the individual and team levels of analysis, whereas performance orientation had more limited influences on regulatory intentions. Further, at the team level of analysis, the combination of a high team mastery orientation and the provision of team feedback resulted in more positive impacts on regulatory intentions.

This research extends the existing literature on team training and performance in a number of ways. First, and perhaps most important, this research examined individual and team performance in training from a multilevel perspective. This research demonstrates that it is possible to compose team-level analogs of individual self-regulatory constructs and that, for the most part, the regulatory process at the team level functions similarly to the regulatory process at the individual level. Second, this research approached the role of team members from a multiple goal perspective where individuals were placed in an interdependent task that required both team and individual actions to maximize learning and performance. Feedback was shown to be a potent lever that influenced the allocation of resources among the multiple goals. Furthermore, this research represents the only investigation of the effect of all three types of feedback (individual, team, individual and team) on both individual and team performance on an interdependent task. Another strength of this research is that team members were able to flexibly adapt their goals and strategies for accomplishing both the individual and team tasks. This task structure is consistent with Steiner's (1972) most general type of team task, termed a *discretionary* task, in which team members have wide latitude in terms of how and how much of their personal resources they allocate to accomplish team performance (Shiflett, 1979). This form of interdependence constitutes a large class of research tasks (Hollenbeck et al., 2002; Porter et al., 2003) and real world team structures (Lawler, Mohrman, & Ledford, 1995). Such teams typically require each member to assume individual responsibilities or goals, coordinate effort, and provide mutual assistance to other team members to meet broader, but distinct, team objectives. The degree to which members allocate attention and effort across both individual and team goals is discretionary, but critical to team performance.

Boundary Conditions and Research Extensions

Despite the strengths of this research described above, there are some important boundary conditions that should be acknowledged, because they set limits on the generality of our findings and prompt further research issues and directions. We consider these issues as two sets of broader and more important conceptual concerns, and then some additional issues.

Interdependence, Feedback, and Early Skill Acquisition

First and foremost, the nature of task interdependence, types of feedback investigated, and focus on initial skill acquisition set boundary conditions for generalizing our findings. With respect to task interdependence, we deliberately modeled a task in which team performance was a weighted function of actions taken by team members to accomplish both individual and team goals (Shiflett, 1979; Steiner, 1972) because of its wide applicability to real work teams and because it provided a context to examine the relative focus of regulatory activity and resource allocation across multiple goals and levels—the crux of our multiple-goal, multilevel model. This form of interdependence is based on goals that are compatible, but that compete for self-regulatory resources. That is, such tasks necessitate that team members devote effort to achieving individual responsibilities, but also require team members to coordinate and work cooperatively to deal with problems that cannot be resolved without collective effort, problems that would have a negative effect on team effectiveness. Exclusive effort directed toward one's own goals enhances individual performance, but at the expense of coordinated team performance, whereas effort directed toward the team enhances team performance and aids teammates, but at the expense of individual performance. Thus, there is a complex interplay between resource allocation choices and linkages between individual and team performance. These are the kinds of choices that many people make every day. However, it may be the case that in situations where individual and team goals are more complementary, different findings regarding the nonoptimality of both individual and team feedback might be expected. For example, in the most extreme form of goal compatibility (i.e., a purely additive task), no resource allocation across two goals or levels is required because individual performance is simultaneously also oriented toward team performance. As that nature of task interdependence becomes less compatible, it necessitates resource allocation tradeoffs directed toward goals that, while compatible, cannot simultaneously be accomplished. Thus, although we believe that discretionary interdependence is widely applicable, it clearly represents a boundary condition. Further research examining other forms of task interdependence is required to establish the limits of generality.

With respect to types of feedback, we deliberately selected individual, team, and both types because these three represented the primary types of performance outcome feedback addressed in the literature and they are the types generally targeted for practical recommendations (e.g., Total Quality Management and ProMEAS recommend team feedback). Moreover, as types of performance outcome feedback, they fit the core research goal of examining resource allocation across multiple goals and levels. However, if one's research goal instead was to design the best type of feedback intervention, then one would be advised to explore other alternatives. For example, in the context of improving resource allocation across multiple goals, it might be better to make individual performance contributions to the team more salient. That is, feedback that placed individual performance in the context of other team members, and the team as a whole, might allow individuals to better calibrate their contributions and tailor their resource allocation across goals and levels. Preliminary research suggests this may be so (Kozlowski, DeShon, Schmidt, & Chambers, 2002). In addition, designing a feedback intervention would likely also entail the incorporation of richer process information that would guide more effective resource allocation to help improve learning and performance (e.g., Bell & Kozlowski, 2002). The findings reported here are directed toward illuminating the processes of individual and team regulation around multiple goals, and clearly apply only to the types of performance feedback investigated. Additional research will be required to establish how robust the effects are given alternative forms of feedback delivery, and to develop application-oriented feedback interventions.

Another important boundary condition concerns our focus on early skill acquisition in newly formed teams. This focus allowed us to better model the regulatory processes at both the individual and team levels, as team members struggled to learn to perform the task and to coordinate their effort as a team. However, it is possible that the effects of feedback on performance found in this research hold only for early stages of task performance and that later stages of performance might benefit from receiving both types of feedback. That is, it may be that with continued practice, the condition receiving both kinds of feedback may have eventually outpaced the other two conditions for both individual and team-oriented performance as they better calibrated how to allocate resources to both goals and levels. On the other hand, if working on team-oriented tasks is incompatible with working on individual tasks, then receiving feedback on both individual and team performance will likely result in diffusion of efforts across these goals. If so, this pattern would likely hold for even highly practiced aspects of individual and team performance. Clearly, further research is necessary to identify the limits of these findings.

Specificity and Emergent Dynamics

A second set of important issues centers on model specificity and temporal dynamics. Our focus on elaborating the multilevel aspects of goal regulation processes necessitated a conceptual and analytical focus that treated the process within a more general framework that linked individual, situational, and team characteristics to regulatory intentions, actions, and outcomes. This approach was necessary in our effort to identify constructs that would compose from the individual to the team level and that would exhibit functional equivalence in relations across levels. Although this strategy was effective for accomplishing our theoretical and research objectives, it means that more specific relationships among constructs and temporal dynamics were not directly addressed. For example, we did not model some of the more detailed aspects of self-regulation, such as the role of goal commitment as a moderator of the relationship between goals and actions. Indeed, this may have accounted for some of the nonparallelism observed in relations involving goal commitment across both levels of analysis. In addition, our repeated measures analyses largely treated measurements across time as parallel, although many theorists argue that team performance is an emergent, episodic process (Marks, Mathieu, & Zaccaro, 2001). Mapping out this episodic process necessitates a finer grained approach that focuses on reciprocal relations between prior regulatory processes (e.g., goal–performance discrepancies, efficacy) and subsequent goals and resource allocation processes.

Similarly, although we modeled the focus of regulatory activity across multiple goals and levels, we did not model the microdynamics of goal switching inherent in the multiple-goal model. Figure 1 depicts the process of individual and team goals competing for attention and resource allocation. This research used performance feedback type (individual, team, and both) to influence the relative salience of the individual and team feedback loops. However, as we previously discussed, a variety of other factors can make one feedback loop or the other more salient. All other factors being equal, the multiple-goal model suggests that the relative magnitude of discrepancies is likely to direct resource allocation, with attention and effort directed toward the goal with the larger discrepancy. Thus, we would anticipate that resource allocation as a dynamic, reciprocal process would be influenced by the interplay among the relative size of the discrepancies between current performance and the goals (Kernan & Lord, 1990), relative importance or goal commitment (Locke & Latham, 1990), differential efficacy for goal accomplishment (Bandura, 1997), and different tolerances for discrepancies in one goal relative to the other (Carver & Scheier, 1998). Moreover, it is likely that the dynamics of this resource allocation process shift as one makes progress toward the goals or as time erodes. For example, whereas the goal with the larger discrepancy may be salient early in the process, the goal with the smaller, achievable discrepancy may be more salient later in the process as time runs out (Schmidt, 2003). Examining these multiple goal dynamics and the interplay among these factors in the emergence of team performance was beyond the scope of the present investigation. Nonetheless, the dynamics of these complex interactions and reciprocal episodic linkages represent important aspects of the multiple-goal, multilevel model that should be addressed as this work is extended. We view this as a long-term effort. Our initial focus has been centered on establishing the basic model framework. Additional research will then elaborate it to better map the dynamics of regulatory processes and emergence of team performance.

Additional Issues

In addition to the boundary conditions noted above, there are a couple of other factors worth mentioning. First, because we were interested in assessing team goal orientation as a team referent construct, it was necessary to allow team members an opportunity to interact and observe their team prior to assessing the construct. In that sense, team goal orientation as assessed in this research is essentially a state. We nonetheless examined team goal orientation as an antecedent team characteristic, thereby creating a degree of causal ambiguity regarding effects. As an alternative, we could have attempted to compose individual-level goal orientation to the team level as a direct consensus construct (Chan, 1998). However, because trainees were randomly assigned to conditions, there is no theoretical basis to assume that team members would be homogeneous on individual goal orientation traits. Hence, on balance, we believe that the approach we took was preferable to this alternative.

Second, because our focus in this research was on regulatory processes, we treated cognitive ability as a control variable, rather than a substantive construct, at both the individual and team levels. However, one could speculate that high-ability individuals might be better able to manage the allocation of resources between multiple goals, and therefore might benefit from both forms of feedback. Although we observed some significant linear effects for ability, we did not observe ability interactions. Because our experiment was not designed to be particularly sensitive to ability effects, we do not believe our results speak directly to the potential for such interactive effects to be relevant. Thus, this is an issue that may warrant further exploration.

Finally, this research was conducted in the laboratory with a synthetic task and college student trainees and is therefore subject to the usual caveats relative to extrapolating the findings to organizational teams. In addition, it is important to acknowledge that such laboratory teams are decontextualized relative to applied settings. Thus, they are not subject to the many strong situational influences that operate in organizational settings—such as incentives or leadership—that may influence the relative salience of different types of feedback or goals, thereby influencing individual and team regulatory processes. This is a deliberate strategy of the laboratory design—to rule out uncontrolled extraneous influences and to focus on precision in capturing fundamental processes—yet it clearly means that generalization to applied settings must be made with appropriate caution and with due respect for the many potent influences that operate in organizational contexts. That said, however, we should also note that the task design used is consistent with a theoretically defined form of interdependence and has psychological fidelity with the real world task it emulates (Kozlowski & DeShon, 2004). Thus, within the boundary conditions we have identified, the core psychological constructs and processes underlying self and team regulation examined in this research can be expected to generalize to related task designs.

Conclusion

In summary, this research posited a multiple-goal, multilevel model of individual and team regulation. The research established the composition and functional equivalence of regulatory constructs and processes at both the individual and team levels of analysis, thereby extending the general model of self-regulation to individuals in the team context and to the team level. In addition, analyses demonstrated essentially parallel effects for feedback, goal orientation, and their interaction over time at both levels of analysis. Thus, we believe that we have established a theoretical and empirical foundation for a multiple-goal, multilevel model that has the potential to help illuminate the influence of individual characteristics, situational factors, and team characteristics on individual and team regulatory processes underlying learning and performance at both levels of analysis. That is, we are beginning to probe the emergence of team performance from the actions of individuals working in concert, to establish the linkage between individual actions and team outcomes (Goodman, 2000). With the increasing push to improve team training, learning, and performance, we believe that our approach will prove useful to enhancing understanding of these processes.

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